PARACHUTE ASSOCIATION

of

SOUTH AFRICA

STANDARD OPERATING PROCEDURES

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Amendments to this manual, as approved by PASA, will be published from time to time.

No hand amendments may be made.

Amendment	Section/s	Effective Date	Approved By
Original		November 2003	
Revision 1	All sections	July 2005	MJ Bellingan
Revision 2	All sections	July 2012	MJ Bellingan
Revision 3	Section 7	October 2015	MJ Bellingan
Revision 4	Section 2 Section 6	August 2016	MJ Bellingan
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Revision 6	Section 16 - add JM Basic Rating Section 17 - various updates to align with best practice	March 2020	MJ Bellingan
Revision 7	Section 2- update AE coach rating renewal requirements Section 7 - update coach rating renewal requirements Section 10 - update open class currency requirements	March 2023	MJ Bellingan

WARNING

IMPORTANT NOTICE

Sport parachuting or skydiving is a potentially hazardous activity that could result in serious injury or death.

This Standard Operating Procedures provides basic rules, standards and recommendations for the conduct of safe and enjoyable skydiving. It is not intended to be all inclusive, but rather the basic essential information. Skydivers are encouraged to research further and to ask their Chief Instructor or Safety Officer, Jumpmaster, Instructor or Instructor Evaluator for additional information or clarification.

EACH INDIVIDUAL PARTICIPANT, REGARDLESS OF EXPERIENCE, HAS THE FINAL RESPONSIBILITY FOR HIS OR HER OWN SAFETY.

An individual's safety can be enhanced by exercising proper precautions and procedures. This publication contains some of the knowledge and practices that, in the opinion of PASA, will promote the safe enjoyment of skydiving.

It is the responsibility of each student to ask whatever questions are necessary for him or her to have a thorough understanding of the actions and procedures that he or she must perform in order to make a safe jump. Each skydiver has the responsibility to exercise certain practices and perform certain actions to maintain safety for himself or herself and for other people.

PASA issues various licences, ratings and appointments and provides various types of information, advice and training. PASA can suspend or revoke any rating, award, appointment or membership.

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SECTION 1

INTRODUCTION

The principles and methods of training sport parachutists and operation of drop zones in South Africa are standardised under the auspices of the Parachute Association of South Africa (PASA).

These principles and methods are contained in the Standard Operating Procedures (SOPs) for Sport Parachuting in South Africa.

It should be noted that the requirements as laid down in the PASA SOPs, are the minimum requirements of PASA and Drop Zone Operators are at liberty to lay down and enforce further regulations, over and above these, at their own DZs.

As skydiving is continuously progressing and evolving, amendments will be made to this manual from time to time. The version available on the PASA website is at all times deemed to be the current and applicable version.

Do not remove anything from this manual as this will reduce its effectiveness.

The objectives of standardised doctrine are:

- To standardise the basic principles of training throughout the country.
- To give DZs, their operators (instructors, etc.) and members a reference guide for the operation of all facets of the sport.
- To define the method by which the regulations, as contained in the PASA SOPs, should be applied, so as to ensure the safe conduct of sport parachuting.

This manual is issued and revised by the National Safety & Training Officer, under the authority of the Accountable Manager. Parachuting is a dynamic and ever-evolving sport, so this manual is a live document, subject to review from time to time.

Skydiving is a sport enjoyed by both men and women. In order to simplify the text, masculine pronouns are used in this publication and shall be considered as including the feminine gender unless the context clearly indicates otherwise.

PASA Contacts

Physical address	4 Janssens Crescent, Melkbosstrand, 7441
Postal address	P O Box 423, Melkbosstrand, 7437
Telephone	021-553-3398
General email	admin@para.co.za
Management Council	mc@para.co.za
National Safety & Training Officer	safety@para.co.za
Website	www.para.co.za

SECTION 2

BASIC SAFETY REQUIREMENTS

CONTENTS

1 DZ OPERATIONS

1.1 ADMINISTRATION

1.1.1 All Sport Parachutists shall be paid up members of the Parachute Association of South Africa (PASA).

1.1.2 A sport parachutist shall be a minimum of 18 (eighteen years) of age or a minimum of 16 (sixteen years) of age, with the written consent of the minor's guardian.

1.1.3 A sport parachutist shall, prior to his first parachute descent, satisfy his Chief Instructor that he is medically fit to participate in parachuting by means of a certificate from a medical doctor or by means of a medical indemnity form.

1.1.4 The DZO shall keep this certificate or indemnity on record.

1.2 GENERAL ACTIVITIES

1.2.1 Sport parachuting at an approved, permanent, student DZ may only be conducted with the authority of, and under supervision of, a current appropriately rated PASA Instructor, approved by PASA as the Chief Instructor. When absent, he must appoint another competent and current appropriately rated PASA Instructor to assume his duties in his absence. (For activities of B licence and higher, he may appoint a competent and current PASA D licence holder to supervise.)

1.2.2 Sport parachuting at an approved, permanent, B licence DZ, may only be conducted with the authority of, and under supervision of, a current PASA D Licence holder approved by the PASA as the Safety Officer. When absent, he must appoint another competent and current PASA D licence holder to assume his duties in his absence.

1.2.3 Operations at non-permanent DZs (i.e. go-aways or demonstration jumps) may only be conducted after the necessary permissions have been obtained from both the NSTO and SACAA and must be conducted in accordance with those permissions.

1.2.4 The DZO or SJO is responsible for all parachuting activities undertaken by his operation, regardless of the activity taking place, i.e. boogies, competitions etc. The DZO shall at all times be held responsible for the safe conduct of parachuting and the adherence to the PASA Standard Operating Procedures.

1.2.5 A manifest list must be completed for each aircraft load. A loadmaster or jumpmaster must be identified for each load. It is the loadmaster or jumpmaster's responsibility to ensure that all parachutists are checked out prior to enplaning.

1.2.6 Except on demonstration jumps every parachutist shall ensure that his main canopy is fully inflated not lower than 2200ft above ground level (AGL).

1.2.7 No person shall make a parachute descent while under the influence of alcohol or a drug having a narcotic effect.

1.2.8 Maximum wind conditions for the use of the different categories of canopies shall be:

- Student 15 knots (28 km/h)
- Non-student CI/SO discretion

1.2.9 A CI/SO or SJO may prevent any individual from participating in sport parachuting activities under his supervision, if in his opinion the individual constitutes a threat to the safe conduct of the activity.

1.3 EQUIPMENT

1.3.1 Parachute equipment may malfunction even when properly designed, manufactured, assembled, packed, maintained and used. The result of such malfunction could be serious injury or death.

1.3.2 No sport parachutists shall make or attempt to make a parachute descent unless wearing both main and reserve parachutes attached to a single harness. Tandem parachuting being the only exception as it requires a dual harness system.

1.3.3 Parachutes used for sport parachuting shall be categorised as follows:

- STUDENT EQUIPMENT
  Ram-air parachutes, suitable for use by students, which have been de-tuned (i.e.: steering lines lengthened or otherwise adjusted to prevent stalling) and approved by the CI.
- NON-STUDENT EQUIPMENT
  All other ram-air parachute types.

1.3.4 The CI shall be responsible for the inspection and approval of all equipment to be used by students at his DZ.
1.3.5 All parachuting equipment to be used by student parachutists shall have a packing record.
1.3.6 The owner and/or, in the case of B, C and D licence holders, the user of equipment is responsible for its maintenance.
1.3.7 No parachute equipment shall be used where the reserve parachute and harness assembly has not been inspected and packed, and recorded on a valid data card, within the previous six (6) months by qualified person(s), as designated by PASA. (See Section 17 - Rigging Regulations.)
1.3.8 Subject to the manufacturer's limitations, equipment used for sport parachuting may remain in service while deemed serviceable by a qualified person(s), as designated by PASA. (See Section 17 - Rigging Regulations.)
1.3.9 All parachute harnesses and reserve parachutes used for sport parachuting in South Africa shall have complied with a TSO test or similar.
1.3.10 A suitable knife shall be carried in all aircraft from which static line parachuting is conducted.
1.3.11 All parachutists doing solo descents in excess of 15 seconds shall wear a functioning altimeter.
1.3.12 Where less than 8 participants engage in Formation Skydiving, at least 50% must wear functioning altimeters where they are readily visible. Where 8 or more participants are involved in a formation, at least 25% must wear functioning altimeters where they are readily visible.
1.3.13 All equipment used for student freefall progression as well as for intermediate freefall progression up to A licence shall be fitted with a serviceable Automatic Activation Device (AAD). It is highly recommended that all equipment used be fitted with a serviceable Automatic Activation Device (AAD).
1.3.14 Student parachutists shall wear NSTO approved hard helmets. B and C Licence holders shall wear at least a NSTO approved French frappe hat.
1.3.15 Visiting Foreign or Military qualified jumpers participating in PASA activities may utilise equipment manufactured and maintained in compliance with regulations of their organisation. If such equipment does not comply with PASA regulations then, however, the above points apply. They may not let PASA members use such equipment.
1.3.16 Notwithstanding the above, the CI or SO may prevent any person from using equipment that in his opinion is unfit for use.

1.4 STUDENT/INTERMEDIATE ACTIVITIES

1.4.1 A student parachutist shall be one who has not completed a PASA Progression Programme.
1.4.2 An Intermediate parachutist shall be a non-student who has not yet obtained a B licence.
1.4.3 Student and Intermediate parachuting and training may only be conducted by or under the direct supervision of a current, appropriately rated PASA Instructor. See also 1.2 above.
1.4.4 A PASA Jumpmaster must accompany every student in the aircraft until he has completed the 20 sec dive exit test and is approved to dispatch himself by the CI.
1.4.5 Student parachutists shall progress via a PASA Progression Programme as laid down by PASA. A student on such a programme may only perform jumps on that programme for which he has specifically been cleared and briefed. He may repeat previously successfully completed jumps with CI's clearance.
1.4.6 No student instruction may be given in the use of round main parachutes.
1.4.7 No intermediate parachutist shall be allowed to progress from student to non-student equipment without receiving the prescribed training.
1.4.8 Before participating in any discipline an intermediate parachutist shall successfully complete the PASA Intermediate Skills Programme.
1.4.9 The currency of a student or intermediate must be verified before he is permitted to jump.

1.5 PARACHUTING INCIDENTS

1.5.1 All incidents (an incident being any unusual occurrence) must be reported on the prescribed PASA form to the NSTO within 7 days thereof.
1.5.2 In the event of a fatality, it must be reported immediately to the following:
- Emergency services
- CI
- NSTO (who will in turn notify SACAA)

- Air Traffic Control (use the telephone and not the aircraft radio)
- Local SA Police
- Next of kin, preferable by way of the police unless a close family friend is nearby

1.6 WAIVERS

Waivers from any one of these Requirements, unless expressly stated otherwise in the requirements, may only be obtained from the NSTO, after application in writing via an affiliated organisation's / DZs CI, SO or SJO.

1.7 DISCIPLINE

1.7.1 Failure to comply with these Requirements may result in grounding or a suspension of the parachutist's rating by a CI/SO/SJO, which action will be reported to the NSTO within 7 days thereof. The parachutist must be given a copy of the grounding notice, and a further copy must be sent to the NSTO within 30 days.

1.7.2 The NSTO shall have the right to suspend or withdraw any PASA rating for any breach of these Requirements. Rating holders who do not ensure that these Requirements are enforced, may, after investigation by the NSTO, have their rating suspended or withdrawn.

1.7.3 Any parachutist disciplined shall have the right to appeal to the NSTO and thereafter to PASA.

1.7.4 The NSTO may suspend operations of any PASA affiliated DZ or organisation that does not conform to these requirements.

1.7.5 PASA shall not be held responsible for DZs operations beyond the jurisdiction of PASA, as defined by SACAA and these Requirements.

NB: Also refer to Discipline in PASA Code of Conduct and Discipline.

2 SKYDIVING CLASSIFICATIONS

2.1 LICENCES

The NSTO shall approve the issue of all parachuting licences.

REQUIREMENTS

- **A** Licence
  - At least 25 parachute descents.
  - Complete a PASA Progression Programme.
  - Complete the Intermediate Skills Programme.
  - Have received instruction in packing a main parachute.
  - Pass the A Licence test as administered by the CI.

- **B** Licence
  - At least 75 free fall descents.
  - Hold a valid A Licence.
  - Prior to jumping non-student equipment:
    - have received an advanced canopy control briefing (logged).
    - have demonstrated safe, competent canopy control to the satisfaction of his CI (own spot).
  - Obtained Category III status in a recognised discipline.
  - Pass the B Licence test as administered by the CI.

- **C** Licence
  - 200 free fall descents.
  - Hold a valid B Licence.
  - One intentional night jump.
  - A planned water jump briefing by his CI.
  - Demonstrated his ability to his SO/CI to spot safely and competently.
  - Have passed the C Licence test as administered by the CI.
  - Have complied with the C Licence minima in a recognised discipline.

- **D** Licence
  - 500 free fall descents.
  - Hold a valid C Licence.
  - Participated in the S.A. National Championships in a recognised discipline.
  - One night skydive with at least one other skydiver of the same discipline.
  - Hold a PASA JM rating.
  - Have complied with the D Licence minima in a recognised discipline.
  - Have attended a PASA sanctioned Boogie.

2.2 CURRENCY REQUIREMENTS

2.2.1 Currency or frequency of jumping is often a factor in incidents.

2.2.2 The CI/SO may request proof of currency from any other jumper before allowing him to manifest.

2.2.3 Any student who has not made a jump for a period of one month and not exceeding 3 months shall undergo full refresher training under supervision of an appropriately rated Instructor before being made to repeat the previously successfully completed task. Thereafter normal progression if appropriate.

2.2.4 A static line student who has not made a jump for a period exceeding three months shall undergo full first jump course training and then perform at least one no task static line jump before being allowed to progress normally.

2.2.5 A freefall progression student who has not yet passed the dive exit test, who has not made a jump in the preceding 3 months shall be required to: undergo full refresher training; one DRCP jump; 1 3sec delay and then the previously successfully completed task before being allowed to progress normally.

2.2.6 A freefall progression student who has passed the dive exit test, who has not made a jump in the preceding 3 months shall be required to: undergo full freefall refresher training; the 20sec dive exit jump; and then the previously successfully completed task before being allowed to progress normally.

2.2.7 An AFF student who has not made a jump for a period of one month and not exceeding 3 months shall be required to: undergo full refresher training under supervision of an appropriately rated Instructor; and then repeat the previously successfully completed task before being allowed to progress normally.

2.2.8 An AFF student who has not made a jump for a period exceeding 3 months shall be required to: undergo full refresher training under supervision of an appropriately rated Instructor and then: If last jump was level 1, 2 or 3 - repeat the previously successfully completed task before being allowed to progress normally. If last jump was level 4 - 10 perform a level 3 check-out jump; then repeat the previously successfully completed task before being allowed to progress normally.

2.2.9 An Intermediate jumper who has not made a jump for a period of one month and not exceeding 3 months shall undergo full freefall refresher training under supervision of an appropriately rated Instructor and then perform a stable delay of at least 20 seconds on familiar gear with practice touches. Opening should be minimum 4000ft.

2.2.10 An Intermediate jumper who has not made a jump for a period of 3 months and not exceeding 12 months shall undergo full freefall refresher training under supervision of an appropriately rated Instructor and then perform at least one jump with a CI approved jumpmaster, coach or instructor. The jump should include a linked exit, body position check and 2 practice touches. Familiar gear. Opening should be minimum 4000ft.

2.2.11 An Intermediate jumper who has not made a jump for a period exceeding 12 months shall undergo full static line training under supervision of an appropriately rated Instructor and then perform at least 1 static line DRCP jump; one 5 second delay (AAD rig); one 20 second delay on familiar equipment with practice touches. Opening should be minimum 4000ft

2.2.12 As an alternative, the Intermediate described in 2.2.11 may get recurrent by: Undergoing full freefall refresher training; performing an AFF level 3 jump with 2 qualified, rated AFF Instructors. Then the last successfully completed category test before normal progression.

2.2.13 A CI/SO may require any other jumper who has become un-current due to inactivity to undergo retraining and make such jumps that CI/SO deems necessary for him to become current.

2.2.14 B, C and D licence holders must realise that extended periods of inactivity make them un-current. They should request the assistance of an Instructor in refreshing their drills and knowledge, and then perform appropriate re-currency jumps before continuing with normal activities.

2.2.15 A parachutist who is required to perform prescribed jumps in order to become current, shall where possible, perform such jumps on equipment with which he was familiar at the time immediately preceding the period of inactivity.

2.2.16 Only current AFF Instructors may be appointed to perform AFF style re-currency jumps. In this case appropriate AFF equipment shall be utilised.

2.3 RATINGS

The NSTO shall approve:

- the issue of all PASA ratings, and
- all Instructor, Tandem and Parachute Technician certification courses.

Only holders of a current PASA rating may perform such duties and/or jumps as required by that rating.

2.3.1 PRO

Parachutists holding a current Pro rating are certified as capable of safely and competently performing demonstration jumps.

Qualifications

- Successfully completed the certification requirements for a Pro rating as contained in Section 14, see Form 3.
- Possess a PASA C Licence.
- Have at least 300 jumps on a Ram-Air type canopy of which 50 must be in the previous 12 months.
- For certification requirements, see Form 3.

Renewal and Revalidation

All Pro rating holders shall renew their ratings on an annual basis along with their PASA membership renewal at year-end, using the official PASA General Application Form.

The application for renewal shall be approved by the applicable CI/SO/SJO certifying that the renewal requirements have been met.

The requirements for renewal shall be:

- Within the previous 12 months the Pro holder must perform 50 jumps of which 5 must be successful Demonstration jumps.

OR

- Within the previous 12 months the Pro holder must perform 50 jumps of which 5 must be re-qualification jumps as required in the Initial Requirements contained in Section 14.
- A Pro rating having lapsed for more than two years the rating holder must redo all 10 qualifying jumps and have done a minimum of 50 jumps within the previous 12 months.
- If a Pro Rating holder's competence is questioned by a CI/SO or SJO, the Pro Rating holder may be required to reaffirm his proficiency.

2.3.2 JUMPMASTER BASIC

Parachutists holding a JM Basic rating are certified as capable of being appointed as the loadmaster on an aircraft load and may be approved by a CI to dispatch AFF graduates as well as static line students that have passed the 20 second dive exit.

Qualifications

- Successfully completed a PASA approved JM B Course. See Jumpmasters manual Section 16.
- For pre-course requirements, see Form 7.

Renewal and Revalidation

The JM B rating does not need to be renewed annually. Use of a JM B rating is solely at the discretion of a CI.

2.3.3 JUMPMASTER STATIC LINE

Parachutists holding a current JM SL rating are certified as capable of supervising students in the aircraft and supervising students on static line and free fall jumps. They may carry out DRCP briefings, FF progression briefings (first freefall with instructor supervision) and assist in training First Jumpers with the CI's approval. They may also conduct hand deploy briefings with CI's approval.

Qualifications

- Successfully completed a PASA approved JM Course. See Jumpmasters manual Section 16.
- For pre-course requirements, see Form 7.
- Completed a post course apprenticeship of Jump Mastering ten (10) SL students under the CI's supervision.

Renewal and Revalidation

All static line jumpmasters shall renew their ratings on an annual basis, along with their PASA membership renewal at the year-end, using the official PASA General Application Form.

The application for renewal shall be approved by the applicable CI, certifying that the renewal requirements have been met.

The requirements for renewal shall be:

- The JM SL shall have at least jump mastered ten (10) static line students, and five (5) free fall students in the previous six (6) months.
- Have attended a JM's seminar, run by his CI, within the last six (6) months.

A static line jumpmaster rating shall lapse in the event of continued inactivity as interpreted by his CI.

In order to revalidate a lapsed rating, a static line jumpmaster shall be required to undergo retraining by his CI and satisfy the said CI of his ability to safely supervise and dispatch a novice or student parachutist.

2.3.4 COACH

Parachutists holding a current Coach rating in Formation Skydiving (FS), Artistic Events (AE), Canopy Formation (CF) and Freefall Style & Accuracy Landing and Para-Ski (SAP) are certified as capable of safely and competently coaching ISP graduates to Category III status in one or more of these disciplines. Parachutists holding a current Coach rating in Canopy Piloting (CP) are certified as capable of safely and competently coaching as described in Section 10 of this manual. Parachutists holding a current Coach rating in Wingsuit Flying (WS) are certified as capable of safely and competently coaching as described in Section 11 of this manual. Ratings are discipline specific.

Qualifications

A FS, AE, CF and SAP coach is defined as a person who:

- has a Category III in the relevant discipline.
- holds a PASA C or D licence.
- holds a PASA JM rating.
- must be approved by the CI.
- must be approved by the relevant discipline.

A CP coach is defined as a person who:
- holds a PASA C or D licence.
- holds a PASA JM rating.
- has done a minimum of 1000 jumps.
- holds a current PRO rating.
- must be approved by the CI.
- must be approved by the relevant discipline.

A WS coach is defined as a person who:
- has a Category III in WS.
- holds a PASA C or D licence.
- holds a PASA JM rating.
- has done a minimum of 100 wingsuit jumps.
- must be approved by the CI.
- must be approved by the relevant discipline.

For Coach Rating Requirements, see Form 19.

Renewal and Revalidation

All coaches shall renew their ratings on an annual basis, along with their PASA membership renewal at the year-end, using the official PASA General Application Form.

The application for renewal shall be approved by the applicable CI, certifying that the renewal requirements have been met.

The requirements for renewal shall be:

Formation Skydiving:
- Have, in the previous 12 months, performed at least 50 FS jumps (two or more people turning prescribed formations on non-coaching skydives) and at least 10 Category II or Category III coaching jumps.
- Attendance of a FS sanctioned coaching seminar in the previous 12 months is highly recommended.

Artistic Events:
- Have, in the previous 12 months, performed at least 50 jumps of which at least 25 must be AE jumps.
- Attendance of an AE sanctioned coaching seminar in the previous 12 months is highly recommended.

Canopy Formation:
- Have, in the previous 12 months performed at least 10 CF Category jumps.
- Have, in the previous 12 months performed at least 20 CF jumps.
- Attendance of a CF sanctioned coaching seminar in the previous 12 months is highly recommended.

Freefall Style and Accuracy Landing:
- Have, in the previous 12 months, performed at least 10 Accuracy Landing jumps.
- Have, in the previous 12 months, performed at least 5 Freefall Style jumps.
- Have attended a SSA recognised judging seminar in Freefall Style, and in Accuracy Landing in the previous 24 months.

Canopy Piloting
- Have, in the previous 12 months, performed at least 50 CP jumps over a CP committee recognised pond (or at least 100 jumps in the previous 12 months, of which at least 25 must be CP jumps over a CP committee recognised pond).
- Have, in the previous 12 months, coached 2 candidates in the Intermediate Canopy Piloting Skills Programme.
- Have, in the previous 24 months, participated in CP Open Class at an IPC First Category Event, Nationals or SSA CP sanctioned competition.
- Have complied with Qualifications of a Coach.

Wingsuit Flying

- Have, in the previous 12 months, performed at least 50 jumps of which at least 10 must be wingsuit flying jumps.
- Have, in the previous 12 months, trained at least 1 full First Flight Course.
- Attendance of a WS sanctioned coaching seminar in the previous 12 months is highly recommended.

A Coach rating shall lapse in the event of continued inactivity as interpreted by the CI.

In order to revalidate a lapsed rating, a Coach shall be required to comply with the initial requirements as contained in Form 19.

2.3.5 STATIC LINE (S/L) INSTRUCTOR

Parachutists holding a current S/L Instructor rating are certified as capable of safely and competently instructing a S/L first jump course and certifying student progression. They may also conduct hand deploy and other briefings required by the CI.

Qualifications

- Successfully completed a PASA authorised Instructor's course.
- For pre-course requirements, see Form 8.
- After completion of the course, the candidate Instructor shall have served an "apprenticeship" under his CI's supervision, as laid down by the Course Director, before being awarded his rating.

Renewal and Revalidation

The application for renewal shall be approved by the CI, certifying that the renewal requirements have been met.

The requirements for renewal shall be:

- The Instructor shall have in the last six months:
  - instructed a complete SL first jump course. (at least two students).
  - trained and jump mastered at least one S/L student through first free fall.
  - have attended an Instructors' seminar, run by the CI.

In order to revalidate a lapsed rating, a S/L Instructor shall be required to:

- assist a current S/L Instructor in the training of at least two first jump students to first jump status; and
- satisfy his CI of his ability to instruct both first jumpers and free fall students.

A S/L Instructor that has not instructed a first jump course during the past 2 years must be re-validated as required by a current PASA S/L evaluator.

2.3.6 AFF INSTRUCTOR

Parachutists holding a current AFF Instructor's rating are certified as capable of safely and competently instructing an AFF course and providing in-air instruction to student AFF parachutists. They may also conduct hand deploy and other briefings required by the CI.

Qualifications

- Successfully completed a PASA authorised AFF Instructor's course.
- For pre-course requirements, see Form 9.
- After completion of the course, the candidate AFF Instructor shall have served an "apprenticeship" under an AFF CI, as laid down by the Course Director, before being awarded his rating.

Renewal and Revalidation

All AFF Instructors shall renew their ratings on an annual basis, along with their PASA membership renewal, at the year-end, using the official PASA General Application Form.

The application for renewal shall be approved by the AFF CI, certifying that the renewal requirements have been met.

The requirements for renewal shall be:

- The Instructor shall have in the last six months:
  - Instructed and trained at least one student through all 10 AFF levels (including jumping levels 1 to 7 twice, or 21 AFF jumps).
  - Have attended an Instructors' seminar, run by the CI.

In order to revalidate a lapsed rating, an AFF Instructor shall be required to: assist a current AFF Instructor in the training of AFF first jump students from Level 1 to 10 status; and satisfy the CI of his ability to instruct First Jump and AFF students on progression.

An AFF Instructor that has not instructed a first jump AFF student/s, or having not done any AFF jumps, during the past 2 years must be re-validated as required by a current PASA AFF evaluator.

2.3.7 TANDEM MASTER

Parachutists holding a current Tandem Master rating are certified as capable of safely and competently performing Tandem parachute jumps without supervision.

Qualifications

- Successfully completed a PASA authorised Tandem Master training course.
- Have a minimum of 800 freefall jumps logged.
- Have a minimum of 8 hours' freefall time.
- Have a minimum of 100 freefall jumps in the past year of which at least 50 must be in the past 4 months.
- Have a minimum of 3 years parachuting experience.
- Be a minimum of 18 years old.
- Hold a current PASA JM rating.
- Hold a current PASA D licence.
- For pre-course requirements, see Form 13.

Renewal and Revalidation

All Tandem Masters shall renew their ratings on an annual basis, along with their PASA membership renewal, at the year-end, using the official PASA General Application Form.

The application for renewal shall be approved by the CI / SO, certifying that the renewal requirements have been met.

The requirements for renewal shall be:

- The TM shall have met the relevant equipment manufacturer's requirements for renewal.

In order to revalidate a lapsed rating, a Tandem Master shall:

- Comply with the relevant manufacturer's requirements for revalidation.

2.3.8 EVALUATOR

Parachutists holding a current evaluators' rating are certified as capable of safely and competently instructing and evaluating candidates for instructional ratings. The 3 classes of evaluator are: Instructor Evaluator (IE), AFF Evaluator (AFFE) and Tandem Evaluator (TE).

Before conducting a certification course, an Evaluator shall obtain NSTO approval.

Qualifications (IE and AFFE)

- Have held the appropriate instructor rating for the previous 5 years.
- Have acted as a Chief Instructor for at least 2 years of those 5 years.
- Have attended at least 1 full instructor certification course as an observer.
- Have assisted on at least 1 full instructor certification course.
- Have attended at least 1 full instructor certification course as co-evaluator.
- Have personally run a full instructor certification course assisted by a current evaluator.
- Have passed the IE or AFFE written test.

Qualifications (TE)

- Be a current Tandem Master on the specified equipment.
- Have completed a minimum of 500 Tandem jumps with inexperienced passengers.
- Be appointed by the manufacturer as an Evaluator on the specified equipment.
- Be approved by the NSTO as a Tandem Evaluator for South Africa.

Renewal and Revalidation

All Evaluators shall renew their ratings on an annual basis, along with their PASA membership renewal, at the year-end, using the official PASA General Application Form.

The application for renewal shall be approved by the CI, certifying that the renewal requirements have been met.

The requirements for renewal shall be:

- The Evaluator shall:
  - have evaluated a complete certification course in the last two years or have attended an Evaluator's seminar in the last year.
  - be current in the appropriate rating.

  OR
  - be approved by the NSTO based on experience.

In order to revalidate a lapsed rating, an Evaluator shall be required to satisfy a current evaluator of his competency.

2.3.9 PARACHUTE TECHNICIANS

There are three distinct levels of Parachute Technician ratings, each with its own regulations, qualifications and restrictions associated with it.

Qualifications

- Successfully completed the certification requirements for a Parachute Technician as contained in Section 17.
- For certification pre-requirements, see Forms 10, 11 and 12.

Renewal and Revalidation

All Parachute Technicians shall renew their ratings on an annual basis along with their PASA membership renewal at year-end, using the official PASA General Application Form.

A PASA Master or Senior Parachute Technician must inspect the applicant's logbook and certify that the renewal requirements have been met. An application for renewal shall be approved by a CI / SO, certifying that the renewal requirements have been met.

The requirements for renewal shall be:

All

- Have attended a Parachute Technician's seminar, run by a Master or Senior Parachute Technician, within the last 12 months.
- A Parachute Technician rating shall lapse in the event of continued inactivity.

Reserve Packer (RP)
- Shall have packed at least 15 reserves in the last 12 months.

Rigger - Senior (RS)
- Shall have packed at least 10 reserves in the last 12 months.
- Shall have carried out or supervised at least 12 minor repairs in the preceding 12 months.

Rigger - Master (RM)
- Shall have packed at least 5 reserves in the last 12 months.
- Shall have carried out or supervised at least 12 minor repairs in the preceding 12 months.
- Shall have carried out or supervised major repair work or have manufactured equipment in the last 6 months.

If, after an investigation by the NSTO of a written complaint, a Parachute Technician is found guilty of either misconduct or unsatisfactory workmanship, the NSTO may suspend or withdraw such rating. The holder may appeal to the executive of PASA, who may review the specific case.

To revalidate a suspended, withdrawn or lapsed rating, the applicant may be required to do a trade test as specified by an appointed Parachute Technician Evaluator.

2.3.10 FOREIGN AND MILITARY RATING HOLDERS

In order to obtain PASA ratings, holders of current foreign or military ratings shall proceed as follows:
- Meet all the PASA requirements for the applicable rating.
- Produce satisfactory evidence of currency (to include paperwork, logbook, video etc.).
- Pass the appropriate theory test.

Jumpmaster and Pro
- Be evaluated by a current PASA CI.

With NSTO approval:

Static Line and AFF instructors
- Attend a complete first jump course.
- Be evaluated by a current PASA static line or AFF Evaluator.
- On a minimum of: 1 of the first jump course lectures, plus:
- Static line: minimum one freefall briefing.
- AFF: minimum one full level briefing and one level 4 evaluation jump.

Tandem
- Be evaluated by a current PASA Tandem Evaluator.
- In all procedures.
- On a minimum 1 tandem jump.

Parachute Technicians
- Be evaluated by a PASA Parachute Technician Evaluator.

3 INTERMEDIATE SKILLS PROGRAMME (ISP)

A Student Skydiver on completion of a PASA freefall programme (graduate) must complete the ISP to obtain Cat I status before progressing on to Cat II and III within a chosen discipline (refer to points 4.1 to 4.4 of this section).

The ISP enables the graduate skydiver to practice the basic freefall skills learnt on progression and reinforce safety skills with another skydiver but in a controlled environment. In addition, every jump includes pre-briefed canopy skills exercises. The Intermediate Canopy Skills programme as contained in Section 5 must be completed during the ISP.

The programme can be completed prior to converting from student freefall equipment or after the mandated hand-deploy pilot chute conversion jumps. Downsizing of canopies or changing deployment systems must not be done whilst on the ISP, but rather on solo jumps following the recommended procedures.

The graduate skydiver must satisfy intermediate currency to progress through the ISP.

Coaches used for the ISP must be cleared by the CI/SO.

Refer to Section 5 of this manual for this programme.

4 SPORT SKYDIVING DISCIPLINES

The internationally recognised disciplines in sport skydiving are Formation Skydiving, Artistic Events, Canopy Formation, Freefall Style & Accuracy Landing, Para-Ski and Canopy Piloting. A jumper, having completed the ISP, may participate in one or more of the following **four** of these disciplines in accordance with the relevant requirements.

4.1 FORMATION SKYDIVING (FS)

4.1.1 FS may commence from a minimum altitude of 4500ft AGL with a minimum break off altitude of 3500ft AGL.

4.1.2 All parachutists taking part in FS will be graded in accordance with FS categories listed below and shall practice the discipline in accordance with the restrictions imposed on each of the different categories.

4.1.3 CATEGORY I

- Shall have completed the Intermediate Skills Programme.
- There may be no more than two skydivers from this category on any one jump.
- In a 2-way formation a CAT I FS skydiver may jump with any FS Category skydiver or a cameraperson approved by the CI.
- In a 3-way or larger formation, there may no more than two CAT I + one CAT II **or** one CAT I + two CAT II skydivers on any one jump.

4.1.4 CATEGORY II

- Shall have completed the CAT II training programme as laid down in Section 6.
- There may not be more than three CAT II skydivers on any one jump with the exception of a jump including one or more CAT I skydivers as detailed under Category I above.

4.1.5 CATEGORY III

- Shall have completed the CAT III ability test as laid down in Section 6.
- Is cleared to jump with other approved formation skydivers within appropriate safety margins.
- Is cleared to jump with CAT I and II with CI permission.

4.1.6 Progression between categories may only occur with the approval of a CI, and shall be logged by the intermediate skydiver, and signed by the coach.

4.2 ARTISTIC EVENTS (AE)

4.2.1 AE may commence from a minimum altitude of 5000ft AGL with a minimum break-off altitude of 4500ft AGL.

4.2.2 All parachutists taking part in AE will be graded in accordance with the AE categories listed below and shall practice the discipline in accordance with the restrictions imposed on each of the different categories.

4.2.3 CATEGORY I

- Shall have completed the Intermediate Skills Programme.
- May only jump with one other CAT III AE Skydiver or with a cameraperson approved by the CI.

4.2.4 CATEGORY II

- Shall have completed the CAT II training programme as laid down in Section 7.
- May not jump with Category I AE Skydivers.
- There may not be more than two skydivers from this category on any one jump.

4.2.5 CATEGORY III

- Shall have completed the CAT III ability test as laid down in Section 7.
- Is cleared to jump with other approved AE skydivers within appropriate safety margins.
- Is cleared to jump with CAT II and I with CI permission.

4.2.6 Progression between categories may only occur with the approval of a CI, and shall be logged by the intermediate skydiver, and signed by the coach.

4.2.7 Skysurfing may not be attempted until the jumper has obtained their C licence in AE. Skyboards to carry NSTO approval.

4.2.8 All skydivers participating in AE must wear both a functioning altimeter and at least one audible altimeter.

4.3 CANOPY FORMATION (CF)

4.3.1 A parachutist shall only participate in CF once he has been cleared to do so by his CI, in accordance with the categories as laid down in these requirements. The clearance shall be logged and signed by the CI.

4.3.2 Parachutists shall not dock on, or transition formations below 1500ft AGL.

4.3.3 A down plane (or similar formation) shall be performed only by CF CAT II jumpers and shall be broken by at least 500ft AGL.

4.3.4 All parachutists participating in CF shall be graded according to the following categories and shall practice the discipline in accordance with the restrictions imposed on each of the different categories.

4.3.5 CATEGORY I

- Shall have completed the Intermediate Skills Programme.
- May only jump with one other CAT III CF skydiver or with a cameraperson approved by the CI.

4.3.6 CATEGORY II

- Shall have completed the CAT II training programme as laid down in Section 8.
- He may not jump at all with Category I CF skydivers.
- There may not be more than two skydivers from this category on any one jump.

4.3.7 CATEGORY III

- Shall have completed the CAT III ability test as laid down in Section 8.
- Is cleared to jump with other approved CF skydivers within appropriate safety margins.
- Is cleared to jump with CAT II and I with CI permission.

4.3.8 Progression between categories may only occur with the approval of a CI, and shall be logged by the intermediate skydiver, and signed by the CI.

4.4 FREEFALL STYLE & ACCURACY LANDING AND PARA-SKI (SAP)

4.4.1 A parachutist shall only participate in SAP once he has been cleared to do so by his CI, in accordance with the categories as laid down in these requirements. The clearance shall be logged and signed by the CI.

4.4.2 All parachutists participating in SAP shall be graded according to the following categories.

4.4.3 CATEGORY I

- Shall have completed the Intermediate Skills Programme.

4.4.4 CATEGORY II

- Shall have completed the CAT II training programme as laid down in Section 9.

4.4.5 CATEGORY III

- Shall have completed the CAT III ability test as laid down in Section 9.

4.4.6 Progression between categories may only occur with the approval of a CI, and shall be logged by the intermediate skydiver, and signed by the CI.

4.5 CANOPY PILOTING

Information for Canopy Piloting has been included in Section 10 of this manual.

4.6 WINGSUITS

Information for Wingsuits has been included in Section 11 of this manual.

5 CAMERAPERSONS

Camerapersons not yet in possession of a B licence shall have their helmets approved by the CI / SO.

Camerapersons must wear a functioning altimeter, a functioning audible altimeter and a hook knife.

Camerapersons must be au-fait with an appropriate camera cutaway procedure.

There are three recognised groups of camera work each with its own specific minimum requirements:

5.1 BASIC CAMERA – a single camera used or worn to film from within a skydive

Minimum requirements:

- Category II in any one of FS, AE or SAP.
- must have the signed approval of the CI / SO.

5.2 THIRD-EYE CAMERA – a single camera used or worn to film from an outside perspective

Minimum requirements:

- to film FS is Category III in FS or AE.
- to film AE is Category III in AE.
- to film CF is Category III in CF.
- to film SAP is Category III in FS or AE.
- to film WS is Category III in FS or AE.
- must have the signed approval of the CI / SO.

5.3 SPECIALISED CAMERA (AFF AND TANDEM CAMERA) – a camera used or worn to film AFF or tandem or if more than 1 camera is worn at any one time

Minimum requirements:

- Category III in FS or AE.
- a minimum of 500 formation jumps (100 in the last year) or 100 Third-Eye camera jumps (50 in the last year).
- must have the signed approval of the CI / SO and the approval of relevant AI / TM.

Information for Camerapersons has been included in Section 12 of this manual.

6 TANDEM PARACHUTING

- All tandem equipment shall be fitted with a serviceable Automatic Activation Device (AAD).
- Tandem Masters must wear a functioning altimeter on all tandem jumps.
- All Tandem Masters (TM or TE) shall log their Tandem jumps.
- Minimum altitudes:
  - Normal exit - 4 500ft AGL
  - Main deployment - 4 500ft AGL
  - Emergency exit - 1 500ft AGL

  (Altitudes may vary from system to system due to manufacturers' specifications and AADs.)

- Only a Tandem Master holding a valid manufacturer's rating on a particular Tandem system may jump with a passenger on that system. (A candidate on a validation/certification/re-certification course is the obvious exception).

- The passenger shall be at least 18 years of age, or 16 years of age with written parental permission required before the jump. For passengers under 16 years of age, PASA Tandem Evaluator permission is required in addition.

- Any Tandem activity must be authorised by the CI.
- Canopy Formation, head down, night jumps and intentional water jumps are expressly prohibited in Tandem parachuting.

Information for Tandem Parachuting has been included in Section 13 of this manual.

7 DEMONSTRATION JUMPS

- All demonstration jumps shall be cleared by the appropriate CI/SO or SJO prior to the jump taking place.
- A current Pro Rating is required to participate in demonstration jumps.
- The canopy used by a Pro rating holder during any demonstration jump may not be smaller than the smallest sized canopy on which at least 5 qualifying jumps were done.
- Information for demonstration (Pro) jumps has been included in Section 14 of this manual.

8 EXTRAORDINARY PARACHUTING ACTIVITIES

Extraordinary parachuting activities, as listed below, may only take place with the prior approval of the CI concerned.

- Night jumps
- Intentional water jumps

NSTO permission is required for:

- Intentional cutaways
- High altitude jumps

Extraordinary activities shall be conducted in accordance with the specific requirements as laid down in Section 15.

8.1 NIGHT JUMPS

8.1.1 May be performed by holders of a B Licence or higher.

8.1.2 All parachutists must wear a functioning, illuminated altimeter.

8.1.3 All altitude minima shall be raised by 1000ft.

8.1.4 No person shall attempt a jump at night that he has not previously accomplished during the day.

8.2 INTENTIONAL WATER JUMPS

8.2.1 May be performed by holders of a B Licence or higher.

8.2.2 All parachutists shall wear functional flotation equipment.

8.2.3 Parachutists engaged in water jumps shall use equipment with which they are familiar.

8.3 INTENTIONAL CUT-AWAY

8.3.1 A reserve parachute shall be worn as a tertiary (on a separate harness if necessary).

9 JUMP PILOTS

Information for jump pilots has been included in Section 19 of this manual.

SECTION 3

STUDENT TRAINING

CONTENTS

This section contains information to be covered in the Instructor's Certification Course.

1 QUALITIES OF AN INSTRUCTOR

The parachuting with which we are concerned is that which people indulge in for enjoyment. For this reason, it is called sport parachuting and a good instructor must do as little as possible to interfere with the enjoyment of the sport. He must therefore be approachable.

The primary concern of all parachuting must always be safety. It almost goes without saying therefore that a good instructor must be safety conscious.

Safety cannot be achieved without supervision and a willingness on the part of all concerned to abide by the rules; this of course, requires discipline. In order to maintain discipline an instructor must be firm and unbiased.

A good instructor, who is responsible for the safety of those in his care, should therefore be firm but not overbearing. He must accept only that response and compliance which will ensure that parachuting can be conducted safely. He will, as in other activities, achieve the best results by setting a good example.

Freefall parachuting is more than a skill. It requires a cool head, concentration and judgement, as well as body control and agility. In the early stages of his freefall progression a novice is likely to be apprehensive. The instructor can help him overcome this by instilling confidence through his own confident attitude. However, there is only one thing worse in this regard than lack of confidence, and that is over-confidence. The latter leads to the acceptance of risks that will inevitably lead to accidents. An over-confident parachutist is a menace to himself and to others; he should be closely supervised and, if necessary, disciplined.

Parachuting can be a complex matter and the supervision thereof more so. The instructor carries a great deal of responsibility and has much to think about. He cannot, for example, instruct others if his mind is on his own skydiving. When he is instructing, he must concentrate wholly on the task at hand. In order to ensure that nothing is overlooked, he must be systematic.

When conditions are right for parachuting, there is a tendency for people to become impatient. Haste leads to danger because sooner or later something important will be overlooked. "If you are in a hurry you are in danger", is a good parachuting motto. The good instructor, therefore, must be alert but unhurried.

Parachuting is not always straightforward. Most parachutists experience problems at some time during their progression. Most of these problems are minor, but at the time they are a cause of concern. Often the novice cannot determine the cause of his problems, and it is up to the instructor to spot the cause and explain how it can be overcome. In order to do this a good instructor must be observant.

There is no substitute for practical experience. The instructor who is highly experienced is better than the less experienced one. He has personally met and overcome many of the problems that from time to time will confront his pupils. But no instructor, however expert, will experience all the problems of others. He will, however, be called upon to give advice and in order to do so, he must understand parachuting in all its aspects; this can only be achieved through intensive and on-going study and intelligent discussion. To this end he must have an inquiring mind.

Honesty. Student parachutists may be intelligent human beings and will often quickly see through an instructor who lies to them. If you cannot answer a student's question, tell him that you will find the answer and tell him at the earliest opportunity.

2 METHODS OF INSTRUCTION

2.1 INSTRUCTION

The performance and even the survival of student parachutists depends directly upon the effectiveness of the instruction that they receive during their training period. The effectiveness of this instruction is determined by the instructor. The fact that a man is a competent skydiver does not guarantee his ability to administer effective instruction. In order to teach others, he must also have a sound working knowledge of the best methods and procedures for imparting his store of parachuting knowledge to his students.

2.2 PRINCIPLES OF LEARNING

There are certain general principles which parachuting instructors must know and be able to apply in teaching. These principles are the basis for instructional methods and techniques.

2.3 LEARNING IS AN ACTIVE PROCESS

Learning can be defined as the process of acquiring new knowledge, skills, techniques and appreciation that will enable the individual to do something that he has not done before. The emphasis is placed upon doing. Learning is essentially an active process; it is not passive absorption. Students must be given purposeful, worthwhile work to do; they must be kept active both mentally and physically.

2.4 LEARNING ORIGINATES WITH SENSORY STIMULATION

Learning can also be defined as the change that takes place in the individual's behaviour as the result of his mental and physical responses to stimuli. The five senses are the channels through which the student is stimulated. Through these senses - sight, hearing, touch, taste and smell - he makes contacts with things around him.

As a result of these contacts, he makes responses that lead to the acquiring of new knowledge, habits and attitudes. It is the instructor's responsibility to provide learning situations which make the maximum use of the senses and which produce the desired responses.

Lessons, which appeal to the greatest number of senses, are the most effective. This is one reason why training aids and demonstration should be used at every available opportunity.

2.5 THERE ARE SEVERAL TYPES OF LEARNING

In learning, the student may gain knowledge, abilities or emotionalised controls.

- **Knowledge** (or "understanding") is the acquisition of ideas, concepts, meanings, facts and principles.
- **Abilities** (both mental and physical) include habits, skills, and the ability to adapt and apply knowledge to the solution of problems.
- **Emotionalised controls** include the attitudes, appreciations, interests, ideas, and habits of conduct that are necessary to give value to learning.

The instructor must be constantly aware of these several facets of learning which are integral in the training of a sport parachutist.

2.6 THE SIX BASIC PRINCIPLES OF LEARNING

These describe the conditions under which learning takes place. They serve as guides to the instructor in his selection and use of teaching methods, devices and techniques. The principles are mutually supporting and all apply to every instructional situation.

The principles are:
- Motivation
- Objective
- Doing
- Realism
- Background
- Appreciation

2.6.1 Motivation

Learning can be effected only when the student is properly motivated, when he is mentally and physically ready to learn because he knows the reason why he should learn.

Motivation is the conscious effort of the instructor to establish student motives that lead to sustained effort toward the learning goal. Motives create a desire to learn.

Motivation is the very heart of the learning process and one of the instructor's most fundamental problems since without motivation, students learn very little.

To help motivate his students, the instructor should show a need, that is, impress upon the student the applicability of the material under study to his upcoming venture into parachuting.

The instructor should guide each student in developing an intent to learn, by instilling in the students the realisation that they are responsible for learning the material that is presented.

The instructor must maintain student interest to assure alert attention to the presentation. He may do this through personal force and enthusiasm, illustrations, and, in limited form, personal experiences ("jump stories" which illustrate the point under discussion).

Early success is a strong enforcement to further learning and is a very flexible aid in instruction. These successes may range from a simple "very good PLF" commendation from the instructor in the presence of other students, to a "Student of the Month" plaque which some clubs award. For the normal person, these achievements bring a certain amount of pleasure and satisfaction and thereby stimulate him to greater activity.

The instructor should make a point to give recognition and credit. These are strong incentives to learning, and students desire, and have a right to expect, credit for work well done. Instructors must mention the good points of students' work and not dwell entirely on their mistakes. Start with favourable comments, then lead into suggestions for further improvement.

Avoid feelings and emotional responses that can interfere with learning. Students who are angry, resentful, embarrassed, frightened, or otherwise emotionally upset, think about the source of their disturbance rather than the subject being taught.

2.6.2 Objective

Learning is more efficient when the student knows exactly what he is to learn and what is expected of him.

Learning is more efficient when the student knows the objectives toward which he may direct his learning efforts. He should know the objective of each lesson and see how the lesson fits into the overall programme of instruction. The lesson objectives and the standards of subsequent performance expected of each student must be emphasised in the introduction to each lesson.

2.6.3 Doing

The most efficient way of learning is by doing. Good instruction takes advantage of the fact that we learn more of the things we do than of those we see or hear.

To apply this principle to the learning of informal phases of a subject the instructor must provide opportunities for student activity - thinking, talking, writing, and problem solving. Verbal directives, demonstration, and various other forms of instruction help the learning process; but practice, repeated under supervision until proficiency is attained, is essential to complete learning.

In sport parachute training, opportunities for taking full advantage of the principle of doing are many. PLF practice, supervised packing, practising emergency procedures in a suspended harness and practising exits from a mock-up of the aircraft are a few common examples of opportunities to apply this principle.

THE MOST EFFICIENT WAY OF LEARNING IS BY DOING.

2.6.4 Realism

The more realistic the learning situation, the more efficient the learning.

This principle requires constant consideration by the instructor to ensure that learning activities in training reasonably approximate the situations of actual practice. Each lesson, or main point of a lesson, should be subjected to the test of these questions:

Is this the way the parachutist must behave in a real situation?

The instructor should consider whether or not there might be other factors than those encountered in the training situation that will be present in an actual aerial situation.

For instance, students learning malfunction procedures on an indoor suspended harness would find the situation unrealistic, due to the absence of noise, stress and the relative wind.

Is my presentation realistic as far as the level of the class is concerned?

Instruction beyond student comprehension is unrealistic; however, relatively difficult subject matter can be presented to classes of different levels if it is adapted to their specific needs and is explained in clear language. For instance, in teaching a class of students techniques of basic freefall manoeuvres, the technical aspects of why this or that will aid or hinder a turn because of effects of centre of pressure, centre of gravity, angular momentum, etc., would tend to create a thicket of complexities which would confuse the average parachutist.

Therefore, the instructor will want to translate these relationships into terms of "what this means to you is that you'll be able to execute a flat turn to your right by assuming this position". Keep it Safe, Keep it Simple, Keep it Short.

THE MORE REALISTIC THE LEARNING SITUATION, THE MORE EFFICIENT THE LEARNING.

2.6.5 Background

A student acquires learning only by building upon what he already knows.

Learning is based on, and organised around, previous experience. New experiences are interpreted on the basis of past experiences. Since the past experience of all students is not the same, they will not attach exactly the same meaning to an explanation.

Instructors must select and present illustrations carefully so that all students will get the desired meanings. In early stages of parachute training, instructors must draw on common experiences of two-dimensional ground life for illustrations, but for more advanced training, more illustrations may be drawn from the parachutist's previous aerial experience.

Instructors may apply this principle in the introduction to a lesson by reviewing previous instruction. This aids the student in associating techniques. What has been learned in previous lessons makes up the student's background, a foundation for subsequent teaching.

Instructors should take into consideration the state of training of students and make reference to lessons already learned and use these lessons as a foundation for their presentations.

2.6.6 Appreciation

The learning process is not complete until the student has acquired the attitudes, appreciations, interests, ideals, and habits of conduct that cause him to apply his knowledge in the optimum fashion to solve the myriad of problems which he may encounter as a parachutist.

Learning is complete only when the student has acquired the attitudes, appreciations, interests, ideals, and habits of conduct that will enable him to apply correctly the things learned.

This statement is of such importance in sport parachute training that it should be considered a fundamental principle for the guidance of instructors. The parachute instructor must not only concern himself with the teaching of skills and information which contribute directly to the lesson; he must also be alert to the development of correct appreciation and attitudes which will enable the student parachutist to most effectively apply his knowledge to actual parachuting situations.

The instructor's real ultimate goal is to train individuals not merely to teach subject matter. The calm, analytical attitude that a parachutist must develop is an essential responsibility of the instructor to instil in his students, since a parachutist who is incapacitated by panic cannot be expected to adequately deal with an emergency situation, even if he has been "taught" how.

To apply this principle in his teaching, the instructor must be alert to every facet of his student's development. He must recognise that his students learn many things from his instruction above and beyond the subject matter presented.

The instructor must set a good example; he must employ a positive attitude toward his instruction. Students are quick to pattern their reactions after the attitudes of the instructor.

The instructor must be cautious to refrain from making incidental remarks and voicing personal opinions that do not contribute to the desired student attitude.

The instructor should set an example for his students that they may safely follow.

2.7 FUNDAMENTAL ELEMENTS OF PARACHUTING INSTRUCTION

The fundamental elements of an instructional situation are:

- The Student
- The Instructor
- The Teaching Process, which consists of the five stages of instruction:
  - Preparation
  - Presentation
  - Explanation/Demonstration
  - Application
  - Examination
- Review and/or Critique

To be successful, the instructor must understand his students and the way in which they learn. As far as possible the instructor should know his students as individuals, appreciate their learning problems, and make every effort to help each student learn.

Instructors must see the course of instruction from the point of view of the learner and plan accordingly.

2.8 FUNDAMENTAL PRINCIPLES OF INSTRUCTION

There are certain fundamental principles followed by effective instructors.

- Never bluff to cover lack of knowledge. Instructors must know their subjects thoroughly; but even then, questions may arise to which they do not know the answers. If you do not know the answer, admit it; then find the correct answer and give it to the class as soon as possible.
- Never use profanity or obscenity in instruction. If you do, you risk loss of dignity and class respect.
- Never use sarcasm or ridicule. Since students are helpless to retort, they become resentful, and therefore resistant to learning.
- Never talk down to a class. Make your class feel that you consider yourself fortunate to have acquired the experience and knowledge that you wish to share with your fellow parachutists.
- Never lose patience. Slowness or inability to grasp a concept may mean that the instructor has failed to teach, not that the student has failed to learn.
- Remember that learning is acquired to ensure safety in parachuting. Use every opportunity to impress upon students the practical aerial importance of what they are learning.

2.9 INSTRUCTOR QUALIFICATIONS

There are certain qualifications that an instructor must possess to do an effective job of teaching.

- Knowledge of the subject
  It is obvious that the instructor must know his subject, if he is to teach it others. He should know more about sport parachuting than he will ever have time to teach and, certainly, should be prepared to answer virtually any question on the subject.

- Knowledge of techniques of instruction
  Knowledge of how to instruct is a definite prerequisite to good instruction and is the reason for this article.

- Personality of the instructor
  A good personality is considered essential to success in all fields of endeavour in which people have to work together and become closely associated.

  Personality can be defined as the sum total of all those things about an individual to which other people respond, either favourably or unfavourably.

  A "good" personality - one that elicits a favourable response - is not some mysterious inbred quality. It can be developed by concentrating upon and improving specific features of the personality.

  Each instructor should observe other instructors whenever he can and weigh their personality characteristics against his own.

  He should then strive to develop in himself those characteristics that contribute to successful teaching, and to avoid those traits that interfere with effective instruction.

- Leadership
  Instructors who are good leaders can develop proper attitudes and appreciations in their students, as well as teaching the basic information of the course. The instructor must have leadership ability if he is to maintain control of the class and keep it moving efficiently. Classes must be managed before they can be taught.

- Professional Bearing
  The parachuting instructor must have genuine and sincere interest in students and their success, in sport parachuting and effective methods of teaching it, and in the specific training course that he is conducting.

  To succeed, the instructor must have a sympathetic understanding of his student's problem and be fair in dealing with each individual.

  The instructor who has the proper professional attitude will continually add to his store of knowledge and skills in his subject and make continual effort to improve his teaching ability.

  Everything the instructor says and does during classes and on the DZ, as well as the manner in which he says and does things, reflects his attitude toward his students, his subject, and the training programme.

  His attitudes have a tremendous influence upon student attitudes and morale, because students tend to adopt both the attitude of the instructor and his point of view toward the subject and the training.

2.10 STAGES OF INSTRUCTION

The stages of instruction serve as a checklist for the instructor in choosing teaching procedures. Whenever practical, this applies to all five stages to each lesson to be presented.

In some lessons, various stages are combined; for example:

In many practical exercises the application and examination stages are combined. In controlled practice, when material is presented step-by-step, the presentation and application stages are combined.

Flexibility is the key to successful use of the stages of instruction. The instructor should use them as a guide; they are not intended to cause instruction to become artificial or stereotyped. However, the instructor must study every instructional situation for opportunities to use student stages. He must strive for the complete teaching process in which he can plan, tell, show, do, check and review and/or give critique.

IF THE STUDENT FAILED TO LEARN, THE INSTRUCTOR MAY HAVE FAILED TO TEACH.

- **Preparation**

  Careful planning is the first step in efficient training.

  The instructor must analyse the specific procedures, skills, and information to be taught.

  He must organise his presentation so that the basic ideas are adapted to the student's background and needs so that the lessons are aimed at achieving specific objectives.

  He must present the lesson in the manner that will best facilitate learning; the objective of the lesson will determine the methods to be used.

  He should proceed from the simple to the complex; from the known to the unknown.

  Careful preliminary analysis, correct solution of all instructional problems, and repeated rehearsal and review of procedures and materials will help to insure maximum student learning in the minimum amount of time.

  Mastery of the subject is only the first step in instructor preparation. The instructor must also determine how to arouse the student's desire to learn and how to present the subject materials so that each member of the class learns all essential procedures and ideas.

- **Presentation**

  Actual teaching begins with the presentation stage. (Elementary school teachers call this the "show and tell" stage). This stage begins with the introduction, in which the instructor informs the students what he expects them to learn during the class, why they are learning this particular material, and what level of proficiency they are expected to attain.

- **Explanation**

  Following the introduction, the explanation presents new concepts to the students. This may be accomplished by lecture, conference or discussion, all of which lead to comparisons and contrasts in terms of what the students understand. The instructor must remember that telling, through lecture and conference, is limited in its appeal to the sense of hearing. A combination of techniques utilising several senses - such as sight, touch, and hearing - results in faster, more efficient learning and should be employed whenever possible.

  Another important method for teaching (presenting) certain parachuting techniques (such as emergency procedures, exits and packing) is demonstration. This is a particularly useful method for presenting the student's initial instruction in the subject. Use of another experienced parachutist as a demonstrator allows the instructor to concentrate on his narrative and respond more closely to his class.

- **Application**

  In this stage, the students are given the opportunity to do, to apply the principle and procedures learned during the presentation.

  Efficient use of application periods will often give students a firm grasp of a difficult subject, such as packing. Application periods must always be supervised to ensure that students follow correct procedures.

- **Examination**

  In this stage, the instructor checks on the student's mastery of the subject taught. Instructors can ascertain that students have mastered the essentials only by checking their ability without assistance.

- **Review and/or Critique**

  This is the final stage of instruction and always follows the application and the examination. Here the instructor reviews the knowledge, skills, techniques, and procedures learned by the students during the instructional period, taking care to clarify any phases of the instruction that are not completely understood. The term critique is usually restricted to the review given after an examination or applicable exercise.

2.11 GUIDELINES FOR METHODS OF INSTRUCTION

Teaching (instructing) is an art. A good instructor is not necessarily one that has great knowledge but one who can convey that knowledge effectively. The following are guidelines to assist an instructor:

- Setting

  Establish control of your students from the start. An image of professionalism does more to put your students at ease than anything else. At the same time be approachable and encourage questions. A course without questions from students is a course that is probably not succeeding.

- Motivate

  Before each lesson motivate why you are doing the lesson and why they need to know it. Motivation keeps them aware.

- Systematic

  Do your course in chronological order where possible. Make it possible for them to see progression. Each lesson should follow from the previous one.

- What concerns them

  Put their minds at rest whenever you can. Try and put yourself in their shoes. What would be particularly concerning them with the lesson you are giving?

- Emphasis on doing

  80% of knowledge is retained through doing. The course must be as realistic as possible i.e. use as many aids as possible. Try to emulate on the ground what would happen in the air. Keep them physically active.

- Don't bluff

  If you don't know, find out, but don't ever guess as this detracts from your professionalism.

- Reinforce

  In order to show progression and systematic instruction it is necessary to tie your next lesson to the previous one. e.g. "The last lesson we did this... now we go on to the next stage which is this".

- Work cards

  Trainee instructors will find it easier to give a course using small work cards that are laid out in point form.

- Intervals

  If a theory lesson lasts longer than 25 minutes, have a short break afterwards. The concentration span of the average person drops dramatically after 25 minutes of non-stop lecturing.

- Questioning

  Ask questions with a specific objective in mind. Don't word your questions in such a way that the answer will be innocuous. Spread the questioning among the group - don't just resort to your "bright" pupil. Pose the question; wait a few seconds then choose someone to answer. This way everyone ponders the question and nobody "switches off".

- Eye contact

  Keep eye contact with all your students; don't concentrate on one student while you talk. Make sure your students have their backs to the sun. It's uncomfortable for you but it doesn't detract from their concentration.

- Stories (anecdotes/jokes)

  A good instructor should relieve tension at appropriate places by telling a well-timed anecdote to do with skydiving. This also gives the student an appreciation of the sport and its facets. This should not be overdone.

- Practical lesson

  If you are busy with reserve drills or landings, for example, don't leave the majority idle while you deal with one person. Everybody should be participating or kept busy when you give an individual attention.

- Perfection

  Don't settle for less than perfect. If necessary, take the student aside and reinforce.

- Blackboard work

  Print - it's easier to read. Preferably do your board work before commencing the lesson. Don't talk with your back to student. Use wall charts instead of the board where possible.

- Keep your explanations simple.

  NB: Don't get involved in confusing explanations that are not necessary to the students' needs.

- Post-jump critique

  Effective instruction is not complete without follow-through and reinforcement. Go through the students' jumps with them as soon after the jump as possible and point out their weaknesses and strengths.

- The sandwich method of discipline

  It is often possible to discipline/critique in such a way that a student never returns or is disheartened. Use encouragement, praise or reason to start with. Critique or criticise (chastise) in the middle and end off with more praise, reasoning and encouragement. This method is particularly effective in encouraging progression without resentment.

  Don't wear dark glasses inside a lecture room. You lose contact with students.

3 FIRST-JUMP COURSE

OBJECTIVE

To impart sufficient knowledge to enable students to make safe static-line descents and to prepare them for progression to freefall.

It is intended that the student can perform the following without hesitation, executing fluent drills, before he is permitted to make his first jump:

- Manifest himself and pay for the jump.
- Fit the parachute correctly.
- Board the aircraft in the correct manner.
- Move in the aircraft correctly with due care for his equipment and reserve handle.
- Check his equipment prior to exiting.
- Exit correctly in the stable, arched position.
- Count out loud at the correct speed.
- Check his main canopy deployment in the prescribed manner and, if necessary, carry out the correct reserve drill confidently and timeously.
- Control his parachute correctly.
- Land his parachute correctly.
- Know what to do in case of a hazardous landing or dragging.
- Gather his parachute up properly and carry all his equipment back to the packing area.
- Take due care when moving on the airfield particularly when crossing runways.
- Report back to the Jumpmaster for a debriefing and to get his next jump authorised in his logbook.

EQUIPMENT

The following items of equipment (training aids) are required to efficiently conduct a first-jump training course.

- Lecture room facilities with chalkboard and, preferably, video.
- Photographs or diagrams of the parachutes being used on the course.
- Aerial photograph of the drop zone.
- Logbook.
- PASA membership forms.
- Parachute equipment of the type being used and all peripheral equipment (jumpsuits, helmets, altimeters, hand batons, radios, etc.).
- Training posters (flip charts) to show types of malfunction and to show a good canopy.
- Suspended training harness facilities.
- Aircraft from which first jump will be made.

PRESENTATION

This course consists of the following lectures:

- Introduction and documentation
- Equipment
- Aircraft drills
- The Exit, arch and count (including body position)
- Canopy control
- Malfunction theory
- Reserve drills
- Landing (for main and reserve parachutes)
- Hazardous landings
- Post-landing procedures
- Revision/test and consolidation

REVISION

Each lesson's content should be revised by the instructor, preferably with the active participation of the students.

TEST AND CONSOLIDATION

At the end of each lesson the instructor must evaluate his students in order to complete the learning process. This is best done by questioning pupils verbally but can be assisted at the end of the course by a standard written test. This test must be objective and the questions be well structured.

PERIOD 1

INTRODUCTION AND DOCUMENTATION

OBJECTIVE

To introduce yourself to the students and to give them some background on sport parachuting and to outline what the sport holds for them as they progress. Also, to fully brief students on the "operation of jumping", i.e. SACAA, PASA, Standard Operating Procedures of the club and the PASA SOPs.

EQUIPMENT

- Chalkboard
- Flip charts
- PASA Standard Operating Procedures

PRESENTATION

Safety

How and why accidents occur. Explain the necessity for discipline at all times and being able to take discipline when it is handed out. Explain that a student is NOT acceptable for sport parachuting if he cannot accept in good grace the discipline he will face on the course. Point out that jumping is hazardous if carelessness creeps in. However, constant care and attention will make it safe.

Fear in Parachuting

Explain to the student that he will be scared on his first jump. This is natural. Emphasise that the real challenge is to overcome this fear and not to just make a parachute jump. Impress on him that he must decide now not to give up until he has made at least one freefall. Point out to him that 8 out of 10 people give up after their first jump, possibly because they do not determine at the beginning to give it a good go. Regular jumping is required to maintain progress and subdue fear.

Operations at the club

Explain the method of operation to include:

- Jump costs and manifesting
- Drawing equipment and returning it to the packers or racks after jumping
- Airfield procedure - particularly crossing of runways
- Club rules such as smoking in the packing and refuelling areas
- Logbooks to be filled in by Jumpmaster after each jump
- Application of the PASA SOPs
- Currency
- Progression
- Reciprocity

Divisions of sport parachuting

Outline the various disciplines within the sport. Run through what is involved in each. Go on to explain how the student progresses through the different levels.

REVISION

Summarise the lecture content and outline the format that the rest of the course is to take.

TEST AND CONSOLIDATION

Students must be advised that for the duration of the course they are expected to attain a proficiency level necessary for a first jump - failing which they may not jump.

PERIOD 2

EQUIPMENT

OBJECTIVE

- To teach the student to check his equipment before putting it on, and to be able to adjust and fit it correctly leading to a safe and comfortable jump.
- To demonstrate effectively the deployment of both the main and the reserve parachute.
- During this period you can teach the student to respect equipment with consequent longer life of club equipment. You can also ensure that he always presents himself at the aircraft correctly kitted up with minimum interruption of the smooth flow of flights and minimum work for Jumpmasters.

EQUIPMENT

- Parachute equipment of the type to be used on the first jump.
- A chalkboard and a photograph of the appropriate equipment to illustrate the situation of the slider, toggles, etc. while under canopy.
- All peripheral equipment.

PRESENTATION

Explain the component parts and their purpose, to include:

- Risers
- Three-ring release system
- Chest strap
- Leg straps
- Reserve ripcord handle
- Cut-away handle
- Static line
- Reserve Static Line (RSL)
- Peripheral equipment

Fitting

Explain and demonstrate the fitting procedure to include the following:

- Leg straps must be TIGHT (without cutting off circulation) - it is the only adjustment to make the harness fit.
- Chest strap to fit width of chest.
- No loose webbing to be flapping around.

Practice the student in fitting the parachute.

Demonstrate effectively the deployment of the main parachute. Make reference to reserve parachute (using appropriate aids and/or assisted by a real demonstration).

- Main parachute
  - Static-line hook and static line
  - Pack closure
  - Line stowage
  - Bag closure
  - Canopy stowage and deployment
  - Slider
  - Risers
  - Steering toggles
  - Cutaway system

- Reserve
  - Cutaway system
  - Reserve ripcord handle
  - Pilot chute
  - Risers
  - Steering toggles

- Field packing (give an effective demonstration)

Care of Equipment

Explain to the student the factors that can damage a parachute, direct heat (e.g. cigarettes) and sunlight. The student should be told that the only three places where equipment may be found are: Back, Pack and Rack

- On his back (i.e. in use).
- Being packed
- In the equipment store (on the racks).

Parachutes should be packed as soon as possible and should never be left in the sun, packed or unpacked.

REVISION

Revise the lecture content.

TEST AND CONSOLIDATION

Practical evaluation can be done by getting all the students to kit up in pairs - ensuring that every individual goes through the drills of kitting up.

PERIOD 3

AIRCRAFT DRILLS

OBJECTIVE

To teach the student:

- To board the aircraft safely
- To move in the aircraft without endangering himself, or the aircraft
- To check his equipment before exit
- To make him aware of aircraft emergency procedures.

EQUIPMENT

Aircraft from which jumps will be made. Parachute system.

PRESENTATION

WARN THE STUDENTS THAT THEY MUST ALWAYS PROCEED AROUND THE BACK OF THE AIRCRAFT, NEVER IN FRONT. IF THE AIRCRAFT IS MOVING THEY MUST STAND STILL UNTIL IT STOPS.

- Students must be made aware that under no circumstances do they board an aircraft without being properly checked out by a Jumpmaster/instructor.

- How to climb in and move safely in the aircraft.

- At 1000ft give command "CHECK EQUIPMENT" and check static-line attachment.

- The jumper will check himself as follows, calling out each item as he checks:

  - Helmet! (fastened)
  - Three-ring releases! (intact, in place)
  - Chest strap! (fastened)
  - Handles! (reserve and cutaway, in place, accessible)
  - Leg-straps! (fastened tight)
  - Static-line! (hooked up)

- On completion of check, the student will give the instructor the "THUMBS UP" sign. Instructor will have visually checked students at the same time ensuring that the static line is not misrouted.

- Run in, Standby, Climb out and exit procedures as per club policy.

Aircraft emergency drills

Brief the following procedures:

- Engine failure (above 1000ft AGL): Inform the pilot you are dispatching the student. Dispatch static-line jumpers as quickly as possible.

- Emergency landing (below 1000ft AGL): Give command "PREPARE FOR EMERGENCY LANDING".

- Canopy entanglement with aircraft.

- Hung up parachutist.

REVISION

Summarise the lecture's content with physical demonstrations given for each step.

TEST AND CONSOLIDATION

This is one of the most critical periods from a safety standpoint. Again, it is one that is usually rushed through and can have serious consequences even later in a jumper's career. Remember that students who know what to do and when to do it make the instructor's life easier.

Ensure that each student has actively participated in the aircraft drills. Evaluation can be done practically as well as by questioning.

PERIOD 4

EXIT, ARCH AND COUNT

OBJECTIVE

To teach the student the basic body position, and the theory of the arch and the count.

EQUIPMENT

Chalkboard (minimum)

Optional:
- Photograph illustrating student arch
- Mannequin to show effects of different body positions
- Video

PRESENTATION

Take the class to the chalkboard and explain the theory of stability and how you fall stable in spread position. Deal with the following specific points:

A. Theory of spread position
B. Importance of arching
C. Relative wind - especially on exit
D. Position in relation to malfunction

Demonstrate, practice and critique the students on the correct body position.

Now add in the count as follows:

Spread and count "ARCH THOUSAND" at the same time. (Any hesitation after "GO" may mean that as he starts to fall he may not count at all).

Continue counting up to 5000.

After 5000 he must count "CHECK" and look and point up to check his parachute. (Maintaining the arch position from the waist down)

Counting must be LOUD and WITHOUT HESITATION.

ARCH THOUSAND
2000
3000
4000
5000
CHECK

Practice and critique the students to a high level of proficiency.

N.B. This phase of the course should be conducted with whatever training aids are necessary to ensure a competent and safe arch.

REVISION

Summarise the lecture content stressing the importance of the student arch and the count in the exit.

TEST AND CONSOLIDATION

Practical evaluation is essential. Each student must have demonstrated his ability to arch correctly on the ground. At the conclusion of this period the student must be able to adopt, INSTINCTIVELY, the correct body position.

To provide continuous action from exit to reserve drill, i.e. (develop an awareness of time)

To show the instructor that he is alert and in command of himself (high motivation here).

PERIOD 5

CANOPY CONTROL

OBJECTIVE

To familiarise the student with the phase of the jump from parachute opening to landing.

At the end of this period the student must understand what he must do to land safely on the DZ, and why.

EQUIPMENT (Optional)

- Photograph of DZ
- Training posters - of canopy
- Chalkboard
- Vertical suspended harness with toggles (recommended)

PRESENTATION

Briefly explain the main parachute and the control thereof.

Explain canopy control procedures

Check parachute OK (Float, Shape, Spin). Is it there? Is it square? Is it spinning?
Make a decision: continue or cutaway and open reserve.
Clear line twists if any.
Release brakes and cycle for 5 seconds.
Check end cells open and slider down.
Control test - Left and Right turn (minimum 180 degree) and full flare.
Make a final decision to land this parachute or to cutaway and open reserve parachute.

Orientation to drop zone or alternative landing area.

Now fully explain control of parachute.

Explain the standard landing pattern and why it is used.

The potential hazards in low (hook) turns or any other radical manoeuvres when using ram air canopies.

RULES:
- NO more than one 360 degree turn in any direction.
- NO more than a 180 degree turn below 1000ft.
- NO more than a 90 degree turn on final approach.

Priority of landing:
- Flat wing and a clear area
- Flare for landing
- Preferably into wind

Introduce any canopy control aids e.g. radios, arrow, batons.

Cover reserve canopy control procedure.

REVISION

Revise the complete control procedure.

TEST AND CONSOLIDATION

Evaluation by means of questioning is most appropriate for this lecture.

PERIOD 6A

MALFUNCTION THEORY

OBJECTIVE

To teach the student to recognise a malfunction at the CHECK or CONTROL test stage.

EQUIPMENT

Diagrams or photographs of the different types of malfunction.

PRESENTATION

Types of malfunctions: Note all of these can be recognised in the two checks as discussed above.

- High speed or fast malfunctions:
  - Total (after hook-up or a pack lock)
  - Bag lock
  - Streamer or sniveller (slider stuck up)
  - Horse-shoe

- Low speed or slow malfunctions:
  - Tears or blown cells
  - Broken lines (steering or suspension)
  - Slider stuck - refuses to come down
  - Rotating malfunction
  - Bird's nest
  - Line-over
  - Steering-line hang up

- Hook-ups
  - Static line hook-up
  - Canopy hook-up

Brief the student on correct procedures for handling abnormalities:

- Line twists - situation must be improving
- Premature brake release on opening
- Two canopies out –
  - If in a stack configuration, DO NOT cut away. Fly conservatively for a safe PLF landing with no flare;
  - If in a side by side configuration, DO NOT cut away. Fly main towards reserve so that they keep touching side by side. Fly conservatively for a safe PLF landing with no flare
  - If in a downplane configuration and one canopy on each side of jumper, perform a cut away.

IF THE SITUATION IS NOT IMPROVING WITHIN 5 SECONDS OF “CHECK” PERFORM FULL RESERVE DRILL

REVISION

Summarise lecture content.

TEST AND CONSOLIDATION

Evaluation by means of questioning is most appropriate for this lecture.

PERIOD 6B

RESERVE DRILLS

OBJECTIVE

To teach the student an instinctive reserve drill procedure which will automatically be carried out as a reflex action after “5000 check” and once a malfunction has been identified.

EQUIPMENT

Cutaway harness.

PRESENTATION

Explain the cutaway and reserve deployment to include the following:

- Action of the cutaway handle. Action of the RSL Deployment assisted by a spring-loaded pilot chute

- Reserve Procedure
  Explain the cutaway and reserve drill as follows: ARCH, LOOK, HANDLES, RIGHT, LEFT, ARCH!
  - ARCH (let go of toggles/rip cord).
  - LOOK and recognise the cutaway puff and reserve ripcord handle.
  - HANDLES (firmly grasp both handles simultaneously).
  - RIGHT, with the RIGHT HAND peel away the cutaway puff and punch it towards the crotch.
  - LEFT, with the LEFT HAND punch the reserve ripcord handle towards the crotch.
  - ARCH, return to ARCH.

Practice
All students should be taken through the drill slowly at first until everyone has mastered the drill. The class should then be speeded up until normal speed is reached. The following points should be emphasised and checked.

- The LOOK and HANDLES phases should not be rushed.
- The student must SEE and FIRMLY GRASP the cutaway puff and reserve ripcord with his thumb inside the ripcord handle.
- The commands should be loud.
- All actions should be aggressive.

Once all the students have achieved an acceptable reserve procedure the exit and reserve procedures should be combined. It is good practice, every once in a while, to stop the class after the CHECK and go through the drills for checking and clearing their canopies.

All students must be trained in a cutaway harness.

Impress on the students the importance of cutting away before deploying their reserve and the fact that the RSL is an extra safety device and should not be depended upon.

REVISION

This is one of the most critical periods. At the end you must have a student with a reflexive, instinctive reserve drill firmly embedded in his subconscious mind, which will surface even if the conscious mind is disorientated. Whether a student survives a malfunction depends entirely on how you conduct this lesson. DO NOT OVERDO it to the point of making the student “reserve happy”. Finish by revising the different types of malfunctions.

TEST AND CONSOLIDATION

Practically evaluate each student on the reserve drills and question them with regard to the purpose of each of the six distinctive movements.

PERIOD 7A

LANDINGS

OBJECTIVE

To teach students to instinctively adopt a correct position for landing and to land softly.

EQUIPMENT

- Overalls
- Platform
- Landing mats

PRESENTATION

Explain and demonstrate the parachute landing position emphasising the following points:

- Feet and legs together - toes, ankles and knees pressed together.
- Feet flat.
- Feet underneath the body. Emphasise this point as the harness will tend to push the feet in front of the body.
- Knees slightly bent and legs firm.
- Hips pushed forward (helps get feet beneath body)
- Shoulders rounded.
- Chin on chest.
- Hands in crotch as low down as possible to flare the parachute.
- Student should be looking out as far as possible.

Get the students to get into the parachute landing position and critique them in it.

Teach the students the five points of contact
- Feet
- Calf
- Thigh
- Back
- Opposite shoulder

Practice the students in PLFs starting first with them on their knees (so they do not start by hurting themselves) and then on their feet giving assistance where necessary. Ensure the students are rolling properly.

- The shock must be taken with both feet flat on the ground.
- The side of the leg is forced to the ground.
- Feet and knees kept together.
- Roll along the thigh.
- Continue across the buttocks and over the shoulder.
- Turn the upper body while rolling i.e. shoulder away from ground.
- Keep elbows in and chin on chest.
- Follow up the roll to end with feet pointing in direction of travel.

After landing get up immediately to indicate that they are not hurt.

Stand-up Landings
- One foot directly underneath the body.
- The other foot extended in front of the body - this foot is what takes most of the landing force.
- Be prepared to run off the forward foot.
- Students, especially on their first jump, should prepare for a landing roll and only attempt a stand-up if they think that they are descending slowly enough.
- Face into wind
- Once committed to flare - do not let up toggles!

Post-landing Procedures

- After touchdown, collapse the canopy – pull on one toggle, let the other go.
- Run around the canopy (downwind of the canopy) if the wind keeps re-inflating your canopy.
- Gather/loop the lines hosepipe fashion while walking towards the canopy. Watch for dragging of the canopy or the pilot chute. Place the lines on top of the canopy and fold the fabric inwards to make a small parcel.
- Walk back to the packing area - be aware of other canopies coming in to land.
- Exercise caution when crossing the runway - walk around or follow the procedure specific to your drop zone.
- Lay your canopy out and call a packer/instructor to help you pack.
- Learn to pack for yourself as soon as possible.
- Get debriefed and have your logbook completed before your next jump or before you leave the drop zone.

REVISION

Summarise the lecture content

TEST AND CONSOLIDATION

Every student must be practically evaluated on all types of parachute landing rolls. Do not accept anything less than perfection.

PERIOD 7B

HAZARDOUS LANDINGS

OBJECTIVE

To teach the student to land as safely as possible on obstacles when they cannot be avoided.

EQUIPMENT

Aerial photograph of the Drop Zone showing surrounding obstacles. Or discuss this at landing area with students identifying hazards.

PRESENTATION

Obstacles can easily be avoided but there will be situations when hazardous landings can occur. If a hazardous landing is unavoidable the student should prepare early for it and remain calm. Most injuries in hazardous landings occur when a student forgets his drills and panics. Teach students about "hazard fixation" i.e. look away from an approaching obstacle to find the safest landing area and turn just enough to avoid it.

Trees

Should it seem inevitable that you are going to land in a tree the following should be done:

- With toggles in hands and elbows in, cover face.
- Keep your legs very firmly together
- Remain in this position until stationary (most people go through the tree and land on the ground).
- If suspended above the ground, await assistance.

Buildings

Buildings should be approached on half to full brakes and a PLF executed (if you hit the side of the building you will have to roll on the ground anyway). Immediately AFTER landing hold one toggle down and drop the other so as to collapse the parachute or cut away main.

Water

Water should be treated with respect. Safe water landings can be done by following this procedure:

- Try to land as close to the shore as possible
- Undo the chest strap
- Remain in a good parachute landing position (water may be shallow with a rough bottom).
- Land into wind flaring normally.
- Once WET, and not before, loosen leg straps and free yourself from your harness.
- Remove excess clothing and swim to shore

Power lines

Power and telephone lines can easily be avoided but should it become plain that you are going to land on one, go onto half brakes and try to avoid touching more than one line. If suspended allow NO ONE to touch you until your instructor arrives.

Roads and Runways

If you cannot avoid these, get off the surface as soon as possible after landing.

REVISION

Summarise the lecture content. Stress avoidance! Straight line features are usually hazardous.

TEST AND CONSOLIDATION

Evaluation should take the form of questioning but stress that obstacles should be avoided at all times.

PERIOD 8

REVISION, TEST AND CONSOLIDATION

OBJECTIVE

To evaluate the student on his performance of all the drills covered during the course and to question him on the more important aspects of the course.

EQUIPMENT

Written test papers (optional, but strongly recommended).

PRESENTATION

This session can take the form of a sit-down test or of an oral evaluation session.

If it is only an oral evaluation, then you must ensure that no students are left out of the questioning - each student must demonstrate a working knowledge of all the work covered in the First Jump Course.

REVISION

Use this period to summarise the whole course content, linking the lectures chronologically according to the phases of the jump.

TEST AND CONSOLIDATION

If the student has not done cutaway training in a suspended harness this must be done now along with any additional exit training in a harness if possible.

4 STUDENT PROGRESSION

4.1 GENERAL PROCEDURES

- A major cause of student problems is too rapid a progression rate combined with an inadequate training programme.
- In progression, a small point overlooked in early stages can create serious, if not dangerous, problems in later jumps.
- NB: Dropping back one level of progression (i.e. 10 second to 5 second) to correct a fault is often the fastest method of advancement.
- Students must always strive for perfection in their performance. A conscientious instructor will demand perfection from his students prior to allowing advancement.
- Prior to advancement, a student must perform all phases of a level to a minimum standard of 80% or higher.
- Emphasis must never be placed on quantity, "QUALITY" is essential.
- The maximum number of jumps which the average student can perform in one day and still advance at 100% of his ability is approximately three.
- Students must be trained on an individual basis according to ability and must never be allowed to progress beyond their capabilities. To do so is definitely hazardous.
- The progression rate outlined in this manual is the maximum rate recommended by the Safety and Training Officer (NSTO). It is rewarding to the natural, an accomplishment for the average and demanding of the slow learner.
- Individual training records should be kept on each student and used in conjunction with the individual's logbook.
- An accurate and detailed briefing, observation and de-briefing must be made on every student if they are expected to learn at their maximum rate.
- Any student whose performance creates a hazard to his safety on a continued basis, without any sign of improvement, MUST be told to quit sport parachuting. This is a difficult decision to make, especially with an enthusiastic student, but necessary to maintain the safety standards of the sport. Such decisions should be left to the Chief Instructor of the DZ.

4.2 LEVELS OF PROGRESSION

The numbers do not necessarily coincide with the student jump number (except maximum progression) but represents levels of skill or achievement in the sport. The points listed with each level are the minimum acceptable performance requirements, which must be achieved by the student prior to progression being allowed.

Levels of Progression Rating of Student Performance:

Excellent	(90-100%)	Maximum progression allowed.
Good	(80-89%)	Acceptable for progression.
Poor	(60-79%)	No progression allowed. Repeat required.
Weak	(Up to 59%)	Additional ground training mandatory prior to jumping again, possible regression and/or possible washout.

Except when on a PASA-approved AFF, or Tandem Instruction programme, a Student Parachutist shall meet the following requirements before carrying out a freefall parachute descent:

- Complete a minimum of eight static line (SL) jumps of which three are no task jumps.
- Successfully complete a minimum of five consecutive stable dummy ripcord pulls of which the last three are consecutively good or excellent.
- Be approved for freefall by his Chief Instructor.

First Jump static line Spread Eagle position

- Good exit, arch and count with head back and toes pointed.
- Locked in spread eagle minimum of 5 seconds.
- Good canopy check (aware of colour) etc.
- Good performance on ground control.
- Good landing

Static line Spread Eagle, same count

- Good exit, arch and count with head back.
- Correction of all faults of previous jump.
- Locked in position for full 5 seconds.
- Good canopy check. Control and landing.

NOTE: Three consecutive no-task jumps rated at 80% or higher are required prior to progression into DRCPs. A student rushed into DRCPs will have numerous problems with them and will have trouble progressing onto freefall. Aircraft awareness is a good indicator.

DRCP

OBJECTIVE

To teach the student how to pull his own ripcord, starting by performing a dummy ripcord pull - while adopting the correct student arch position with the correct time delay.

Spread eagle (Arch 000, Two 000, Reach 000, Pull 000, 5000, Check)

- Good exit and spread arch prior to starting the DRCP.
- Cleanly pulling the dummy without loss of arch or inducing body bank.
- Maintaining arch throughout the DRCP with synchronised movement of the arms.
- Forcing arch on pull and holding arch through Check.

Subsequent DRCP jumps

- Same position and count.
- Same as previous jump with correction of faults from the previous jump (marked improvement).

Last three DRCP jumps

- Same as previous jump, performance must be in the 85-100% range by now.
- Student should be seeing the aircraft for the initial two seconds for orientation purposes.
- Satisfactory progression in canopy control and landings.
- Student must have self-confidence.
- Instructor must be 100% positive that the student is ready for freefall, mentally and physically.

First Free Fall

- Same count as DRCP (3500 feet AGL)
- Locked into arch prior to pull and not rushing.
- Proper time sequence on count.
- Maintain arch throughout 6 seconds (or to inflation).
- Satisfactory in canopy control and landing.

The student is now on the freefall progression programme.

After completion of freefall progression programme, the student is a graduate skydiver and must complete the Intermediate Skills Programme before progressing via a recognised discipline's Category programme in order to obtain further licences.

NB: A jumper is considered a student until he graduates from the freefall progression programme.

Levels of Knowledge	
1 Student	Eager to learn and improve skills.
2 "B" Licence Holder	Often over-confident
3 "C" Licence Holder	Knows everything in the world about parachuting.
4 "D" Licence Holder	Begins to realise how much more there is to learn about the sport, usually self-confident and competent

If there is a considerable length of time between jumps, a student should either repeat the performance of his jump or drop back one level. Never attempt something entirely new and different or use strange equipment after a lay-off from active jumping. See currency requirements.

5 FREEFALL PROGRESSION

TEST 1

FIRST FREEFALL (3 SECOND DELAY)

OBJECTIVE

To teach the student how to safely perform his first short delay freefall - by adopting the correct student arch position with the correct time delay.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended) preferably to go with manual.

PRESENTATION

- Student must be cleared for freefall by the CI. Instructor to do this briefing.
- Explain the freefall programme, how it works, who can sign it etc.
- Explain freefall equipment fully including deployment system and AAD.
- Student must do exactly the same count and action as his last DRCP and his first freefall must be done within a day of each other.
- Explain floating ripcords and stoppages - try once to remedy the situation and then use your reserve.
- Review freefall malfunctions - total, horseshoe etc.
- Review emergency exit procedures - use reserve below 3000 ft.
- Explain different sensations that are encountered i.e. slower opening, added nervousness etc.
- Maintain arch through to check and then do a proper check.
- Any time the student goes unstable, loses count or gets disoriented he must arch hard and deploy main immediately.
- Recommend that the student uses goggles from now on.
- Discuss gloves.

NB: Test reserve drills again.
NB: Three priorities of freefall to be introduced. Student to write into own logbook.
1. PULL A RIP CORD
2. PULL AT THE RIGHT ALTITUDE
3. PREFERABLY PULL STABLE

NB: Stress the overriding importance of 1 and 2.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- Student should do a 3 second delay.
- A positive arch should be maintained from exit to check with no kicking and fighting.
- A clean pull.
- A good recovery back into the arch.

NOTES

Unless the student's performance is very bad the student should be passed on to a 5 second delay as faults may be easier to correct with a slightly longer delay. If the jump is really terrible the student should be returned to the dummy ripcord phase.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 2

FIVE SECOND DELAY

OBJECTIVE

For the student to do a slightly longer delay while keeping his arch.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)

PRESENTATION

- Explain the different count sequence (Arch 1000, 2000, 3000, 4000, Reach thousand, Pull thousand, 5000, check).
- Explain the necessity for keeping a hard arch all the way through the pull and then to check properly.
- Stress that all instability can be overcome by a hard arch.
- The student should be able to see the aircraft throughout the count.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- Student should pull within a second of five seconds.
- The student must maintain a hard arch throughout the jump.
- The student must maintain his stability while deploying i.e. correct symmetry of arms (left hand in front of eyes) while pulling.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 3

TEN SECOND DELAY WITH BOX/NEUTRAL POSITION - 2 Jumps

OBJECTIVE

For the student to experience a delay allowing him to almost reach terminal velocity and to reach a proper face to earth position while maintaining stability.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall.
- Suspended harness, training trolleys.
- Video (recommended)

PRESENTATION

- Explain the box/neutral position fully.
- Explain the different count sequence (1000 - 9000, reach thousand, pull thousand, 5000, check).
- Brief the student on falling faster and flatter. Refresh attitude to relative wind.
- The student should watch the plane for the first few seconds and then alternately watch the ground and the horizon.
- The student should be told about buffeting and rocking, not to worry, just to relax into the box/neutral position after 4 seconds.
- The student must deploy at the correct time regardless of what is happening.
- If instability is encountered the student should push hips forward and if that does not correct the situation, he should deploy immediately.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student must be completely stable throughout the whole jump including while he is deploying.
- The student should not turn off more than 90 degrees.
- The student should deploy main within a second of ten seconds.
- The student’s awareness should be increasing through all stages of the skydive.

NOTES

Two good jumps are required on this test as the student is doing longer freefalls. Many freefall problems can be corrected at this stage giving the student a chance to progress smoothly through the rest of his freefall progression programme.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 4

FIFTEEN SECONDS BOX/NEUTRAL POSITION ON HEADING

OBJECTIVE

For the student to develop a feel of balance and to use the wind to achieve stability rather than rely on a forced arch. The student will be starting to control his heading from now on.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)

PRESENTATION

- Explain the different sequence (1000 - 14000, reach thousand, pull thousand, 5000 check).
- Tell the student he will now be falling at terminal velocity (approx. 200 km/h) and should be falling flat by 10 seconds.
- After four seconds the student should relax into the box/neutral position.
- The student should keep his eyes on the horizon while he is in the relaxed position with occasional glances at the ground.
- If instability is encountered the student should push hips forward and if that does not correct the situation, he should deploy immediately.
- Explain the theory of turns. Asymmetric body position is what causes a turn and that this asymmetric position may be caused by an unevenness of the arms or legs.
- To stop a turn you should look over the opposite shoulder. To stop a turn it is usually enough to watch a selected point on the horizon.
- Reiterate that the student must deploy on time.
- The student may do his own spot from now on (depending on the type of aircraft being used).

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student should be able to fall in a box/neutral position without any signs of buffeting or rocking.
- The student should stay within 30 degrees of his heading.
- The student should deploy within two seconds of fifteen seconds.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 5

FIFTEEN SECOND COUNT WITH ALTIMETER/ALTITUDE AWARENESS

OBJECTIVE

To teach the student the care and use of an altimeter and its limitations. To make the student more altitude aware while he is still counting the freefall delay.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness - training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

- The same count sequence as for the fifteen second delay is to be used.
- The altimeter must be in an easily visible place.
- It is recommended that the altimeter be worn on the wrist.
- If possible, the needle of the altimeter should be at its most visible at opening altitude i.e. the 3000 on the altimeter away from the body so the needle is pointing out.
- A student with a newly acquired altimeter should have it checked by a senior jumper prior to using it.
- Students should be warned that altimeters are mechanical devices and are not fool proof. A sense of altitude awareness must be developed using both a sense of time and visual checks of the ground. If a student's altitude awareness says he is lower than his altimeter says, the student should rely on his altitude awareness.
- If the student cannot see his altimeter or is unsure of his altitude, he should deploy the main immediately.
- The student must not stare at his altimeter. When checking his altimeter, he should glance at the altimeter, glance at the ground and then back at the horizon.
- The altimeter should be set on the ground and then checked at 1000 ft and just before exit. Under no circumstances must the altimeter be adjusted in the aircraft even while the aircraft is on the ground as the prop blast can lower the air pressure inside. Care must be taken of an altimeter at all times especially in the aircraft as it is a delicate piece of equipment.
- The altimeter should be checked just before exit, at 5 sec. at 10 seconds and while deploying. The student must be able to tell his instructor what heights these were.

NB: Review and test reserve drills.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- Understand the use and limitations of an altimeter.
- Be able to remember the heights he was at during the various checks.
- Show no signs of instability while checking his altimeter.
- Be able to maintain a box/neutral position during the whole dive.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 6

TWENTY SECOND POISED EXIT WITH ALTIMETER AND INTRODUCTION OF WAVE-OFF

OBJECTIVE

To get the student used to using an altimeter for longer delays and to develop ground awareness.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

- The altimeter is to be used from now on but a sense of time awareness should be cultivated - possibly mental counting. Visual checks must also be used - check the altimeter and then check the ground.
- Introduce the wave-off and safety application thereof. i.e. opening signal.
- The student must remain on heading, his heading picked on the horizon and not directly below him.
- Before deploying the student must wave off.
- The wave off should be a crossing of the wrists in front of the head while in the box/neutral position.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student should remain on heading for the whole jump.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 7

TWENTY SECOND DIVE EXIT

OBJECTIVE

To teach the student to do a dive exit maintaining control and remaining stable throughout the dive.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Mock-up/aircraft
- Altimeter

PRESENTATION

- Revise relative wind and box/neutral position.
- The student should dive down, if he dives out too flat the prop-blast will catch him on the side, and he will probably go unstable.
- The student should stretch his arms forward and relax, tuck back his legs so that the prop-blast does not flip him over. The student will feel as if he is going over but must remain in this position until he can see the horizon, at which time he must relax into a normal freefall position.
- If the student goes unstable, he should arch.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student should be stable by 5 seconds after exit and should maintain his heading for the duration of the dive.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.

NOTES

Don't worry if the student does not handle the exit too well as he will have plenty of other opportunities to get it right.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 8

180 DEGREE TURNS IN BOTH DIRECTIONS

OBJECTIVE

To teach the student how to execute and control 180 degree turns in both directions and be able to stop the turn.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness - training trolleys
- Video (recommended)

PRESENTATION

- Explain again the theory of turns - asymmetric body position will create a turn. Mention inertia.
- Explain how to control turns. Turn your head in the direction of the turn (look where you're going) and look over your shoulder. Bank the upper body while keeping the lower body neutral.
- The turn should be stopped just before the heading is reached so that the student does not over-shoot. The turn is stopped by returning to the neutral position and countering in the opposite direction if required.
- The student should only start working after 5 seconds or more so that he has completely recovered from his dive exit and has built up some speed.
- There is no need to rush. Slow, good turns are better than fast turns that go past their headings.
- If a spin is encountered, push hips forward and counter in the opposite direction. If that doesn't stop it, deploy main.
- The altimeter should be checked after each turn.
- Briefing should be done with the aid of a harness, training trolley or other training aid.

NB: Review and test reserve drills.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student should do at least one turn in each direction.
- Each turn should be within 20 degrees of 180 degrees.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 9

360 DEGREE TURNS IN BOTH DIRECTIONS (TEST)

OBJECTIVE

To teach the student how to execute and control full turns in both directions and be able to stop the turn.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

- Brief as per test 8.
- The student should know that the turns are executed exactly the same way as 180 degree turns but that more speed (momentum) can build up.
- For this reason the student should start stopping the turn about 90 degrees before the heading is reached.
- Again slower, controlled turns are better than fast, sloppy turns.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- At least one turn in each direction must be performed.
- Each turn must be within 20 degrees of the chosen heading.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.

NOTES

Students should be completely proficient in turns before passing this test.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 10

BACKLOOPS

OBJECTIVE

To teach the student how to recover stability if he is knocked unstable on break-off or some other out of the ordinary circumstances.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

- The student should delay for about 5 seconds before attempting backloops to ensure that he is properly stable and has built up enough speed.
- Show the students how to do backloops:
  - Head up and knees up.
  - As the knees come up push down with the arms keeping the arms 45 degrees away from the body.
  - As the legs come under the body the student should kick his legs out.
  - Keep the head back and as soon as he sees the ground arch to get back to the stable position.
- The arms are the pivotal point of the backloop and should be kept out from the body and never brought in to the sides.
- The backloop must be done fairly quickly, it is almost impossible to do a backloop slowly.
- If a student finds himself on his back in an arch, he should pull in one arm and then re-arch.
- The altimeter must be checked after each backloop and the student should be aware of the excessive altitude loss during backloops.

NB: No backloop may be performed below 4500ft

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student should be able to recover stability at least twice.
- An option is to brief the student for an intentional front loop on exit.
- Once recovered he checks his alti and then performs a back loop, thus demonstrating recovery twice.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 11

FULL (INTERNATIONAL) SERIES (TEST)

OBJECTIVE

To give the student more work in the air and to test his ability to think in the air as a sequence of manoeuvres has to be put together.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

Brief the student on a full series:

- Backloop / alti
- Right turn / alti
- Left turn / alti
- Backloop / alti
- Left turn / alti
- Right turn / alti

There is not an excessive amount of time to do this test and so the student should not waste time before starting and should do each manoeuvre as quickly as he feels he can manage it.

Student should be practised within the allowed time, i.e. 25 seconds.

NB: No backloop below 4500ft.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- All turns and backloops should be within 20 degrees of heading.
- The student should be able to complete the whole full series.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 12

DELTA IN TWO DIRECTIONS

OBJECTIVE

To teach the student a method of getting down to other skydivers while doing Formation Skydiving and is to be used as an introduction to tracking.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

- Once stable and a heading 90 degrees to run-in has been obtained, the student should move slowly into the delta position. Rushing into the delta position could cause him to go unstable.
- Brief the student on the delta position as follows:
  - Straighten the legs.
  - Sweep the arms back from the body (approx. 45 degrees) and let the wind blow them back.
  - This should push the chest out.
  - Student should look where he is going.
- The delta should be held for about 5 sec. and then the student should arch out of the delta.
- Check alti.
- The student must turn 180 degrees and repeat the delta in the opposite direction.

NB: No delta below 4500ft.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student should be able to delta twice without any signs of lateral instability.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 13

DELTA & TURN

OBJECTIVE

To teach the student how to control direction in a delta. This is a key safety manoeuvre and will be invaluable when skydiving with others.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

- The student should delta for at least 5 seconds before attempting the turn.
- The student must be told how to turn in a delta:
  - Drop one shoulder slightly and look where he is going.
  - Push out the opposite arm slightly (right arm in a left hand turn).
- Tell the student if he turns too hard he will lose his lateral stability and "spiral". The turn should therefore be done slowly.
- The turn should be a 90 degree turn on preset headings. Tell the student which direction to start and what heading to turn onto.
- If the student goes unstable in the turn he should return to the box/neutral position. If time allows, try again.
- Flare, wave-off and deploy by 3000 ft.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student must be able to delta without any signs of lateral instability.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.

NOTES

It is imperative that the student be able to delta properly before he can safely progress.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 14

DELTA & TRACK

OBJECTIVE

To teach the student how to transition a delta into a flat track.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

- Brief delta as per test 12.
- The student should delta for at least 5 seconds before attempting the track.
- Brief the track as follows:
  - From the delta, sweep the arms forwards to a straight line while rotating the palms through 180 degrees.
  - At the same time bring the legs together and point the toes.
- Maintain this position for at least 5 seconds. If time permits, do a 90-degree turn.
- Flare, wave-off and deploy by 3000 ft.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student should be in complete control of his track at all times.
- The wave before deploying should be automatic by now.
- Priorities of freefall should be ingrained.
- The student should be opening between 3500 ft and 3000 ft.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

TEST 15

SPIN TEST

OBJECTIVE

To teach the student to regain control at any time e.g. after being knocked unstable on break-off. This is the final test of the freefall progression programme.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)
- Altimeter

PRESENTATION

- The student should delay for at least 10 seconds before attempting the spin test so that he can build up some speed.
- The spin is performed by starting with a 360 degree turn after which the student will grab an ankle and "salute" with the opposite hand.
- If the turn is to the right, the right ankle must be grabbed and the salute done with the left hand and vice versa for the left turn.
- To recover from the spin, return to an arch and force a turn in the opposite direction.
- If recovery is not achieved within 5 seconds, arch and pull.
- If recovery is achieved the student should wave-off and deploy by 3000 ft.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student must go into a high speed spin and recover within 5 seconds.
- The student should be seen to wave off clearly before opening.
- The student should be opening between 3500 ft and 3000 ft.
- On successful completion, the student is a graduate skydiver and must complete the Intermediate Skills Programme before progressing via a recognised discipline's Category programme in order to obtain further licences. (See PASA SOPs Section 2, 1.4)
  NB: This is to be logged. Chief Instructor to sign off the freefall progression sheet and the ISP to be explained to the student.

PULL A RIP CORD
PULL AT THE RIGHT ALTITUDE
PREFERABLY PULL STABLE

6 HAND-DEPLOYED PILOT CHUTE CONVERSION

OBJECTIVE

For the student to learn a new deployment system.

EQUIPMENT

- Freefall rig of the type being used
- Mannequin - to illustrate body positions in freefall
- Suspended harness, training trolleys
- Video (recommended)

PRESENTATION

- The student shall be a graduate skydiver.
- The particular deployment system should be explained and demonstrated fully.
- Mention the alternative deployment systems i.e. BOC or pull out.
- Show the routing of the bridle cord and explain the importance of it.
- Show method of packing pilot chute and pin position.
- Show the pin and the piece of slack bridle created with Velcro to enable the pin to be easily extracted.
- Show the student how to deploy the pilot chute with his palm up to prevent the pilot chute or bridle tangling with his hand or arm.
- The pilot chute should be taken to arm's length and released immediately. Normal check procedure.
- Malfunctions should again be reviewed and any new potential malfunctions introduced - pilot chute in tow, horseshoe, etc.
- Test reserve procedures. Mention need to ensure clear air below jumper before cutaway.
- Introduce collapsible pilot chutes.
- If a parachute of a different design and or smaller size is to be jumped, fully brief the student on this. Student to read "The Canopy Pilot's Handbook" as contained at the end of this section. Student should be progressively stepped down from student canopy to the minimum size appropriate to his weight. See manufacturer's recommendations.

Two separate jumps should be performed in order for the student to be fully familiar with the new deployment system.

- Jump 1
  The student should exit at altitude and perform at least 3 dummy pulls where the student touches the handle but does not deploy it and then does a proper pull at 5000ft.

- Jump 2
  A half series with dummy pulls between each manoeuvre. The student to deploy at 5000ft.

REVISION

Summarise the lecture content.

TEST AND CONSOLIDATION

- The student should have demonstrated his understanding of both the cut-away system and the deployment system:
  - Operation
  - Safety checks
  - Advantages and disadvantages over previously used equipment.

- The student must be able to deploy without going unstable.

- This conversion must be done before or after the ISP, not during.

7 TRANSITION TO HIGH PERFORMANCE PARACHUTES

INTRODUCTION

The high-performance parachute presents substantial new challenges to the parachutist converting from the student square. This chapter is intended to guide the parachutist and instructor in the conversion. It is not intended to replace a thorough pre-jump briefing by a qualified individual.

The parachutist must:

- Have demonstrated consistent good canopy handling practices (i.e. no downwind landings, reasonable accuracy, etc.)

- Prior to making a first high performance parachute jump, the student should be thoroughly briefed by an instructor or Jumpmaster, and the parachutist should:

  - Become familiar with the varying relationships of forward speed and rate of descent.
  - Understand recommendations for flight in gusty and turbulent conditions.
  - Be familiar with procedures for recovery from stalls.
  - Understand the recommended methods for initiating and stopping turns.
  - Receive a thorough discussion of malfunctions and appropriate emergency procedures.
  - Participate in a thorough discussion of abnormal conditions which do not necessarily constitute malfunctions i.e. line twists, closed end cells, etc.
  - Clearly understand the potential hazards in low (hook) turns or any other radical manoeuvres when using higher performance canopies.
  - Be aware that the forward speed, vertical speed and handling characteristics differ greatly amongst High Performance parachutes.
  - Appreciate that several jumps need to be made on any parachute make or model (not type) before carrying out a demonstration jump with that parachute or, if at the CI's discretion, there is a risk that the parachutist may not be completely familiar with the parachute's flight characteristics or other potentially hazardous factors.

- The parachutist should demonstrate a basic understanding of the aerodynamic characteristics of high-performance ram-air flight. It is not drag produced by the area of a square parachute that retards its descent; but the lift produced by its forward flight through the air. The forward speed of a ram-air canopy is not simply a desirable advantage, it is essential to its performance.

- Participate in packing the canopy to be jumped under supervision of a suitably qualified person. During packing, the parachutist should become familiar with:

  - The design and construction of the canopy including its cells, line structure and deployment system.
  - The method of stowing and releasing the brakes.
  - The general principles of packing the canopy according to the manufacturer's instruction.

SUGGESTED JUMP PLAN

Early jumps should be carefully planned to provide the parachutist with an opportunity for systematic exploration of the flight characteristics of the canopy.

First Jump

- Exit the aircraft solo at altitude sufficient to permit a terminal or near terminal opening at 4500 to 5000ft.

- After deployment and checking canopy, do not release brakes (unless necessary to clear end cells or bring down slider). Instead, make several rear-riser turns to left and right. Rear-riser turns without release of brakes may be needed to avoid other canopies.

- Release brakes and make 360 degree turns to right and left.

- Gently pull both toggles down towards waist, observing canopy stall point. Recover from stall by letting toggles up slightly.

- Set up for landing. If the drop zone permits, it is best to set up an aircraft-type approach, with downwind leg, crosswind leg, and 90 degree turn to final. Altitudes for these manoeuvres will depend on DZ layout, rate of descent, etc.; the instructor should be consulted for advice.

- Prepare to land.

IMPORTANT:

Be prepared to do a PLF if necessary. Flaring either too high or too low is a major cause of injuries among inexperienced ram-air jumpers. A flare is simply a controlled stalling manoeuvre. It is intended to convert the energy of the jumper's forward speed to lift, momentarily stopping of slowing the descent. Flaring too high means that at the moment the jumper hits the ground, his canopy has lost lift, and its rate of descent increases greatly. Flaring too late means the jumper is travelling at a higher-than-necessary rate of forward speed.

Flaring must be performed from full or near-full canopy speed, since it is that speed, transformed into lift, which momentarily slows the rate of descent. Many inexperienced ram-air jumpers, failing to understand this attempt to flare from a partial or near-full brake situation, resulting in a sudden stall and increase in rate of descent.

On the first few jumps, the parachutists should not attempt accuracy landings and not be concerned about landing some distance from the target. It is far better to make a safe landing off-target than a crash landing on target.

The novice high-performance ram-air jumper should consult with an instructor as to the appropriate altitude to set up landing approach for prevailing wind conditions.

SUBSEQUENT HIGH-PERFORMANCE RAM-AIR JUMPS

After the first successful ram-air jump, the next several jumps should be carefully planned so that the parachutist will have an opportunity to explore the flight characteristics of the canopy.

The stall point should be checked on each jump, since it can be affected by atmospheric conditions.

Flight characteristics, which the jumper should study, include:

- The effect of holding the canopy in a steady-state stall (a stall entered from near full brake position for several seconds; recovery from this stall).
- A dynamic stall (a stall entered by rapid depression of toggles from near full flight to the stall position attempting a dynamic stall) and understand the recommended recovery procedure.
- Stall turns (turns entered by pulling down rear risers rather than toggles).
- Effect of pulling down front risers changing the angle of incidence and increasing forward speed but also rate of descent.
- Multi-revolution hard spiral turns (noting especially the rapid loss of altitude).

THE CANOPY PILOT'S HANDBOOK

By Bryan Burke
first edition, July 1997
edited by Johanna Faust

SKYDIVE ARIZONA
4900 N. Taylor Road
Eloy, AZ 85231
jump@skydiveaz.com

"The vast majority of parachuting injuries these days is related to canopy control (or lack thereof)."

INTRODUCTION

The following materials are presented to the skydiving public in the hopes of bringing up our level of performance and understanding. Anyone is free to copy this material. However, you are on your honor not to plagiarize or edit my work. If you choose to copy this material for instructional purposes, fine. All I ask is that I am credited as author and Skydive Arizona is also given credit, since these materials were developed partly on their time and with their instructional programs in mind. In addition, please do not change the text. If you feel the need to add to, subtract from, or contradict something, please do it in the form of foot notes. I look forward to hearing from anyone with comments, criticisms, or suggestions - but when it comes to adding or subtracting from the text, I reserve the right to do it myself.

At this time the Canopy Pilot's Handbook consists of five chapters. I plan to add a sixth chapter, on precision landings for modern parachutes, by the fall of 1997. There is an additional section at the end directed to people who may wish to teach canopy flying courses at their own drop zone. It offers a few suggestions. I would like to hear from people who host such courses; perhaps we can come up with some common denominators that will lead to better teaching.

Most of the material presented here came from long observation, experience, and thought. There aren't many sources of information out there, and some of those are incomplete or even inaccurate. But there are some good ones. Works that particularly influenced me are:

The Parachute Manual (v.II) by Dan Poynter. This fascinating volume (and v.I for the really hard-core enthusiast!) has a place in the library of any skydiving professional, especially riggers. For typical skydivers the $49.95 price tag is a bit high, since two thirds of the book is devoted to specifics of rigging that aren't much use to the layman. The last third of the book, however, has interesting discussions on design, deployment, packing, malfunctions, etc. Some of the material is a bit obsolete since the latest revision that I know of was in 1991. Most research libraries have this book in their collection, so try the nearest university library or your local rigger if you want to look at the book before you lay out fifty bucks. It can be ordered through any of the big mail order parachute suppliers or direct from Para Publishing, PO Box 4232, Santa Barbara, CA 93140-4232, USA.

The Aerodynamics and Piloting of High Performance Ram-Air Parachutes by Jerry Sobieski. This is a very interesting treatise on how modern parachutes fly. Although it is written in the style of a college thesis even someone like me, who flunked calculus, can understand it. The first forty pages are a detailed technical analysis of how parachutes fly; the remaining thirty are about how to fly them. The author's e-mail address, last I knew, is jerrys@umiacs.umd.edu. The treatise can be found on the skydiving archive at http://www.afn.org/skydive. Quite a few other interesting things are there too; just browse through the safety and training section for information specific to canopy flying.

The owner's manuals that accompany new canopies usually have at least one or two useful nuggets of information. Performance Designs also has published two sets of lecture notes written by John LeBlanc. John is a very interesting man to talk to and gives seminars on canopy flying at many boogies and other skydiving events. You may want to contact PD and get these two notes. They are also available on the skydiving archive mentioned in the previous paragraph.

Talk to canopy manufacturers if you get the chance. Most of them have thought deeply about parachute performance. Unfortunately they tend to be a bit cagey when you get down to specifics of design, since they consider some of this information proprietary, and possibly potential liability. Still, most have some very interesting views on the subject. Most of them are also very busy people, so be sensitive to the possibility that they might not have a lot of time for idle chatter.

Most of all, keep your eyes open. In your skydiving career you will see far more landings than you will ever make. All of them are learning opportunities.

Blue skies, soft landings
Bryan Burke
Safety and Training Advisor at Skydive Arizona, USPA National Director, 1997-98

Chapter One: BASIC AERODYNAMICS

The forces that affect a parachute are invisible, but not incomprehensible. Learn what makes a parachute fly well and you will know what makes it fly badly.

There are two basic ways for parachutes to slow our descent - lift and drag. A round parachute creates drag by simply grabbing as much air as it can, putting on the brakes for us. But a square parachute creates lift, which forces an air foil in a particular direction determined by the design of the foil and its presentation to the fluid it moves in. Controlling the flow of air over the foil is the art of the canopy pilot.

Lift
A canopy produces lift in two ways. The form of the wing itself produces some lift. Wings are shaped so that air must flow faster over the top of the wing than the bottom. When the velocity of air increases, its pressure decreases. This creates a low pressure area on the top of the wing, and a corresponding higher pressure below. Thus the wing is "lifted" towards the low pressure area.

Deflection of air is the second type of lift. If air is deflected one way, there must be an equal reaction in the opposite direction - the same principle that lets us turn, track, and perform other freefall maneuvers.

The balance of deflection and form lift is a complex one. If deflection were the principle source of lift, in a right toggle turn (the right trailing edge pulled down) air deflected downward would push the right side of the canopy up, putting the canopy in a bank to the left and creating a left turn. But in fact, pulling the right toggle down reduces lift, because it increases drag on that side. With the right side moving slower, it creates less lift. The canopy banks to the right.

The main skydiving use of deflection is at flare time. When a canopy is flared, some air is deflected downward with a resultant upward motion of the canopy. But this also increases drag, slowing the canopy's forward speed. The pilot beneath, having more mass and less drag, does not slow down as fast and swings forward. This changes the entire angle of attack of the canopy, greatly increasing deflection of air as long as any airspeed remains. We'll look more closely at this use of deflection when we discuss angle of attack, and in the chapters on practical flying techniques.

Drag
The other main force acting on a canopy is drag. Drag also has two manifestations, which I will call form drag and parasite drag. Put simply, form drag is the result of friction between the air flow and the wing. It is a penalty all wings incur to some extent and you can even think of it is as lift - towards the back! Parasite drag is the result of disruptions of the air flow from irregularities in the wing. The cell openings create turbulence. Seams, packing tabs, lines and line attachment points, the pilot chute, the slider, and even you, the pilot, contribute drag but no lift. Parachutes have never been very effective wings in comparison with airplanes because their very structure creates a great amount of parasite drag.

Lift and drag, then, are both results of airflow over a wing. Because it is the flow of air over the wing that creates these flight forces, more flow means more force. Lift and drag increase in geometric proportion to speed: twice the speed, four times the lift - and the same for drag. This means that airspeed is crucial to performance. Going faster means - to a point - more lift and crisper control response. It also means drag goes up, which is why fast canopies have several design features to reduce drag such as removable pilot chutes, collapsible sliders, and small diameter lines.

Flow Separation
Fluids flowing over a foil have another interesting characteristic - one you can easily see by watching water pass over a rock in a stream. The fluid will try to follow the curves of an object in the smoothest possible path. A foil can have its shape changed to some extent without disrupting the flow. The direction of flow can also change slightly without disruption, but if either the direction of flow or the shape of the foil changes too rapidly, "flow separation" occurs. Instead of cleanly following the shape of the foil, the fluid breaks loose in eddies and ripples. This is very important to canopy pilots because in essence it means that any sudden, radical maneuver greatly reduces the lifting efficiency of the foil by reducing form lift. The most common and dramatic example of flow separation for parachutes is a slow speed stall, but as we will see in later chapters, there are many more subtle variations: excessive front riser input, "pumping" the toggles, and extreme toggle input.

Thrust and Weight

For a wing to move through the air and produce lift, there must be some force propelling it. Normally this is called thrust. In an airplane it is easy to understand - the engine does the work. With a sport parachute gravity is the engine. On a ram air parachute, the A (leading edge) lines are shorter than the D (trailing edge) lines, causing the canopy to have a downward tilt. Air is deflected towards the back of the wing, causing forward speed. The weight of the system (you, plus the gear) pulls down on the wing. The wing is sliding, like a sled on a hill, down a slope determined by the trim of the suspension lines.

The more the weight pulls down, the more thrust you get. We commonly refer to the relative amount of weight under a wing as "wing loading," an important term to canopy pilots. In America parachute loadings are based on exit weight - the combined weight of the jumper and all equipment - and expressed as a ratio of pounds per square foot of canopy. This can lead a pilot into the assumption that wing loading remains constant, and in straight and level flight this is true.

However, wing loading can change dramatically during a turn. To illustrate the concept simply think of a weight swung on the end of a string. The faster it goes, the heavier it seems. You have the same effect on your canopy in a toggle turn. As the canopy turns, the pilot's body continues in a straight line until the canopy pulls him to the new heading. If the turn continues, centrifugal force continues to keep the pilot swung out from under the canopy. When the turn stops, the suspended weight then swings back under the canopy. This transition from the "swung out" position to back under the canopy is the moment when the greatest speed is reached. The canopy reaches top speed because of an increase in wing loading as well as the speed garnered from an increase in descent rate. The faster you turn the more weight appears to be under the canopy. We can think of this as apparent or induced weight, as opposed to simple suspended weight.

Note that in some maneuvers you can actually reduce wing loading for a moment. On many canopies the pilot can create a turn that flings his body up while the canopy turns down and for a moment the lines will actually get a little slack - meaning the wing loading has decreased to almost nothing for that point in time.

Up to a point, more weight (thrust) under a parachute enhances performance. Thinking back to our sled analogy, adding weight to the sled will make it go faster up to the point where it begins to sink into the snow or break up. Without sufficient wing loading canopies become sluggish, while increasing the wing loading enhances speed. Since lift increases with the square of the speed, a wing going thirty miles per hour produces four times the lift of one going fifteen miles per hour. That's why a jet airplane can be supported by wings tiny in proportion to a Cessna's, and why people with the proper training can jump relatively small canopies loaded to 1.4 or higher - some are experimenting with wing loadings of 2 or more! The enhanced performance that comes with high wing loading is not only experienced in straight ahead speed, but in turn rate, flare, and overall responsiveness. But everything has its price. The price of high wing loading is seen later, when we discuss flying in the real skydiving environment.

Center of Mass, Center of Lift

The center of lift is a point on the wing where the lift can be thought of as concentrated. The center of mass is where the weight of the system is focused. On a sport parachute the weight is clearly centered well below the wing, in the form of the pilot. By changing the relative position of the center of mass to the center of lift, the pitch of the canopy can be affected, changing the angle of attack.

Angle of Attack

Many skydivers think angle of attack means the angle of the parachute relative to the ground. Not at all! Angle of attack is the angle of the chord line to the apparent wind. Changing the angle of attack is done by applying leverage against the wing. An aircraft does this with its tail section but parachutes lack this capability. Flaring is the only way to make a change in a canopy's angle of attack. In a flare, as brakes are applied the weight suspended under the canopy (that's you, the pilot) swings forward because the light, high drag parachute slows down faster than the heavy, low drag pilot. The result is that the angle of attack temporarily increases, generating more lift through greater deflection of air.

Note that in a flare, the changed angle of attack is due to an actual change in the apparent wind felt by the canopy as the weight below it swings forward - a lever action against the wing just like a hang glider flare. Toggle action changing the shape of the canopy does make a contribution, but if the weight swing does not occur the angle of attack does not change significantly and only a little additional lift is produced by the increased camber of the canopy. A deep brakes accuracy approach is the typical example of a landing using brakes but not a flare. In a good flare, a steady application of brakes causes the canopy to go slower and slower; the pilot remains slightly ahead of the normal position under the canopy, retaining the increased angle of attack and increased deflection of air. Once all of the canopy's speed is used up, the pilot swings back to normal position. At that point there is no speed left to produce lift of either type, and a high rate of descent

begins until the canopy regains speed or the ground interrupts the flight.

You may have noticed I use the term "apparent wind" instead of the frequently heard "relative wind." Apparent wind is a common term in sailing. It refers to the wind the sail feels as it passes through the air. The operator often forgets the apparent wind, confused by familiar but useless references such as the horizon. But the foil knows no horizon, only apparent wind. To visualize this principle clearly, think of a drag plane. People who see this formation for the first time often wonder why the bottom canopy stays inflated. But the apparent wind that the canopy feels is much the same as in normal flight. Just because it is upside down doesn't mean it won't pressurize and produce lift - it just means the lift is down.

Angle of Incidence

Now let's look at angle of incidence, often mistaken for angle of attack. The angle of incidence can be thought of as the trim (nose up or nose down) of the canopy and is built into the parachute by the length of the suspension lines. It can be altered by using either front or rear riser input. Pulling down front risers changes the angle of incidence, not the angle of attack. At the steeper angle, the canopy will descend faster but the apparent wind striking the foil remains fairly constant, although it will shift momentarily as the maneuver begins and ends. With most canopies, the trim of the suspension lines results in a tilt where the canopy slides about three feet forward for every one it slides down - a 3 to 1 glide ratio. Flatter trim will let a canopy fly further, but the penalty is that the canopy is not pressurized as well as a more steeply trimmed canopy, resulting in a foil more vulnerable to turbulence. Steeper trim increases descent rate and pressurization but sacrifices glide, and some flare capability is lost.

Camber

When you pull the toggles down, you change not only the angle of attack, but the shape of the wing itself. Camber refers to the amount of curve across the top of the wing. Wings with a lot of camber generate a lot of lift at slow speeds but create a lot of form drag. If you pull the brakes down and hold them steady, this change in camber will affect how your parachute flies. The descent rate will decrease. So will the forward speed. Modern canopies generally get so much of their flare from angle of attack that your best flare will be from full glide. The high descent speed translates into lift when the canopy is flared. But in situations where you want to slow your descent for an extended period, increasing the wing camber by applying brakes is a very effective way to accomplish this.

Summary

Take a minute some day to watch rocks in a fast moving stream. The smooth, round rocks will have a clear layer of water flowing over them with very little turbulence until the water reaches the down stream side of the rock. That smooth flow over the rock is like the lifting air over the top of your canopy. The turbulent water behind the rock is form drag, the wake your canopy leaves behind as it cleaves through the air. Moss, irregularities in the surface, and roughness at the upstream edge is parasite drag - you can see it. Now look at a jagged rock. Flow separation is written all over it, all rough water and no smooth layer. No smooth flow, no lift. No lift, no control.

As you drive down the highway, put your hand out of the window. Find neutral. Angle it up, angle it down... deflection.

How do these abstract ideas about fluids and foil apply to the day to day skydive? We'll look at that soon. But before we do, let's take a look at the different canopy designs on the drop zone so we can understand why they are built the way they are, and what we can expect them to do.

Chapter Two: DESIGN PARAMETERS

Individual canopies can be described in terms of wing shape, trim and loading. The designer determines the first two, the jumper the latter. Choices on these items determine the way a particular parachute flies, so without even jumping a canopy you can deduce to a great extent how it will fly if you understand these features. Wing shape is defined by aspect ratio and airfoil section. Aspect ratio is the ratio between span (side to side width) and chord (front to back.) Airfoil section can be thought of as the ratio of the wing's height to it's chord. Trim is adjusting the particular wing shape to the apparent wind to gain the best compromise in performance characteristics. And wing loading is the choice of how much power the pilot decides to give to the system.

Aspect Ratio

In theory, high aspect ratio canopies fly faster because the higher the aspect ratio, the lower the form drag for the amount of lift produced. In other words, a 200 square foot nine cell produces more lift than a 200 square foot seven cell for the same amount of form drag. Why not build a 200 square foot eleven cell at a very high aspect ratio?

The practical limits of aspect ratio are reached at about 3 to 1. At this point, a designer runs into several problems. Unlike an airplane wing, a parachute has no solid structure but maintains its shape through air pressure. To fly well the canopy must maintain good internal pressure in every cell. The higher the aspect ratio, the more difficult it is to pressurize the end cells. The wing needs to maintain a clean shape, too, which means more lines and ribs. But these mean more drag.

High aspect ratio canopies have a shorter control (toggle) stroke and therefore react more sharply. They tend to stall more sharply and inflate more unevenly than low aspect ratio canopies. Although it takes longer to initiate a turn on a high aspect ratio canopy, once the turn is under way it will be at a higher rate than a low aspect ratio canopy of the same surface area. Finally, more parts (cells, ribs, and lines) found in a high aspect ratio canopy means more pack volume for the wing area.

Between pressurization, diminishing returns on drag, and managing deployment of the canopy, the highest aspect ratio canopies on the market have never passed about three to one. Most nine cell canopies approach three to one; most seven cell canopies fall in the 2.2 to 1 range. Which is better? Everything has its price. A nine cell should fly faster than a seven cell because of less form drag - but it has 20% more lines, ribs, and cell openings than a seven cell - all contributing parasite drag. Throughout the 1990s prevailing wisdom has been that nine cell canopies also have better glide than seven cells. But the definite speed and glide advantages shown by nine cell canopies in the past decade may be largely a function of different foil sections and trim angles combined with more efficient construction. Time will tell; as designs improve seven cells seem to be catching up to nine cells in many aspects of performance but we can still expect high aspect ratio canopies to have more efficient gliding characteristics.

Because they tend to have more predictable inflation and stall characteristics, virtually all reserves are seven cells. So are canopies specialized for accuracy landings, canopy relative work, or fixed object jumping - applications where opening and slow speed flight characteristics are more important than speed and glide.

Foil Section
The foil section of a canopy is defined by the shape of the ribs - a "side view" of the canopy. Generally speaking a slow flying wing must have a thick foil in order to produce lift. (The reason for this is in chapter one but you will have to think about it!) The penalty is that a thick foil has more drag than a thin one. An accuracy or CRW canopy might have a foil section of 15 to 18% of the chord, while a high performance RW canopy might only have a 10% section. Although the thinner section flies faster, it has less lifting ability at slow speeds and will have more abrupt stalls and turns. The actual curve of the foil is also important. If the center of lift of the foil is far forward, the canopy will have a high descent rate and very solid pressurization. Putting the center of lift further towards the center of the chord creates a flatter glide but makes it harder to pressurize the canopy. Combining this type of foil with a high aspect ratio will cause the leading edge corners to collapse in turns. Elliptical canopies are designed to address this problem: sweeping the leading edge back and reducing the size of the outer cells seems to increase the pressure in the end cells. As an added benefit, ellipticals feel the effects of a steering input more (proportionally more of the outside section of the wing affected by toggle input) giving very snappy response.

Summary
Here are some general guidelines about airfoil design, given a seven cell and a nine cell canopy of the same surface area.

The seven cell is more likely to open on heading, will pack slightly smaller for the same wing area, and is less vulnerable to malfunctions of a line-over type. In a partial malfunction situation, the seven cell will be less radical (have a slower descent rate and less violent behavior.)
A nine cell will have a flatter glide, giving it slightly more range. It will have a longer flare, which may make the flare easier to time but requires a longer runway.
The seven cell will be more stable at slow speeds, give more warning before stalling, and recover from a stall more predictably than a nine cell.
The nine cell may have more forward speed, an advantage in winds.

Wing Loading
This term refers to the amount of weight a parachute is carrying and this is probably the single most important factor in how a modern parachute flies. In the U.S. wing loading is expressed as a ratio of pounds per square foot. For pounds, use your exit weight: combine the weight of your body and all of your equipment. For square footage, use the manufacturer's figure. Then divide the weight by the square footage for the wing loading. For example, I weigh 190 pounds and my equipment weighs another 25, including main, reserve, container, jumpsuit, and paraphernalia. That makes my exit weight 215 pounds. If I am jumping a 205 square foot canopy,

my wing loading is 1.05. A student my size under a Manta (288 sq. ft.) would have a wing loading of .75. Someone my size under a Sabre 150 would have a wing loading of 1.43. Most manufacturers will have a suggested maximum wing loading for various designs; many also suggest a minimum.

As a rule, the higher the wing loading, the higher the performance. At very low wing loadings, canopies are sluggish and unresponsive. Increasing wing loading increases forward speed and descent speed. This increased speed gives you a higher turn rate, and the controls will feel more sensitive. Keeping in mind that lift increases with speed, a high wing loading can mean that you get a longer flare than you would with a low wing loading. But since everything happens faster, your room for error is reduced. Partial malfunctions will be more severe with an increase in wing loading.

There is a point of diminishing returns with wing loading. Using an airspeed indicator and variometer (a device to measure descent rate) to test a variety of modern canopies, I found that at wing loadings above 1.5 the only performance increase is in turn rate and responsiveness. As more weight is added, the canopy loses glide (comes down faster) with no gain in forward speed. For general canopy flying, loadings above about 1.4 seem to confer zero benefit to speed and glide while increasing descent rate. Stall speed (the point at which flow separation occurs) also goes up as the wing loading increases.

Here are some general guidelines about wing loading given canopies currently on the market in 1997:

For slow, soft landings, or for jumping at higher elevations, choose a low wing loading: .7 to .9.
For a good compromise of performance and safety, jump a 1 to 1 wing loading; one square foot of canopy for each pound of exit weight.
For a fast canopy, jump at a wing loading of 1.1 to 1.3. Any wing loading over 1.3 puts you in the experimental category, where the canopy is at the edge of its performance envelope.
Experts routinely jump at wing loadings of 1.4 to 1.6 - but they are jumping in the same conditions, every day. Changing landing areas, altitude, or other factors make these wing loadings questionable.
As a rule, zero porosity canopies and 9 cells can be safely flown at higher wing loadings than F-111 seven cells. A skydiver who might jump an older seven cell at a .8 wing loading could, with a little training, safely jump a modern zero porosity 9 cell at 1.1.

Trim
How a parachute is trimmed and tuned has a great effect on its performance. Trim refers to the angle at which the parachute is set to descend - the angle of incidence. Nose down trim results in a higher descent rate and increases stability. Nose up provides more glide but makes the canopy less resistant to turbulence or deformation and such a canopy will also take longer to re-inflate once collapsed. Typically, Accuracy and CRW canopies are trimmed nose down (steep angle of incidence) while RW canopies have a flatter trim. Trim affects the flare in the same way it affects glide. A canopy with a steep angle of incidence will not flare very long, but the canopy will be more stable in brakes and recover from stalls faster. Steering line trim also affects canopy performance. Having the steering lines too long diminishes the effectiveness of control input and might mean the jumper is not getting the full potential out of the parachute at flare time. If the lines are too short, the canopy will always be in partial brakes and will be easy to flare past the stall point. Just moving the point where the toggle is tied to the steering line an inch up or down can make a big difference in your parachute's flare characteristics. If you have trouble slowing the parachute down on a calm day, chances are your toggles are too low. If your canopy rocks behind you on landing and is easy to stall, you may need to lengthen your steering lines.

Trim isn't always controlled by the manufacturer. Over time, lines stretch and wear. On higher performance canopies, an inch or two either way makes a big difference. Canopies need to have the lines replaced periodically as they come out of trim. Yet the same skydivers who would meticulously change oil or replace tires on their car may never think about how their canopy holds up over time.

Parachute Materials
The standard parachute nylon throughout the '80s and early '90s was F-111, after the designation given to it by the mill that produces it. Lately coated fabrics, commonly referred to as "zero-p" fabrics, are taking over the market. F-111 is less expensive and easier to work than zero porosity fabrics, which means parachutes of this material are cheaper. They are also easier to pack because air escapes from this fabric more easily than from zero-p. However, they wear out sooner. An F-111 canopy is at its prime for about 300 jumps, will work well for another 300, and will have lost a lot (20% or more) of its original performance by the time it reaches the last 300. Few F-111 canopies are any good after 1,000 jumps.

Zero porosity fabric is more expensive and harder to work with than F-111, so canopies made from it are more expensive. However, the expense is offset by several advantages. Zero-p canopies hold their shape better

and less air passes through the fabric, giving them better flight characteristics than a similar canopy built of F-111. They also last much longer, and zero-p canopies may still fly well after 1,000 jumps. They have the disadvantage of being more difficult to pack - until you get used to them, which only takes a couple dozen pack jobs.

Some canopies combine the two fabric types for the best of both. These seem to work well.

Canopy Material	***Advantages***	***Disadvantages***
F-111:	*Cheap*	*Easy to Pack* *Less Aerodynamically Efficient* *Good for only 600 - 700 jumps*
Zero-P:	*More Aerodynamically Efficient* *More Durable*	*More Expensive* *Harder to Pack*

Parachute Lines

There are two basic types of parachute line, regular dacron line (the thick type) and microline or spectra (the thin type.) Microline is more expensive than dacron, adding to the cost of the parachute. However, since it is significantly smaller, it reduces drag, giving perhaps a 5% performance increase over a canopy equipped with regular line. Microline is very strong and does not stretch much when weight is applied, as dacron lines do. This means that it tends to cause harder opening shocks. It may also shrink unevenly over time, causing a canopy to get out of trim. Some people find it slightly harder to handle and stow, and it is inappropriate for canopy relative work.

Line Material	***Advantages***	***Disadvantages***
Dacron:	*Easy to pack* *Soft Openings*	*Bulky* *More drag*
Microline:	*Low drag* *Small pack volume*	*More expensive* *Harder openings*

Other Modifications

Most skydiving equipment comes in a fairly stock configuration, but there are a number of small modifications you can make to the risers and canopy to improve flight characteristics. Not all of them are useful for everyone, but by customizing your gear you can get as much as a fifteen percent performance increase. Enhancements come in two forms; those that reduce drag and those that improve handling.

Reducing parasite drag has obvious benefits because by increasing speed you increase the lift your canopy produces without adding any weight to the system. The most common ways to do this are removable sliders, collapsible pilot chutes, and riser modifications. All of these are fairly simple modifications you can usually order from a dealer or have made for you by a capable rigger. But since they do require a little knowledge to use safely, be sure to get advice and instruction from someone familiar with the modification.

Slider Modifications

A slider is essential to deployment but serves no purpose once the canopy is open. From there on, it is just a burden to the canopy. If you think the drag is negligible, drive down the road at 25 mph holding your slider open. Getting rid of the slider provides another benefit by letting the canopy spread out more towards its original ideal design shape, reducing some of the anhedral of the parachute and giving a slightly flatter flight. Removing the slider not only increases a canopy's performance, it confers aesthetic benefits too by eliminating a lot of noise and greatly improving the view.

There are a number of ways people have dealt with the slider. Each has pros and cons. On every system, the biggest con is that you have to deal with your slider after opening. Remember that stowing your slider is not nearly as important as managing your flight - other traffic and the spot - so never mess around with your slider until you have a safe path back to the dz picked out!

The most common way to eliminate the slider is to pull it down and stow it under your chin or under a velcro strap on the neck of your jumpsuit. The good part of this method is that it is a very simple system in that it does not add significant time to packing and can't be screwed up at packing time. However, it doesn't work if you have thick risers instead of mini risers. If you pull it under your chin, it can blow loose and block your vision. If you wrap somebody or induce a malfunction after stowing it behind your neck, when you cut away your canopy might stay with you! Both the latter cons have occurred with disastrous results. Finally, do not put bigger grommets on your slider to ease the pull down unless you put correspondingly big stops on your canopy's

stabilizers or you will get an exciting malfunction!

Fairly common is to leave the slider in place but collapse it with a drawstring. Actually, all this does is silence it a little and reduce some drag, so although this is the simplest possible solution to the slider, it is also the least effective.

Splitting the slider is common with accuracy canopies because it allows the canopy to spread out, it works with big risers and is fairly simple to use. This method is fine for slow canopies because the slight drag from the split slider isn't as much of a factor on an accuracy canopy - they have drag all over them anyway. Aesthetically, split sliders are rather ugly.

Removing the slider altogether is the final option. Removable sliders use a loop and pin system, kind of like a tiny toggle stow, that holds the grommets onto the fabric. To remove the slider you grab a loop in the middle of the slider where lanyards from the four corners come together. A quick tug and the fabric is loose in your hand. You then have to stow the slider in your jumpsuit or some other place where you won't loose it. The grommets of the slider remain at the top of the risers. Before packing you re-attach the slider, which adds a minute or two to the packing process. Because you definitely do not want to hook it up wrong, it is important to pay attention to the re-attachment.

Collapsible Pilot Chutes
Collapsible pilot chutes are another easy after market feature to add to your parachute. There are two types. Bungee collapsed pilot chutes are simple in that they do not need to be "cocked" to work, as kill line collapsibles do. Their disadvantage is that if the bungee is worn out or when deploying at slow air speeds, they can fail to inflate and cause a pilot chute in tow. Kill line types are the opposite - they work well in most deployment conditions, but if they aren't cocked before packing, you get a pilot chute in tow. As long as you understand and properly maintain the type you have, there should be no problems.

Both types have a somewhat bulkier, stiffer bridle than non-collapsible types. This may increase the probability of tying a knot in the pilot chute as it is inserted in the pocket. I have seen this problem several times and there seems to be a high correlation with collapsible pilot chutes, so be very careful about the packing technique you use.

Riser Modifications
Being able to steer with your front risers adds considerably to your piloting options, yet a stock riser can be hard to grip. Furthermore, as you turn the tension on the riser increases with the weight increase induced by centrifugal force. Therefore, most advanced canopy pilots have some kind of hand hold added to their risers. These usually come in the form of loops or blocks.

Front riser loops are loops of webbing sewn to the riser. Blocks are a stiffener of some kind, usually folded webbing or a metal ring, that is placed just below where your hand grabs the riser. The block keeps the riser from sliding through your hand when you pull on the riser. The advantage to loops is that they have little bulk and won't catch on anything during deployment. However, you have to actually get your hand in and out of them. Blocks are simpler: you just grab the riser and close your hand around it. Open your hand, and you are free of the riser. For this reason canopy relative workers have a preference for blocks, as do many advanced canopy pilots.

Some pilots of small, high aspect ratio canopies have three risers instead of two. The third riser is for the steering line. This modification, like a removable slider, allows the canopy to flatten out, improving the shape and therefore the performance. The fact that third risers are uncommon may indicate that the increased performance may not be worth the increased complexity.

A final modification seen on a few canopies is trim tabs. These allow the pilot to mechanically lock in a certain amount of front riser trim. Trim tabs were fairly common on CRW canopies in the early and mid 80's but are now rarely seen. They add some bulk to the riser but are only occasionally of any use.

Chapter Three: ENVIRONMENT

Weather
The environment in which you fly your parachute includes a large number of variables, any one of which can contribute to an accident. Let's look at some of the many things that affect your canopy.

Turbulence
Turbulence can be described as a disturbance in the air. Several things can cause turbulence that can affect

a canopy in flight. Among them are wind, heat and wake turbulence.

Wind over an uneven surface or a temperature gradient creates turbulence. The amount of turbulence increases geometrically with the wind speed. In other words, a building that creates negligible turbulence in a 10 mile an hour wind can create extremely dangerous turbulence in a 20 mile an hour wind. Turbulence extends far downwind of an obstacle. Visualize the wind as flowing water. A line of trees or a long building will have a definite downward wave behind it. A single obstacle such as a building will have both sideways and downward turbulence. For a graphic demonstration, stand behind a large building on a windy day and note which way the wind currents are where you stand. Odds are they will be quite different from the general wind direction.

Dust devils are caused when a small area of air is heated above the temperature of the surrounding air. These miniature tornadoes create severe turbulence in an area up to a hundred or more yards wide. They can easily collapse all or part of a canopy. They can also cause downwind landings, either by causing a false reading on wind indicators or by changing the wind direction in their immediate area.

Wake turbulence is a common cause of hard landings in a crowded landing zone. A canopy's passage through the air leaves a wake similar to the one behind a boat. The wake has two characteristics. One is general turbulence directly behind a canopy that can drastically increase the descent rate of a parachute flying through it. This occurs because the "bumpy" air reduces the lifting force of the canopy by disturbing the airflow over the wing. The other wake turbulence is from "tip vortices," which spiral out from the edges of the canopy. These occur because air tries to move from the high pressure bottom skin to the low pressure top skin. It takes the path of least resistance, which is towards the sides of the canopy. As it spills off the end cells it creates a circular wake trailing behind each wing tip - just imagine the V shaped wave behind a power boat. These are essentially miniature dust devils and can easily collapse an end cell or two. Both types of wake turbulence extend well behind the canopy - as much as fifty feet or more - before becoming insignificant. An interesting exercise is to open high with a friend and intentionally fly through their canopy wake to get an idea of how your parachute handles turbulence.

Last but not least, don't land behind the airplanes when the engines are running!

Density altitude
Thin air reduces a wing's performance. Two things cause air pressure to drop: heat and altitude. Therefore, you can expect that a canopy that performs well at sea level on a cool day will fly significantly worse at high altitude on a hot day. As a rule of thumb, count on a 3 to 4 percent performance loss for each 1,000 foot elevation gain or each 10 degrees temperature increase. Using this rule of thumb, a parachute taken from sea level to a 3,000 foot high dz would lose about 10% of its efficiency if the temperature remained constant. Or, jumped at the same sea level dz on a 70 degree day and a 100 degree day it would show a comparable change in performance. Humidity also decreases performance slightly.

Traffic
At a large drop zone it is not uncommon for twenty or more skydivers to share the landing area. As more and more of these jumpers use fast canopies, traffic becomes a real hazard. We all know that auto traffic follows certain universal guidelines to minimize collisions. The same is true of aircraft and boats, and even in the freefall portion of skydiving. Yet for some reason, skydivers have been reluctant to adopt standard traffic patterns under canopy even though this simple idea could prevent several injuries and fatalities annually. By following some simple guidelines, you can be a good citizen in the skydiving community, minimizing risk to yourself and others while still having fun.

Break-off and Deployment
Traffic management actually begins at the dirt dive. Be sure you plan a break off altitude that will allow plenty of time to get away from others and still be open by at least 2,000 feet. USPA's Basic Safety Requirements specify container opening by 2,500 feet for intermediate level jumpers (A and B license) and 2,000 feet for advanced jumpers (C and D license.) The custom for many years has been to break off at 3,500 for small RW groups and USPA recommends 4,000 feet for groups of six or more. But in the modern canopy environment, we should reconsider these numbers. The advent of "fast" canopies has had two effects on the break off and deployment section of the skydive. One is the issue of how much separation from other canopies is enough. The other is how much time a jumper might want to deal with a malfunction on a modern canopy.

At Skydive Arizona, canopy collisions at the deployment phase cause one third of fatalities - more than any other type of accident. To minimize risk skydivers need to minimize the causes of these collisions: off heading openings and inadequate separation. In an ideal world where canopies would always open on heading it would suffice for everyone to turn away from the center and deploy. We'll discuss controlling the openings later, but

right now, let's talk about the real world of canopies that occasionally open off heading. That's when adequate separation becomes essential.

How much separation is enough? Typical modern canopies fly forward at about 35 feet per second while the brakes are still set in deployment configuration. When facing another canopy as a result of off heading openings the closing speed can be up to 70 feet per second. With brakes off, it is more like 90 feet per second. Given that it will take about three seconds to recognize the emergency and begin appropriate action, deploying within 200 feet of another skydiver is very hazardous. A good skydiver can attain speeds of 80 to 90 feet per second in a track - but it takes time to turn, build up speed and then wave off and slow down the track. To turn 180 from the formation, begin a track, sustain a good track for at least three seconds, and then wave off is the work of at least eight seconds - 1,500 feet of altitude at the minimum. That means that if you want to initiate deployment at or above 2,500 feet, you need to break off at or above 4,000 feet. More tracking time means a higher break off.

Although details on tracking skills fall outside the scope of a treatise on canopy control the collisions that might result from poor break offs are part of the subject. Learn how to "flat track" from an experienced RW jumper - just watch the break offs from the ground and you will be able to figure out who has mastered the technique. But there is much more to separation than how effectively you can track. An important thing to keep in mind is that the fundamental goal of break off is to deploy your parachute in clear airspace - not necessarily the same as being able to track fast and far.

For example, if two skydivers find themselves tracking in roughly the same direction at 4,000 feet, they have a traffic problem. If both continue to track, at 2,000 feet they will have the same traffic problem and no altitude in which to fix it. In this situation, the higher (or further behind) skydiver should wave off and deploy as soon as he knows there is no one above, behind, or deploying to the side. Similarly, it makes sense to have one person pull in place (customarily the video man, if there is one) while the others track away from the center person.

Separation is one way to minimize the risk of collisions. Controlling the deployment is another. Most off heading openings, line twists or snivels are caused by either packing or body position. Be sure to pack as symmetrically as possible. Since this discussion is on canopy flight, not packing, you will need to get this information elsewhere. BASE jumpers and canopy formation enthusiasts are good sources for packing tips that will contribute to on heading openings.

Body position is as crucial as packing technique. To understand this, next time you are under canopy raise your right knee as high as you can and twist your shoulders to the left. You should notice a left turn (assuming your canopy flies straight in normal flight!) The turn will be more pronounced on higher performance canopies. Now imagine how much more air is affecting your canopy during the deployment phase, when you have considerably more speed. Having a shoulder down (looking behind is a common cause) can result in off heading openings or line twists. To prevent this, as you track away clear the air to the front, sides and below. Looking behind is largely a waste of time and awareness. Your job is to ensure no one is deploying below you.

When the time comes to deploy, wave off and throw your pilot chute. As you do so, pick a point on the horizon straight ahead. When the canopy deploys, it may have an inclination to turn right or left. Concentrate on holding your shoulders square and towards your heading point. If the canopy turns right, twist your shoulders back towards the heading. As the canopy fully inflates, grab risers or toggles and steer towards your heading. Turning back onto the heading will keep you flying away from others until you have a chance to ensure the space around you is clear.

Traffic management under canopy

Once under canopy, immediately clear your airspace. This means checking for potential collisions before you do anything else. Releasing brakes, stowing sliders and heading for home are all secondary to collision avoidance. If you are faced with a collision, the general rule is to turn right. Practice using front and rear risers for this. Front risers will cause sink, rear risers cause float. Altering descent as well as direction should be practiced until it becomes second nature.

As you head for the dz, there are a couple things you need to check as soon as you have cleared your air and have your canopy in hand. Is anyone under their reserve? If so, go to their aid by following them or their equipment - the main and free bag. Ideally someone will follow each item to ensure recovery. This is your duty to all fellow parachutists, whether you know them or not. Sooner or later you will be under your reserve, watching your main canopy drift away from the dz at sunset. When it happens, you will be glad to have some company.

Assuming all is well your next task is to obtain as much vertical separation from the other skydivers as you can, assess the spot and choose your landing areas. We'll hold off discussion of bad spots until later, while we continue to look at traffic. Assuming you can make it back to the intended landing area, while you are flying along take stock of the other canopies. With practice you will be able to recognize the types, speeds and altitudes of other canopies. Compare them to your own and begin the process of vertical sorting. Low canopies with high descent rates should maintain a fast descent rate to increase separation from higher canopies, while higher canopies should slow their descent.

Regardless of design specifics a typical modern canopy will have a broad range of descent speeds. In full glide most canopies will descend at 1,000 to 1,500 feet per minute. The same canopy in one half to two thirds brakes will descend at 600 to 900 feet per minute. In a turn, it can easily reach descent rates of 2,000 feet per minute. Therefore, most canopies have a range of descent rates of at least 1,500 feet per minute. By taking advantage of this a wise canopy pilot can ensure that of the twenty people he was on the plane with only two or three will be landing at the same time he is. A helpful hint: most people are better at sinking than floating. Learn how to slow your descent rate and you can have the landing area to yourself. The added advantage is that you get to watch everyone else land, giving you extra information about ground winds.

Final Approach
Eventually it will be time to enter the landing pattern. Like the break-off, this is a very dangerous part of the skydive. A good approach is more than aesthetically pleasing - it can be the difference between life and death. What makes for a good traffic pattern? Whether your style is aggressive or conservative, an elegant landing is characterized by these features.
The initial approach is easily understood by other canopy pilots in the air.
The turn on to final approach does not intersect the flight path of other canopies.
The entire approach and landing is done in such a way that it does not cross a straight ahead, conservative approach to the center of the landing area.
The approach is not directly over or next to any bystanders.

Most landing areas will have some buildings, roads, fences or other obstacles that affect the pattern. With airplanes, the convention is to use a left hand pattern - one that uses only left turns onto the different legs of the approach. That makes sense because the pilot sits on the left of the plane and has better visibility that way. With parachutes the situation is different. Some drop zones like a left hand pattern so everyone does the same thing. Some allow either left or right patterns to allow skydivers of different experience levels to split up the landing area and control what obstacles they will have to fly over.

Canopy and pilot types also affect the pattern. Generally I find they can be broken down into two classes: conservative approaches used by novices or other people inclined towards caution, and aggressive approaches used by skydivers with high performance canopies. Since these types may be about equal in numbers, the vertical separation mentioned earlier is critical. Even so, we can expect a few of each category to be landing simultaneously. How do we keep the two incompatible styles safe?

Let's use Skydive Arizona as an example. We allow skydivers to choose either a left or right pattern. Our primary landing area is about 80 meters wide from north to south. On a day when landings are to the west, people using left hand patterns should approach over the buildings and land within 20 meters of the fence. By local custom this pattern is reserved for fast canopies and experienced pilots. They have the skill to land near obstacles, and it keeps them out of the rest of the landing area. People using right hand patterns should land well to the north of the gravel target in the center, leaving that area free for people using a straight in approach.

The less experienced jumpers stay out over open desert and land further away from the fence. Their main concern is to avoid overshooting the landing area and ending up on the asphalt taxi way. But imagine the wind shifting to either the north or the south. Now a new set of problems arises - the danger of undershooting or overshooting the landing area.

In general, overshooting is a problem on calm days; undershooting, windy days. Instead of thinking of landing on a circular target, imagine a runway. Depending on your skill level and canopy type, always give yourself a long enough runway so that whether you land long or short you will not be faced with hitting obstacles or people. Sometimes that will mean picking an alternate landing area with a little more room, since on a calm day most modern canopies need at least a one hundred yard runway to be safe. The dart board style idea of a landing area has become obsolete - always think of a runway!

Finally, we need to consider the combination of traffic and obstacles. Look at our sample landing area again. Let's say the wind is out of the west and you are approaching along the fence. If a canopy on a more southwesterly heading lands in front of you, you have no place to go. Choices are collide with the canopy,

collide with the fence, or do a sharp right turn out into any other traffic, with the hazards of wake turbulence and low turns thrown in. Many canopy pilots develop the habit of thinking of a certain area is "theirs." If you find someone in "your" airspace, what will you do? Learn to maintain a flexible approach!

Low speed approaches have their own set of problems. Using deep brakes or "S" turns in a crowded landing area is as dangerous as "hook" turns. Do not employ student flying techniques in an area for advanced jumpers.

Regardless of your personal style, the etiquette is:

> *Low man (including people on the ground) has the right of way, as do students and tandems.*
> *Never use an approach that will force traffic behind you to use evasive action or fly through your wake.*
> *Don't intentionally land crosswind or downwind: This not only presents a huge traffic hazard, but leads everyone still in the air into a state of confusion.*

Any discussion of landing areas needs to address so called "hook" turns. I dislike this term; to me a hook turn is a low toggle turn, not necessarily intentional, that shows a lack of planning or respect for the surroundings. High performance landings are another thing altogether. It is acceptable to blend the turns onto crosswind and final into a single, smooth, carving 180 if it is "round" enough to allow you to alter it in the event of traffic conflict and is intelligible to others as a transition through the customary downwind, crosswind and final approach. A detailed discussion of good high performance technique will follow in the chapter on flying skills.

Just as there are some things that define exemplary landings, there are some that define unacceptable technique. Some common approach errors that are rude or dangerous are:

1) *Downwind approaches over the center of the landing area. In this situation, no one in the air knows which way you intend to turn. For all practical purposes you are obstructing the entire landing area. In addition, you are putting yourself in a situation with no escape routes - if traffic eliminates your intended turn you will be forced to land downwind or execute your turn too low. Therefore, all downwind legs of the approach must avoid flying over the center of the landing area.*
2) *Sudden, "snap" turns, especially more than 90 degrees. These turns have several problems. From the standpoint of other traffic, they do not allow you a good view of where you will be going and greatly increase the possibility of a collision. They are also confusing to other canopy pilots.*
3) *Approaches that may cause you to land crosswind/cross traffic Due to traffic, obstacles, turning too low, or other factors.*
4) *Approaches that cross through some or all of the normal straight in approach pattern. Imagine a line along the wind through the center of the target. No approach should cross this line. If you use a left hand approach, finish on the left side of the line. If you use a right hand approach, stay on the right side of the line.*
5) *Final approaches that put the pilot over or next to bystanders. Always remember that many skydivers have poor hearing and may not know where you are if they don't see you. Whuffos have no idea where parachutes will go. Never assume they will stay in place - or move - if you need them to. While striking people on the ground is rare, it should be considered as reprehensible as a motorist striking a pedestrian.*

The final aspect of controlling the landing area takes place after you land. Collapse your canopy quickly so no one will hit it. Leave the area promptly; you can discuss the dive somewhere other than an active landing area. In particular avoid the area downwind of obvious landing spots such as the pea gravel. This is where incoming canopies will tend to concentrate. If you are in the pea gravel assume someone is right behind you and clear the area at once. As you depart the landing area, scan constantly for incoming canopies: never assume they see you or that they are in control.

Chapter Four: GETTING THE MOST OUT OF YOUR CANOPY

If you watch a busy landing area for a while, it becomes obvious that some skydivers are masters of their canopy. They land gracefully and safely where they want to, every time. It looks effortless. Others do well sometimes, but often seem to be on the verge of losing control. Still others are clearly either novices or intimidated by their canopy - their landings lack precision and grace. And the parachutes aren't the deciding factor. Look closely; some of the best landings will be on older, well worn canopies, while the finest new equipment can be dangerous in the wrong hands.

The difference is in the pilots. The good ones have an intuitive understanding of aerodynamics and the experience to completely control their environment. And over the years, experimentation has taught them some

practical techniques to get the most from their parachutes.

The Spot and the Winds

In the previous chapter we looked at the problem of airspace management without taking the spot into consideration. If you are jumping from a large airplane, or from a small one with a bad spotter, your opening point may be less than ideal. But there is a lot you can do about this under canopy. By learning a few tricks about canopy flight, you can optimize early in the ride where, when, and how you will land.

First of all, keep in mind that altitude is your friend. The more altitude you have, the more options you have. This is another good reason not to pull low. Under an open canopy at 2,500 feet you have forty percent more options than someone in the same spot open at 1,500. This means more time to acquire vertical canopy separation, more time to assess the wind conditions, and if necessary, more alternate landing areas to pick from.

Your first priority after a successful deployment is to avoid collisions. Once that is done, determine where you are and head for the dz. You will already have this information if you checked the spot during exit or freefall; now you need to decide what to do with the knowledge. Incidentally, I often see people land out because once they were open they stowed their slider, removed booties, or did some other trivial task while flying away from the dz! These things can be done just as easily flying towards the landing area instead of away from it.

Depending on the circumstances you will be in a perfect spot (which we won't consider here) or one of three variations of a not so perfect one: long, short, or off the wind line. In each of these cases there are certain strategies that will help you out. And in all of them your best plan will be influenced by the amount of ambient wind. On a no wind day the plan is the same regardless of position: for the greatest range, trim your canopy for distance. Most parachutes fly flatter, and just as fast, if you hold in a couple inches of rear risers or about one third brakes.

Optimizing Glide

Finding your best glide position takes a little work. A variometer and airspeed indicator designed for hang gliding is ideal, but observation works too. Try flying next to a similar canopy and applying brakes or rear riser trim to flatten your glide. You will notice that you can flatten the glide quite a bit before you loose much forward speed. Another trick that you can use by yourself and which will come in handy often is to learn to visualize your glide. To do this, watch the ground ahead of you. Looking at a point far ahead, you will notice that point will appear to rise relative to you. That means you will land short of the point. Look just a little ahead - the point will sink relative to you, since you will pass it in flight. Somewhere between will be a point that doesn't move - where you will land if nothing changes. (Illustration maybe including into wind and downwind variations.)

With practice, you will be able identify this point quickly. Once you can do so, whether you are facing into the wind or running with it, you can check and see what your best glide is. Generally, when facing into a strong wind you want a steep angle of descent for the greatest forward speed and the least amount of time at the wind's mercy. Full drive (toggles all the way up) will produce the best results when you are trying to penetrate into a strong wind. Front riser input is even better, but few people have the strength to hold down their risers for long.

If you are upwind and have a little breeze to work with, the reverse will be true. In this situation, apply brakes to get your slowest descent rate. Most modern canopies reach their slowest descent in about 50% brakes. You might loose some air speed, but you will gain distance. Why? Let's say your canopy descends at 1,200 feet a minute in full drive but only 800 feet a minute in half brakes. If you are open at 2,400 feet, that means a two minute ride in full drive but three minutes in half brakes. Now, say the canopy will fly 30 miles per hour in full drive, 20 in half brakes. Add a ten mile an hour wind and your ground speed will be 40 and 30 miles per hour, respectively. In two minutes at 40 mph you will cover about 7,200 horizontal feet. In three minutes at 30 miles per hour, you will cover about 8,100 horizontal feet - quite a gain! Therefore, whenever you are spotted long upwind, you are better off using some amount of brakes. How much will depend on the particular canopy, winds and spot.

Spots that are off the wind line are also common. In this situation, don't fly directly towards the dz. If you do so, your canopy flight will take the shape of an arc across the ground as the wind pushes you sideways while you fly forward, constantly changing heading to stay pointed at the target. Instead, take an angle that points upwind of the landing area and again watch your path over the ground. If your ground path is a straight line to the landing area, you are doing fine. If it is curving ahead of you, you are crabbing too much. If the curve sags behind you, you aren't crabbing enough.

Landing Out

Sometimes the spot is so bad all the piloting technique in the world can't salvage it. Landing out is a fact of life. It is also a common factor in landing injuries: an out landing may involve a tight landing zone, no wind indicators, unforeseen hazards, or all of the above. If there is any possibility of landing out, start making your plans up high! In fact, the time to plan for an out landing is before you get in the plane. It is always a good idea to note the prevailing wind direction and speed. Most drop zones will be able to provide an aerial photo showing hazards, good alternate landing areas, hostile neighbors, etc.

If you are landing out and forgot to check the winds earlier, start looking for indicators. Distant fires or dust can help. In areas with lots of foliage, you can sometimes tell by observing grass or trees. If some people are making it back to the dz, watch them: they will be close enough to see the wind sock. You can also look for cloud shadows on the ground. For that matter, your own shadow is a good indicator of ground speed, if you can locate it while high enough for the information to be of any use.

Even if you can't determine wind direction, remember that a crosswind or downwind landing is still much safer than landing in a turn. In fact, one of the more common causes of so called "hook turn" injuries is from unintentional low turns. The scenario is simple: running downwind from a long spot, the pilot doesn't realize until too low they are flying downwind. Then they try to turn into the wind without enough altitude. Most canopies need at least two hundred feet to complete a fast toggle 180 degree turn with a safety margin to spare. Practice turning in half brakes for just this eventuality. A turn in brakes doesn't use nearly as much altitude as a full toggle turn.

Regardless of where you land, you will have a choice of how you approach - either a left or a right hand pattern. Always pick the one that flies over the fewest obstacles and offers the most alternatives. That way, if the wind is stronger than you expected you still have some options.

Common Landing Problems and Their Solutions

Before we look at specific landing problems, here is some general advice. If you have trouble landing your canopy, or you are relatively inexperienced and planning on buying a canopy, have someone your size and weight who really knows what they are doing jump it. They can give you a good idea if the problem is your technique or if it lies in the canopy itself. I also highly recommend video. The common piloting problems discussed below are easily eliminated by one or two video reviews, provided the coach is competent.

Depth perception
We'll get this out of the way at once, since I believe it is the least common problem. Detailed and useful depth perception doesn't occur until we are within fifteen or twenty feet of an object, and in parachute flying this is when we already need to be acting. Furthermore, for novice jumpers there is a timing problem. When your brain finally says "I'm about 15 feet up" it starts an equation based on what would happen if you jump off an object and accelerate constantly till impact OR one based on a steady state descent like the one you are in. It isn't programmed yet for the deceleration you experience as you flare. So depending on your eyes and brain, you might flare high or not flare until too late. This is compounded if there are confusing conditions: twilight, very flat surfaces such as concrete or astroturf, unusual lighting, tilted surfaces (hillsides), unusual vision (jumping without your usual prescription eyewear), and other eye/brain variables. The only solution I know is experience. Have someone who is real good call the flare for you on several jumps, but only if you are not already flaring correctly. See the other problems below before you put all the blame on depth perception. Usually your brain figures out the depth thing after at most a dozen jumps. Therefore, if you still have trouble flaring it's more likely a technique or equipment problem.

Flaring too high or too low
This is a very common mistake and the way most schools teach a flare only makes it worse. Instructors commonly teach students to make a single flare motion, knowing that a two stage flare is a bit complicated for a first jumper. And since they don't want the student to flare high, they often tell them to flare fast and low. You can get away with this on huge canopies, but it will hurt you when you transition to something requiring more finesse. Flaring is like applying the brakes on a car. It doesn't need to be done all at once, at the last possible moment.

[DIAGRAM UNDER CONSTRUCTION]
Connect the x's from left to right to complete this diagram of what a canopy does in a good flare. The numbers above the line indicate horizontal speed, and the ones below are vertical speed. This is an example only; student canopies fly slower, low aspect ratio and slow canopies have a shorter flat spot in the flare.

This picture is about what a seven cell at 1 to 1 wing loading would do. Many nine cell canopies have a much longer flat spot in the middle. The faster the canopy goes the longer the flat spot in space, though not

necessarily in time. From full glide to about a third to half brakes should take a second or two. Then there is a pause as the canopy remains flat and bleeds off speed. Finally, to keep the descent rate slow continue to apply brakes as needed, keeping the angle of attack up and increasing the "flaps" effect for a better slow speed foil (increased camber). Going from full glide to full brakes as fast as possible cuts out the entire middle half of the flare - one second you're flying fine, the next you are at the edge of a stall as airflow separates from the canopy surface. That's why a very fast flare doesn't work well. The canopy needs a smooth transition to flare effectively.

To pick your flare timing imagine a calm day. Put a sheet of blank paper across the drawing to represent the ground. You can easily see that you would rather land towards the end of the flare, where you have the lowest overall speed - a little down, a little forward. Flare too high (move the paper down) and you have a lot of vertical speed. Flare too low (move the paper up) and you have a lot of horizontal speed. Now imagine a day with a ten mile per hour breeze. Move the "ground" up to the optimal point, which is in early part of the second half of the flare - still some forward speed, very little down. This is why 5 to 10 mph days produce the best landings - you have a long sweet spot. But flare too high, and you will be backing up and descending fast. Don't flare enough, or too low, and even though your forward speed is low you still have a lot of downward speed. That's why even on a windy day you need to flare in order to eliminate the downward component. But the windier it gets, the lower you can flare because you only need the first part, the part that flattens you out, not the one that slows you down.

Hopefully this will show why on windy days the common mistake is to flare too high (the other is to undershoot the target, but accuracy is another topic.) On calm days, people tend to flare too low and overshoot. Perhaps this is because our habits aren't based on living in a fluid environment that varies not just day to day but hour to hour. Sailors, kayakers and pilots are used to the idea of life in a fluid and tend to pick this up quickly. People who have led very static lives have a tough time. The bottom line is that you don't need to learn just one flare, you need to learn half a dozen to cover the basic variations in conditions. To do this, you need to combine experience with an understanding of how a parachute flies.

Too much input
This problem occurs when you are indecisive about flare altitude. As a rule "the more you do with your toggles, the harder you land!" Up and down toggle motions cause you to oscillate below the parachute, making it alternately dive and float. This will also reduce lift since airflow is being disrupted. The net result is an increase in descent rate. Your flight path varies constantly, making the situation even more confusing. You land hard. The only way to fix this is to be decisive. If you flare high, stop. Hold what you have, then finish the flare at the appropriate time. This means if you are in half brakes, don't apply the second half at normal flare height, but somewhat lower - say, waist to head high. Finally, it is easier to speed up a flare than slow it down, so when in doubt, maybe wait an extra second.

Asymmetrical or incomplete flare
There are two manifestations of this problem. The first is that the flare stops at about elbow height. Toggle pressure increases as you go down, so the first half is easy but the last requires quite a bit more strength. No problem on a breezy day, but if you come in hot on calm days it may be that you aren't flaring all the way.

The second manifestation is when one hand comes down further than the other. There are two causes. One is having a weak side, and the other is landing crosswind. Fix the first by shifting your beer cans to the left hand (or whichever is the weak side) when discussing your latest crash and burn after jumping is over. You can also develop the habit of turning with your weak side when you are flying around, to get it more used to the toggle feel.

The crosswind is more subtle. Crosswind landings are actually quite easy, but as you flare you need to keep the canopy flying straight, which means a little extra toggle on the upwind side. Like any technique, this can be practiced. But be aware that you should only practice crosswind landings where it won't confuse others in the pattern. You should be the only one landing when you are working on crosswind technique. Naturally, start with a light breeze rather than a strong wind! The main thing to remember is to look where you want to go, not where you are actually going. By doing so you will automatically keep the canopy flying straight and level.

Whether the asymmetrical flare is caused by a weak side or a crosswind, the effect is the same. As the pilot perceives drift to one side, they usually look down where they are going. This turns the canopy even more that way as the hand on the low side comes down and the shoulders rotate that direction. Often the pilot instinctively reaches out for the fall, making it worse - especially if the other hand is forgotten and comes up, a common action. The moral of the story is always look where you want to go, not where you are going. If the canopy is veering left, look straight and compensate with right toggle.

Mechanical problems
A surprising number of canopies come from the factory unevenly built or poorly tuned. Even more slip out of perfect tune after a few hundred jumps. If your canopy has a built in turn, it probably won't flare too well either. Bad line trim can be just an inch of variation, and it takes a good rigger to find this.

Most factory brake settings are wrong. They are built for the average hypothetical perfect wing loading, with no regard to long or short arms, harness configuration, riser length, actual wing loading and other variables. Generally speaking a canopy will have the factory brake mark about three to five inches too low (done so a heavy guy with real long arms can't stall it easily) which means that the last half of the flare can't be completed. While one or two inches of toggle setting might not seem like much, it is very noticeable when landing on a calm day. Therefore, if you routinely come in too fast on calm days this may be your problem. Experiment first with gripping above the toggle to take out a couple inches of line, then with a wrap around your hands. Once you find a setting that gives you a good flare, move the toggles to that point. Be sure to get a rigger or other knowledgeable person to check the toggle attachment. Having a toggle come loose can be a serious emergency, especially if it happens at flare time!

Some people will tell you that if you move your toggles up too far, you reduce the forward speed of the canopy because it is constantly in slight brakes. You also make it fly less well in front risers due to deformation of the foil. But don't worry too much about this. If you get a better flare and don't fly in risers much anyway, what do you care? We are talking good landings, not the CRW nationals, so use what works for you.

Many canopies are just plain dogs, either because of old design and construction or because of wear. F-111 canopies become very permeable and zero-p parachutes lose their line trim. Don't buy old (over 500 jumps) canopies unless you can't afford anything else. If you are in this economic situation, get one bigger than you would if it was new. Generally, don't assume that your landing problem is pilot error if you are under an old canopy. Check for trim problems and toggle setting. And if you are considering buying a used canopy, get a good pilot of your weight to evaluate it first. Old canopies have a very small zone of forgiveness. If you are looking at one of these, think about what will happen if you step out of that zone. Given the choice, would you prefer to spend money on good gear or medical bills?

Inappropriate transition
If the canopy you are transitioning to is just too different from the one you are used to, you will have trouble figuring it out. That's why a 120-pound jumper who learns on a Manta might have trouble on a PD 170. The canopy size may be appropriate, but the difference in flight may be too great. Similarly, if you are used to nine cell canopies, going to the short flare and steeper glide of a seven cell can be a bit of a surprise.

Conditions
Wake turbulence or obstacle generated turbulence can suck you into the ground hard. Chase someone's canopy up high to get a feel for turbulence, but avoid it down low. Density altitude can also deprive you of performance. A rule of thumb is that you lose about three to four percent of performance for every 10 degrees over 70 and/or every thousand feet of elevation. You just don't notice the loss until faced with a stable reference such as the ground.

Terrain
When landing on a slope, unless there is a lot of wind (10 plus) land across the hill, not up or down hill. It is a good idea to practice crosswind landings for just this sort of eventuality. However, be sure your crosswind training doesn't confuse or conflict with other traffic!

Finally, there are a couple things to do that will improve your performance even if you already land OK. Cross train: mountain bike, run cross country, ski, kayak, drive - anything involving movement and coordination in a rapidly changing environment. Exercise does a lot more than make you stronger; it makes you mentally more agile. The people who land really well seem to be fairly athletic, so maybe there is a connection. And obviously, if something isn't working, don't continue to make the same mistake. In several sports I've taught, people seem to intuitively know that repeating a correct action is good, but they don't always understand that repeating an incorrect action is bad. If you aren't happy with your landings, something is wrong. Something can be fixed. Do it!

CHAPTER 5: HIGH SPEED CANOPY FLYING

During the early nineties advances in materials, design and construction techniques allowed canopy manufacturers to produce a new generation of canopies with previously unheard of durability and speed. Initially these designs were used only by the most advanced skydivers, but in recent years they have become more common among average recreational jumpers. Speed and energy definitely enhance fun potential - but

they also greatly increase risk. Unfortunately flying technique, instruction and skydiving customs have not kept up with fast canopies and the sport is paying for it with a big increase in injuries and deaths in which these parachutes are a factor.

Two fundamental truths underlie the risks of fast canopies. One is that kinetic energy increases geometrically with speed. In other words, doubling speed results in a four fold increase in energy. The second is that speed is, essentially, the relationship of distance and time. Doubling speed cuts time or distance in half, leaving a pilot with less time and space in which to consider his options. The bottom line is that using a faster canopy leaves little room for error, while at the same time greatly increasing the penalty for mistakes.

That said, it should still be possible to fly fast parachutes safely. The key is in developing techniques that minimize traffic conflicts and the potential to collide with the ground, obstacles or spectators. Look back at the section in Chapter Three. The sections on obtaining vertical separation are particularly important to anyone planning high speed landings. By minimizing the number of people you share the landing with you minimize your hazards. Furthermore, study the regular jumpers for their tendencies. If you know the flying style of the people you share the sky with it becomes relatively easy to predict their behavior.

The next step is to control the landing area. By this I mean that while still high, you have identified all possible traffic, determined landing direction and considered obstacles and escape routes. I like to do a long crosswind approach since it allows a clear view of the intended landing area and if the crosswind is done over an open area, I can abort the approach to the primary landing area with ease. Never do "S turns" or spirals on the approach if you are sharing the air with other canopies because every turn you make increases the chance of a collision. Unless you are alone, the most predictable and safe pattern is the one airplane pilots use at every airport - downwind, ninety degree turn to crosswind, then ninety degree turn to final.

The Final Turn

Beginning with the first jump course every skydiver is drilled on the concept that a turn close to the ground is one of the leading causes of injury in our sport. Whether such a turn is intentional or not, contact with the ground before the canopy has resumed normal flight often results in serious injury or death. There are essentially two causes of these premature landings. One is an unintentional emergency maneuver, often to avoid a far lesser threat such as a downwind landing. The other is intentionally induced turns.

There is no doubt that the increased speed provided by a turn just prior to landing provides thrilling performance. Since many skydivers seek this particular thrill, they need to be extremely familiar with the effects of turns and the implications of poor judgment. However, even skydivers with no interest in so called "hook turns" still need to know what is involved in order to avoid the consequences of a panic turn. Many of the so-called "hook turn" injuries and fatalities are from unintentional turns. It is also important to distinguish, as we will below, between the out of control hook turn and a controlled high performance landing.

The only safe path to stylish landings is to work your way up slowly, know where to stop, and always be willing to abandon the high performance approach for a more conventional one. For this, of course, you need a canopy that gives this option! One should also recognize that performance is as much a function of piloting as of equipment. Instead of increasing the thrill of canopy flight by moving to a faster design, skydivers should strive to get the maximum performance out of their existing canopy and only move on after they have mastered all aspects of flight on a conservative canopy.

The entry level high performance approach is to use a normal, high toggle turn to put yourself on a straight ahead approach on final, at a comfortable height off the ground. Keeping your toggles securely around your hands, grab your front risers and pull them down about four inches. It will be just like a normal approach, but let the risers up slowly a few feet higher than you would usually flare. Then flare smoothly and slowly at your normal altitude. Initially you will probably initiate and end front riser input too high. Only four or five seconds are needed to reach top speed, so starting too high will wear you out but is otherwise harmless. Ending a little high doesn't do much good either, since your speed bleeds off rapidly. But the important point is that ending high doesn't hurt you either. Ending low will.

There are a few things to watch out for as you begin learning high performance approaches. One is that riser input definitely increases speed. It also increases forward penetration and once you drop the risers your canopy will tend to float. Expect to overshoot your target, so leave some outs! If you have to run out your landings on calm days, either you are flaring too low or your steering lines are out of tune - toggles too low on the lines. Fix this before trying the front riser approach. Finally, whether you choose riser blocks or dive loops, be sure your toggles remain securely in your hands when you grab or release the risers! This should be practiced up high to get the feel of it.

At this point in your progress it is a good idea to have an expert canopy pilot watch a few landings, perhaps with a video camera, and critique your technique. An experienced eye can tell you if you are using too much front riser, if your toggles need to be re-set, if you are flaring unevenly, and other important details.

Once you are to the point where you never under or over shoot your landing or have to alter your approach because of traffic not accounted for early enough, you may want to use a slight front riser turn onto your final approach. Be an honest judge of your performance: if you use variables such as changing winds, traffic, or other conditions to excuse a botched approach, you have not mastered the first two steps: traffic management and control of the landing area environment. Using excuses indicates an unwillingness to take responsibility for inexperience or poor judgment, a mental state that has no business in the world of high speed canopies. The increased speed created by high performance canopy flying is a great hazard to others in the landing area, and therefore carries a heavy weight of responsibility. Under a fast canopy there are no excuses!

Progress by making shallow front riser turns of about 30 to 45 degrees onto your final approach, then transition to both front risers until flare time. A turning front riser approach is a step beyond a straight approach, and probably the most commonly used high performance approach. As with a straight approach, a good front riser turn requires a smooth entry and exit from the maneuver. The initiation of the turn may be steep, but the second half should have a gradual reduction in front riser input. In this situation, the initial steep descent creates speed that is translated into lift as the parachute flattens out. The transition from riser input to toggles should be almost imperceptible.

If at any time you are having to use rapid, aggressive toggle movement to avoid hitting the ground, you are far too low in your turn. "Stabbing" the toggles down is a definite indication of poor control. The best landings involve both a gradual entry and exit from front risers, followed by a smooth, slow flare. A well landed canopy builds speed gradually and practically flares itself as front risers are smoothly released, leaving the pilot to slowly bring the toggles down to keep the canopy planing as it bleeds off speed. Not only does stabbing the toggles indicate the pilot was about to hit the ground hard, it deteriorates the overall landing. Why? Because toggles are also brakes. The less you use them, the further and faster you will be able to swoop. The longest, fastest canopy swoopers always use the least amount of toggle input!

Because of the lack of formal training for high performance landings, many skydivers have developed bad flying habits that put them in dangerous or inefficient situations without conferring any speed and performance benefits. For example, if too much front riser is pulled down, you deform the airfoil and reduce its efficiency. This will become obvious when you realize pulling the front risers down only affects the front area of the canopy. Seen from the side a canopy with too much front riser input appears to have a step in it, which means a perfectly good canopy has been deformed to the point where it no longer flies well. The classic manifestation of the trashed foil is a canopy that appears to be bucking, or lurching down a flight of stairs. In some situations (and only with some canopies!) this is actually useful, such as initial descent into a tight area like a clearing in the woods or a stadium. For landings, however, deep front risers need to be released early since they create lots of downward speed but not much lift.

Another common mistake in front riser approaches is to enter and exit the front riser maneuver suddenly. A sudden change of the surface configuration can disrupt the smoothness of the flow and cause a dramatic loss of lift! Suddenly dropping the front risers and then rapidly braking with toggles is a very inefficient way to flare, since both actions handicap the airfoil's lifting ability. Instead, a good front riser landing involves a gentle entry into front risers (never let go of your toggles!) that gradually steepens until the canopy achieves its fastest speed without major distortion of the wing. When the risers are smoothly let up, the canopy slows down and the pilot swings forward - the flare has begun before the toggles are even used. Then, the pilot maintains the high angle of attack by using toggle input to keep the flare going.

In any discussion of high performance landings the subject of riser verses toggle turns will come up. After years of watching a variety of techniques, I have concluded that front riser turns are far superior to toggle turns from a safety stand point. The reason is an extremely simple one. For a toggle turn to produce any speed to swoop with, it must be done as low as possible! Otherwise, it is just another high turn and all of the speed bleeds off well before the flare. A front riser turn, on the other hand, can intentionally be initiated too high, and then steepened or supplemented with the other front riser as needed. Therefore, a swooper using a front riser approach can always start at a conservative height while a toggle turn onto final compels the skydiver to turn as low as possible.

The implication of this goes further because of the way a canopy comes out of a turn. A front riser turn accelerates the canopy, while a toggle turn slows the canopy down. The difference is most noticeable at the end of the turn. Following a front riser maneuver, the canopy slows down to its normal speed and wants to come back over the pilot. After a toggle turn, the canopy must speed up, then there is a considerable delay

before the pilot swings back under it. A toggle turn may create a bigger pendulum action for the suspended weight because the canopy can slow down much faster than the person under it, whereas in a riser turn the canopy accelerates only slightly faster than the pilot. In a toggle turn, the pilot must swing back under the parachute and the parachute must regain lost speed before it is controllable and generating maximum lift. A front riser turn is easily abandoned at any point, with full control of the canopy retained. Once a toggle turn is in effect, there is no escape.

A dramatic toggle turn also causes the wing loading of the canopy to change considerably - normal in flight, low as the canopy slows down and the weight reaches the height of its swing, then heavy as the weight swings back under the canopy. Whether or not these dynamic changes in wing loading make the canopy more vulnerable to turbulence than the fairly steady loading of a riser turn is open to debate.

An additional hazard with toggle turns can occur at very high wing loadings - perhaps 1.4 or higher, depending on the canopy. In a sharp enough turn, the pilot can swing out so far that as he swings back under the canopy, the induced weight overloads the canopy. In this situation the wing is essentially in a high speed stall - what pilots would call an accelerated stall. At this point the pilot has no control and even flaring may be useless. In fact, flaring might reduce lift even further. In any case, remember the apparent wind. If you are looking straight at the ground, flaring will only change your impact point.

However, this is not a blanket endorsement of front riser turns. There is a phenomenon that can take place in a high speed turn that can lead to complete collapse of the canopy, and in theory a canopy in a sudden front riser turn may be the most susceptible. Canopy collapse takes place when the apparent wind striking a canopy undergoes a sudden change, whether the cause be a change in angle of attack, angle of incidence, or some other factor - wake turbulence off another canopy, for example - causes the canopy to be "back winded," a term from sailing. When a foil is back winded, it means the apparent wind is striking the lifting surface of the foil instead of the leading edge. In the case of a canopy, this can drive the air out of the cells and collapse the canopy. Canopies at particular risk are small, highly loaded canopies with a relatively flat trim angle and a relatively aft center of lift. Proponents of toggle turns argue that a front riser turn is more likely than a toggle turn to produce a canopy collapse, due to the changing angle of incidence. In the real world, the few catastrophic canopy collapses on record seem to be more a factor of design than of handling. There does not seen to be a correlation between front riser input and canopy collapse - at least none that I know of.

In summary, while both front riser turns and toggle turns create an increased descent rate and corresponding increase in speed, for intentional maneuvers a front riser turn is usually more desirable in that it offers more escapes in the event of a lapse of judgment or a sudden change in the environment.

Turns over 90 degrees carry an unacceptable degree of risk to other skydivers unless they are very carefully executed within an established pattern. It becomes very difficult to monitor traffic once you stray from the customary downwind, crosswind, final pattern. Equally important, it is difficult for traffic to monitor you! Downwind legs over the landing area followed by low 180s not only create tremendous changes in vertical and horizontal speeds but interfere with the traffic patterns already established by others. An additional consideration is that a turn over 90 degrees does not confer significant increases in speed but greatly increases the potential for mistakes, not just on the part of the person doing the hook turn. Some of the other parachutes on approach could be piloted by people who may not be able to avoid unusual wake turbulence or who might do their own low turn unintentionally in order to avoid the undisciplined canopy pilot. The same ethics apply to people on the ground. The whuffo being swooped could be deaf or unaware of how parachutes fly, and no skydiver likes to hear the whistle of wind through microline behind their back and wonder if they are the next innocent victim.

Referring again to practical tests with an airspeed indicator and variometer, modern canopies at 1.4 wing loadings typically fly at about 30 mph straight and level, toggles up. They can hit speeds of up to 50 mph coming out of a turn, and may be going 20 mph with the brakes still set for deployment. In descent rate modern canopies usually peg my variometer at its peak reading of 1600 feet per minute of descent, giving us a minimum downward component of 18 miles per hour. Since this instrument limit is hit long before the maneuver is completed, we can assume downward speeds of 20 to 30 mph are routine when deep in a turn. Older, lightly loaded designs are significantly slower. Thus, it is the combination of a fast canopy, high wing loading and a turning maneuver that creates the greatest energy.

Besides the amount of kinetic energy delivered by fast canopies, there is the time factor. I prefer to use feet per second instead of miles per hour, since skydivers work in feet and seconds, not miles and hours. Twenty miles per hour is roughly 30 feet per second. Thirty miles per hour is roughly 45 feet per second, and fifty miles per hour is about 75 feet per second. Regardless of how fast the canopy flies, human reaction time is about one quarter of a second to merely recognize a problem. In a complex emergency situation, we can assume

that an alert individual will require a quarter second to recognize a problem and no less than the remainder of a second to implement a response.

A second is more than enough time to resolve a simple emergency - pulling your hand away from a hot stove, for example - but is it enough time to recognize, assess and resolve a potential canopy collision? I think not, since the pilot must not only avoid the collision but do it in such a way that he does not create an equally serious secondary emergency, such as a different collision.

The illustration shows [webmaster's note: we're still working on the illustrations] two canopies on a collision course at ninety degrees to one another. We can see that in situation a) the canopies are one second from a collision when they are 42.4 feet apart. If we speed the canopies up, that one second remains constant as the distance expands. In situation C, the canopies are one second from collision when they are just over one hundred feet apart.

Now imagine that these scenarios are transpiring not on a blank sheet of paper but in a crowded sky fifty feet above the ground. Add a couple buildings and some power lines to the landing area to dramatically curtail the options. The point? We must assume a single second is not enough time to adequately respond to this complex emergency. That means to have any kind of safety margin - let's say three seconds - the canopy pilots in situation C must know the position, current direction and the intent of every canopy within three hundred feet.

In a similar situation, let's substitute a running child (12 feet per second) for one of the canopies. If the child darts out in front of the swooper (canopy C) with only 40 feet of horizontal separation, we have a dead child on our hands.

Using the same scenarios and assuming a collision at the end, let's look at the kinetic energy involved. For simplicity we will assume that the skydivers involved both weigh 170 pounds. Using mass times velocity squared to determine the energy going into the collision, we find each skydiver in a) enters the game with 153,000 foot-pounds of energy, for a total collision force of 306,000. Moving to scene c) we come up with 956,250 per skydiver and 1,912,500 total points in the collision.

Substitute a seventy pound child at 12 feet per second for one of the canopies, and you find the child enters collision a) with a mere 10,080 points versus the skydiver with 153,000. In c) the difference is even more spectacular: 10,080 vs. 956,250.

Thus we see that speed, more than any other factor, drives up risk by increasing collision forces and reducing the time and space in which we act. An interesting corollary develops with fast canopies; piloting them to a safe landing can demand so much focus that other important factors might be neglected. For example, if you need to devote all of your concentration to your canopy handling in order to land well, you have nothing left for traffic management. Conversely, if a traffic problem suddenly arises you may not have enough attention left to land your own parachute well. In a crowded landing area with canopies of varying speeds you need to devote quite a bit of concentration to the other canopies. If your own parachute demands all of your attention, you cannot safely land around others.

TEACHING CANOPY PILOTING TO OTHERS

Guidelines for Instructors

The Instructor

When I began learning freefall technique in 1980, there was no real body of instructional knowledge on how to teach freefall. Each person had their own way of communicating technique, and in fact even actual technique varied considerably. Half a generation later we have AFF, Skydive U, and other teaching standards. Everyone knows what a box man is. Coordinated turns, exit positions, vertical and horizontal control - all these things that were obscure and arcane subjects in 1980 are now well understood and easily taught. Nothing about the air or our bodies really changed; it was a change in thinking. Freefall skills went from being some mysterious ability to being simple techniques that anyone could learn and most people could learn to teach.

Canopy flying today is where we were in freefall when AFF came along. Many of the finest canopy pilots I know could not describe what their parachute does, or their technique to put it where they want it, if their life depended on it. They learned through trial and error over thousands of jumps. But just as what I learned about freefall in a thousand jumps I could now teach someone in 250, what I learned about canopies in 3,000 jumps I can teach to someone in 500. But it doesn't really matter what I can teach: I can only reach a few dozen, at most a few hundred people. A teaching method that can be used by any mentor, any drop zone, is far superior.

I have tried to formulate the text with that idea in mind. The next step is for you, the instructor, to put the information out in a useful context.

Before we go further, however, let's ask an important question. Who is capable of instructing someone on canopy control? To be blunt, I would say that more than half of the AFF Instructors I have met do not have the necessary knowledge. I personally don't feel someone should present themselves as a competent canopy pilot unless they have at least fifty CRW jumps, competition accuracy experience, and a number of demo jumps under their belt. Although CRW canopies are very different from RW canopies, CRW is without a doubt the best all around teacher of canopy skills there is and anyone who hasn't done enough to at least dock fourth is under qualified to be a canopy flight instructor. True, we aren't teaching a CRW course here. But to really understand how canopies sink and float, fly in turbulence and deploy you need some serious CRW experience. It is also invaluable for canopy collisions.

You should also have several hundred "hook turns" in your log. Regardless of how you or your dz feels about hook turns people want to know about this technique. If you can't do it safely, you can't teach it. Before you answer "yeah, I can swoop with the best of 'em," ask yourself this: Have often do you use your brakes to pull out of your dive? If you use your brakes very often (more than once every fifty or so swoops?) you don't have the skill. Do you use more than a 180 turn? If so, you don't have the judgment.

It might seem to some that my standards are too high. After all, you might say, "I don't need to be a national champion to teach RW." No doubt some individuals will be exceptions, but my point is that most so called expert skydivers have extremely limited canopy experience and don't realize how little they know. If you haven't done a fair amount of CRW, you don't know much about canopies, period. Go get the experience; learning to learn again will make you a better teacher. If you don't know how to swoop a modern canopy, you won't have any credibility with that very large segment of our audience that wants to learn. Try it - you might like it. Finally, someone is bound to have a big, slow demo type canopy. You need enough accuracy skill to guide them on approach planning and inform them on how to fit in with other canopy types in the traffic pattern.

Other than the canopy handling skills, the course instructor needs two teaching skills: assessment of performance and ability to communicate. A good grasp of the materials and flying skills won't be any help if you don't have the ability to watch a landing and critique it effectively. To practice this, just watch a lot of landings with a critical eye. What distinguishes a "good" flight from a "bad" one? What would you have done differently?

Class Size and Management

To test my theories I ran three "canopy camps" in 1996. The camps were one day affairs. Students signed up in advance, with a ten dollar down payment to cover the cost of the written materials they were expected to study before arriving and to confirm their reservation. To qualify they needed at least fifty jumps and their own gear, with a minimum of twenty jumps on the canopy they were using. The day's structure was simple, and it was effective enough that I didn't make any significant changes between courses. We met at nine a.m., at which time I would get everyone's name, number of jumps, canopy type, wing loading, and general goals. All the camps were about evenly split between conservative canopy fliers seeking better accuracy and traffic skills and aggressive younger fliers interested in learning how to swoop, or planning to move to a smaller canopy.

The fee for the one day course was $60.00. This included six jumps from 3,500 feet, video of each landing, course materials, and classroom instruction/video debriefs. I paid the drop zone $6 per jump; that left $24 per person to pay the video man, the copy shop, and myself. With six students I could figure on making about $100 for a day's work. Not a princely sum, but enough to give an instructor an incentive to take a day off from other teaching duties. People motivated primarily by money would want to charge a little more if class size is small. I don't want to sound cynical here, but I understand the financial reality of choosing between doing six tandems or teaching a canopy class.

Regarding class size, at a Cessna dz a class of four would be ideal. I am from an Otter dz and I didn't want to load the plane up with a lot of people going out low, so I limited it to six. More than that requires a second load (which would really slow things down) and clutters up the sky with too many students. The students need a little traffic to sort out, but not too much. I believe that four or five is the optimum class size. Larger groups are also unwieldy in time. It takes everyone longer to pack, get manifested, sit through the briefings, etc.

For optimum efficiency, stick to four or five and have then all exit on the same pass. This keeps the class moving as a group. If drop zone logistics don't permit moving as a group you will have to be creative, but it really helps to debrief as a group since so many common errors will be shared by more than one participant. As soon as they land, they should get packed while you review the video in private and note what you will cover in the debrief. Give them about 20 minutes to pack and grab a snack or drink before meeting again. Be

sure they know when they are expected and emphasize that they are part of a group; being late or unprepared is unacceptable behavior.

We met for a debrief after every jump as soon as the group was packed. I did my best to point out things that everyone could learn from. Be sure to emphasize positives more than negatives, but don't hesitate to be firm about any dangerous behavior. I found I needed to allow about twenty minutes to review and debrief the prior jump and another twenty to thirty to present the next segment of material and brief the group for the next jump. If there is any back up at the manifest, be sure to manifest while you are still in class to avoid idle time waiting for a plane.

I feel strongly that the jumps should be done from 3,500 and dedicated strictly to canopy flying. Doing canopy instruction after RW would involve too many distractions. The 3,500 exit really focuses people on the task at hand, which includes spotting and deployment as well as piloting the open canopy. With four to six people getting out on the same pass they have a little traffic management to work on, but not so much that it distracts from the landing portion. It is also an economical altitude and keeps the pace moving quickly. My classes always went until six or seven in the evening - there is that much to cover once you get into detailed analysis. Of course, after the last jump a debrief over cold beer is the natural course. Most of the class will feel they have really learned something. This is a great time to reinforce their enthusiasm for improving flying skills.

Another important point is the video. On a few landings I tried to shoot the video myself, but it is much more effective to get someone else to do it while the instructor stands by with a note book to record what takes place. A video doesn't show the ground reference until the canopy is quite low, so you need to take careful notes about what they do while setting up the approach. Furthermore, it helps the video recorder to have the instructor help spot canopies since they will all be landing in the space of a couple minutes. You will soon learn that vertical traffic separation is as crucial to you as it is to the student; they need it for an unimpeded approach and you need it so you can concentrate on individuals one at a time.

The first jump of the course was always the same. I asked each student to do what they would normally do, aiming at the pea gravel to establish a yardstick of precision landing skill. Once they were down, a brief critique would pick out one or two points for them to concentrate on. As the course progressed the individual students would become differentiated: some would need lots of focus on their set up, some on the flare timing, etc. In any teaching effort it is useless to try and note every possible area of improvement. One or two major things will stand out. Focus on no more than three areas of improvement.

I found it easiest to have a theoretical outline I would cover in class between jumps, and then a particular set of tasks on the jumps themselves to reinforce basics.

Classroom Syllabus

Section I: Introduction to the course, evaluation, and goals. Prior to the first jump.

1) *General discussion of common problems/accidents associated with canopies; the reason we are doing this course.*

    a) *Deployment collisions and malfunctions*
    b) *Approach collisions with other canopies*
    c) *Collisions with the ground or obstacles*
    d) *Collisions with people on the ground*

2) *General overview of parachute design and flight characteristics. Discuss lift and drag, fluid flow, turbulence, and flow separation. Differences between main and reserve, and what to expect. Special reserve considerations: rounds, old five cells.*

3) *Basic canopy safety*

    a) *control of deployment: packing, body position, separation.*
    b) *visual assessment of altitude; emergency procedures*
    c) *malfunction related problems (hard cutaway, self induced mals, etc.)*
    d) *collision avoidance control*
    e) *traffic management - vertical and horizontal space, assisting others to a safe approach. Patterns left most of the time, responsibilities of right patterns, sharing the landing area.*

Section II: Improving your canopy flying. Discussed between the next three jumps.

1) Discussion of canopy control input
- *a) normal toggle input*
- *b) front and rear risers*
- *c) deep brakes*
- *d) flat turns in brakes*
- *e) minimum and maximum sink rates*
- *f) tuning your canopy to maximum efficiency: blocks and loops, pilot chutes, sliders, etc.*

2) Conventional approach - downwind, crosswind, final. Patterns, why no S turns or brakes.

3) Performance approach
- *a) straight front riser*
- *b) front riser turn to final*

Section III. Canopy Safety: after a three or four jumps.

1) Unusual landing situations
- *a) tight landing areas*
- *b) cross wind landings*

2) Problems specific to our drop zone
- *a) obstacles with different wind directions*
- *b) traffic*
- *c) density altitude*
- *d) turbulence from thermals, wings, aircraft engines, the hangar*

3) Problems associated with out landings
- *a) causes of out landings - reserve ride (etiquette review), bad spot, etc.*
- *b) hazards, light and wind assessment*

4) Winds
- *a) short, long, and off the line - tricks to get you home*
- *b) special approach for windy days - no 360s, never get behind the landing area*
- *c) flare for windy conditions*

Section IV: Ethics and Aesthetics. At the end.

1) develop a thoughtful pattern that gives the most options to you and to everyone else.

2) if you want to fly like a student, go to the student area! Do not use brakes, 360s, or S turns in the landing area.

3) clear the area at once, don't run with an open canopy. Reasons not to debrief or chat in the landing area. Particular traffic danger zones: peas, fence. You aren't safe until you are out of the landing area!

Jump Schedule

Lesson 1: One jump

Focus on clean deployments, have them play with body steering, both riser groups, toggles. Flat turns. Discuss riser blocks and loops. First jump will be an evaluation, so no special approaches, just try and put it in the peas using your normal approach.

Lesson 2: Three jumps

Based on the performance in jump one, discuss traffic management and approach patterns. Give each a goal based on previous demonstrated ability. Have them track on opposite 90 headings prior to deployment, stage openings, etc.

Lesson 3: One jump - set up crosswind landing with cones if conditions permit

Further individual instruction, review mals and collision procedures. Lengthy talk on separation, tracking

technique, and wave offs. Two most critical decision making areas of the skydive are break-off/deployment and the landing.

Final jump, class wrap up

Continued individual assessment and challenge. Reserve characteristics.

Some of the things covered in the camp are items that many people have never had presented to them before. Give them challenges. For example, I always try and get people to check altitude visually on the ride up and the ride down. Teach them to play a game with themselves where, without looking at their altimeter, they glance out the window (or at the ground when under canopy) and ask themselves if they are high enough to cut away, what the exact altitude is, whether they could make a certain field from where they are, etc.

My class of six was a little perplexed when I told them on the second jump that I wanted them all out of the Otter in ten seconds, leaving from 3,500. On the first load they had each waited in the door for five seconds or so prior to a hop and pop. Without guiding them too much, I pointed out that 3,500 was a typical break off altitude, and they had plenty of time to track off the line of flight, stagger openings, etc. They soon learned to take advantage of the 1,500 feet of potential freefall altitude, combined with varying descent rates, to give themselves plenty of separation for deployment and landing approaches.

Another challenge is to restrict a certain portion of airspace; "on this jump you may not overfly such and such an area." Add imaginary lakes, power lines, or buildings to your landing area. If the winds are light, make them land cross wind if a safe opportunity to do so exists.

In conclusion, what has been done so far has been simple, early experimentation. There is lots of room for improvement and innovation. I look forward to hearing from instructors or students who have insights, suggestions, or other information to share. Please feel free to contact me at

Skydive Arizona
4900 N. Taylor Road
Eloy, AZ 85231

e-mail: jump@skydiveaz.com

SECTION 4

ACCELERATED FREEFALL

CONTENTS

RHS Instructor Student LHS Instructor

1 INTRODUCTION

Both AFF and static line, on completion of the full course, qualify the student as a GRADUATE SKYDIVER.

NOTE: A Student who has begun an AFF course remains an AFF student:
- until he is signed off as a graduate by an AFF Instructor; or
- until he is released by specific logbook entry by an AFF Instructor.

Overall Objectives:

To teach the candidate to be safe and independent.

Levels (1 - 3) - Two instructors per jump.

Survival skills in priority
- Student to deploy own parachute.
- Student to be altitude aware.
- Student to have basic body position and be able to do manoeuvres.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.

The student's ability to perform these skills will give the instructor an indication as to the safety level of the student.

Levels (4 - 7) - One instructor per jump.

These levels place the emphasis on "solo" skill of the student.

All skills as above and;
- Student must initiate and stop turns on a heading.
- Student must demonstrate ability to regain stability – frontloops/backloops.
- Student must show ability to move forward - delta/track.
- Student must show more individual mind work i.e. start sequence on own.

Here the student must show independence as well as safety skills.

Levels 8, 9 and 10 - Solo jumps which may be done in any order:

- As briefed by AFF Instructor - a repeat of level 7 tasks.
- Spin test.
- Clear and pull (hop and pop).

Student is now a graduate skydiver and must complete the Intermediate Skills Programme before progressing via any recognised sub-discipline's category system in order to obtain further licences. See PASA SOPs Section 2 - licences.

Notes:
All altitudes referred to in this manual are "AGL" (above ground level).
Only PASA rated AFF instructors may operate within the bounds of South Africa. See PASA SOPs Section 2 - licences and ratings.
The drop zone must have a designated senior AFF Instructor if the CI is not AFF rated. He must liaise with the CI on AFF matters.
AFF must be taught from Level 1.
An AFF Instructor, after consultation with the senior AFF Instructor, may adapt/modify a level to suit an individual student's needs.

2 EQUIPMENT (Full lecture as for first jump course)

Objectives:

- To teach the student to perform a basic check and to fit the equipment.
- To demonstrate the deployment sequence.
- To familiarise the student with additional ground equipment.

Training aids:
Video, batons, radios, trolley, mannequin, clock altimeter, wrist altimeter, jump suit, clear goggles, hard helmet, packed rig.

i. Peripheral equipment
- Jump suit - NB for choice, no flap on arms.
- Clear goggles.
- Hard helmet.
- Altimeter - wrist mount.
- Shoes (no hooks, jewellery etc.).
- Gloves - (be aware of temperature).

ii. Operational equipment
- Packed rig to explain component parts and their purpose.
- AAD compulsory.
- PASA approved student canopy - canopy control assistance on at least L1.
- Secondary handle recommended, not compulsory.
- Square reserve.
- RSL compulsory.
- Audible altimeter recommended.

iii. Instructor equipment
- Neat clothing and jump suit.
- Frappe hat recommended. Instructor must be able to talk to student in aircraft and on step.
- Clear goggles.
- Audible altimeter highly recommended.
- Wrist mount altimeter.
- Well maintained rig - (with AAD highly recommended).

Evaluation questions review and critique

3 AIRCRAFT DRILLS (Full lecture as for first jump course)

NB Student must be checked out and AAD on before getting in.

Helmet on for take-off.

1000 ft **E** - equipment check
S - sequence rehearsal
S - signals - recap and do
A- abnormalities:

- bad exit - do what - arch harder
- 1 instructor - carry on and arch harder
- no instructor - L1, L2 wave and open

Helmet off.

5000 ft pass over DZ if possible, for student to see and orientate.

Discuss canopy control and show.

Sequence rehearsal.

Student to read alti on way up - 1000ft, 5000ft, 9000ft.

At 9000ft student gets ready and ESSA again with pin checks and AAD on.

At altitude, climb out.

Student on knees (remember to spot short)
1. Are you ready to skydive?
2. Climb out after me.
3. Student takes over the skydive.

Student does pre-exit check - check left OK - check right OK.

Exit count - Ready/ Set /Go – arch.

Aircraft Emergencies
- Student to take instructions from Instructor.
- 1000ft and below - land with the aircraft.
- Major aircraft problems: 1000ft - 3000ft - Bail out- pull reserve ripcord.
- 3000ft and above - Bail out – deploy main parachute.
- If nobody told him and he is outside the plane, he chooses reserve because of fast reliable opening OR normal exit if appropriate.
- Parachute hook ups - cutaway and reserve.
- AFF to exit last unless inappropriate.
- **NB:** for descending in aircraft with students - AAD to be turned off.
- Instructor to have a system.

Evaluation questions review and critique

4 EXIT, ARCH AND COUNT

Objectives:
- To teach the free fall position – BOX/NEUTRAL.
- To teach student the level sequence with hand signals.

Free fall position
- Demonstrate box/neutral.
- Symmetry and centre of gravity.
- Practice student and review/critique.

Free fall sequence
- Demonstrate from start to finish.
- Explain component parts.
- Practise the student.
- Review/critique.

The signals - (for sequence and body position)

- Demonstrate signals with appropriate response.
- Explain.
- Practise student.
- Review/critique.

Evaluation questions review and critique

5 LEVELS 1 THROUGH 10

LEVEL ONE SKYDIVE

Objectives:
- Student to deploy own parachute - no pull then repeat.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.

The sequence: (demo, explanation, practise and review - including signals)

Student	**Action**	**Instructor response**
"check left"	Looks left	"OK" if ready
"check right"	Looks right	"OK"
"ready, set, go!"	Arch	
circle of awareness	Start on own	Shake/signal if necessary
"horizon"	Look forward and register	
"altimeter"	Look at alti and register	
	Report altitude to L Instructor	Thumbs up or other signal
	Report altitude to R Instructor	Thumbs up or other signal
3 x rip cord/pilot chute touches	Arch, touch/feel, arch	Observe/assist/signal as necessary
	Student to look at alti when L hand in front for balance	
	Report altitude seen on last ripcord/pilot chute touch (only to L acceptable)	
Free time with short circle of awareness	i.e. horizon/alti/ground	
5500ft - wave	Signal intention to open	Observe/assist/signal as necessary
"arch"	Emphasise body position	
"touch/pull"		Observe/assist/signal as necessary. R Instructor to leave after ripcord/pilot chute out
"arch"	Emphasise body position	
"2000"		
"3000"		
"check"	Look and point up	L Instructor to leave as student lifts

Exit 11000ft, min 9000ft
Wave at 5500ft
Min. opening for student 4000ft then RHS Instructor takes over
3500ft then LHS Instructor takes over
Min. opening for Instructors 2000ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL TWO SKYDIVE

Objectives:

- Student to deploy own parachute - no pull then repeat.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Student to start and stop forward movement.

The sequence: (demo, explanation, practise and review - including signals)

Student	**Action**	**Instructor response**
“check left”	Looks left	“OK”
“check right”	Looks right	“OK”
“ready, set, go!”	Arch	
circle of awareness	Start on own	Shake/signal if necessary
“horizon”	Look forward and register	
“altimeter”	Look at alti and register	
	Report altitude to L Instructor	Thumbs up or other signal
	Report altitude to R Instructor	Thumbs up or other signal
2 x rip cord/pilot chute touches	Arch, touch/feel, arch	Observe/assist/signal as necessary
	Student to look at alti when L hand in front for balance	
	Report altitude seen on last ripcord/pilot chute touch (only to L acceptable)	
Above 7000ft then forward movement for 6 seconds	Straighten legs and sweep arms out to side	Observe/assist/signal as necessary
Relax to neutral	Alti check	If student position/stability is good, L Instructor can release
After forward movement free time with short circle of awareness	i.e. horizon/alti/ground	
5000ft - wave	Signal intention to open	Observe/assist/signal as necessary
“arch”	Emphasise body position	
“touch/pull”		Observe/assist/signal as necessary. R Instructor to leave after ripcord/pilot chute out
“arch”	Emphasise body position	
“2000”		
“3000”		
“check”	Look and point up	L Instructor to leave as student lifts

Exit 11000ft, min 9000ft
Wave at 5000ft
Min. opening for student 4000ft then RHS Instructor takes over
3500ft then LHS Instructor takes over
Min. opening for Instructors 2000ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL THREE SKYDIVE

Objectives:

- Student to deploy own parachute - no pull then repeat.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Student to start and stop turn.
- Full release of student preferable.

The sequence: (demo, explanation, practise and review – including signals)

Student	**Action**	**Instructor response**
“check left”	Looks left	“OK”
“check right”	Looks right	“OK”
“ready, set, go!”	Arch	
circle of awareness	Start on own	Shake/signal if necessary
“horizon”	Look forward and register	
“altimeter”	Look at alti and register	
	Report altitude to L Instructor	Thumbs up or other signal
	Report altitude to R Instructor	Thumbs up or other signal
1 x rip cord/pilot chute touch	Arch, touch/feel, arch	Observe/assist/signal as necessary. LHS to release
	Student to look at alti when L hand in front for balance	
	Report altitude seen on last ripcord/pilot chute touch (only to L acceptable)	
If above 7000ft left turn 90 degrees to face Instructor	“look/bank/arch”	Observe/assist/signal as necessary
Alti check	Maintain visual contact with Instructor Proximity - left, right, up, down	If student position/stability is good, RHS to give full release
Instructor/alti		
6000ft - no more work	Shake head to indicate no more work and maintain heading	
5000ft - wave	Signal intention to open	Observe/assist/signal as necessary
“arch”	Emphasise body position	
“touch/pull”		Observe/assist/signal as necessary
“arch”	Emphasise body position	
“2000”		
“3000”		
“check”	Look and point up	

NB if student alone and OK (i.e. in control and on heading and altitude aware), then carry on with skydive to 5000ft.
NB priorities of free fall - pull, pull at the correct altitude, pull preferably stable.
NB student to understand i.e. must not sacrifice altitude for stability.

Exit 11000ft, min 9000ft
Wave at 5000ft
Min. opening for student 4000ft then RHS Instructor takes over
3500ft then LHS Instructor takes over
Min. opening for Instructors 2000ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL FOUR SKYDIVE

Objectives:

- Student to deploy own parachute - no pull then repeat.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Student to start and stop turn.
- Full release of student AND DEFINITE SOLO DEPLOYMENT.

The sequence: (demo, explanation, practise and review - including signals)

Student	**Action**	**Instructor response**
"check left" or "check right" as appropriate	Look left or right as appropriate	"OK"
"ready, set, go!"	Arch	
circle of awareness	Start on own	Shake/signal if necessary
"horizon"	Look forward and register	
"altimeter"	Look at alti and register	
	Report altitude to Instructor	Thumbs up or other signal
1 x rip cord/pilot chute touch (optional)	Arch, touch/feel, arch	Observe/assist/signal as necessary. Instructor to release
	Student to look at alti when L hand in front for balance	
If above 7000ft left turn 90 degrees to face Instructor	"look/bank/arch"	Observe/assist/signal as necessary
Alti check	Maintain visual contact with Instructor Proximity - left, right, up, down	
Instructor/alti		
6000ft - no more work	Shake head to indicate no more work and maintain heading	
5000ft - wave	Signal intention to open	Observe/assist/signal as necessary
"arch"	Emphasise body position	
"touch/pull"		Observe/assist/signal as necessary
"arch"	Emphasise body position	
"2000"		
"3000"		
"check"	Look and point up	

NB if student alone and OK (i.e. in control and on heading and altitude aware), then carry on with skydive to 5000ft.
NB priorities of free fall.

Exit 11000ft, min 9000ft
Wave at 5000ft
Min. opening for student 4000ft then Instructor takes over
Min. opening for Instructor 2000ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL FIVE SKYDIVE

Objectives:

- Student to deploy own parachute - no pull then repeat.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Student to start and stop turn - 360 degrees to right and left.
- Unassisted climb out and linked exit.

The sequence: (demo, explanation, practise and review - including signals)

Student	**Action**	**Instructor response**
"check left" or "check right" as appropriate	Look left or right as appropriate	"OK"
"ready, set, go!"	Arch	
circle of awareness	Start on own	Shake/signal if necessary
"horizon"	Look forward and register	
"altimeter"	Look at alti and register	
	Report altitude to Instructor	Thumbs up or other signal Instructor to release
If above 6000ft - turn 360 degrees Left	"look/bank/arch"	Observe/assist/signal as necessary
Alti check		
If above 6000ft - turn 360 degrees Right	"look/bank/arch" Maintain visual contact with Instructor Proximity - left, right, up, down, forward	
Free time: Instructor/alti	No docking	
6000ft - no more work	Shake head to indicate no more work and maintain heading	
4500ft - wave	Signal intention to open	Observe/assist/signal as necessary
"arch"	Emphasise body position	
"touch/pull"		Observe/assist/signal as necessary
"arch"	Emphasise body position	
"2000"		
"3000"		
"check"	Look and point up	

Exit 11000ft, min 9000ft
Wave at 4500ft
Min. opening for student 3500ft then Instructor takes over
Min. opening for Instructor 2000ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL SIX SKYDIVE

Objectives:

- Student to deploy own parachute - no pull then repeat.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Student to recover stability twice - start and continue at own discretion.
- Unassisted climb out and unlinked exit.

The sequence: (demo, explanation, practise and review - including signals)

Student	**Action**	**Instructor response**
"check left" or "check right" as appropriate	Look left or right as appropriate	"OK"
"ready, set, go!"	Arch	
Heading	Alti check	Shake/signal if necessary
If above 6500ft - backloop		Observe/assist/signal as necessary
Heading	Alti check	
If above 6500ft - backloop		
Heading	Alti check	
If above 5500ft - 5 second delta on heading	Straighten legs and sweep arms out to side	
5500ft - no more work	Shake head to indicate no more work and maintain heading	
4000ft - wave	Signal intention to open	Observe/assist/signal as necessary
"arch"	Emphasise body position	
"touch/pull"		Observe/assist/signal as necessary
"arch"	Emphasise body position	
"2000"		
"3000"		
"check"	Look and point up	

Note: An available option is to have the student perform a front loop on exit.
After recovering from this he only has to perform one backloop to have demonstrated recovery twice.

Exit 11000ft, min 9000ft
Wave at 4000ft
No backloop below 6500ft
No delta below 5500ft
Min. opening for student 3500ft then Instructor takes over
Min. opening for Instructor 2000ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL SEVEN SKYDIVE

Objectives:

- Student to deploy own parachute - no pull then repeat.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Student to do half series starting with backloop- start and continue at own discretion.
- Unassisted climb out, opposite of last exit i.e. dive/surf and unlinked.
- Student to clearly demonstrate safety and independence.

The sequence: (demo, explanation, practise and review - incl. signals)

Student	**Action**	**Instructor response**
"check left" or "check right" as appropriate	Look left or right as appropriate	"OK"
"ready, set, go!"	Arch	
Heading	Alti check	Shake/signal if necessary
If above 6500ft - backloop		Observe/assist/signal as necessary
Heading	Alti check	
If above 5000ft - turn 360 degrees Right	"look/bank/arch"	
Heading	Alti check	
If above 5000ft - turn 360 degrees Left	"look/bank/arch"	
Heading	Alti check	
If above 5000ft - Delta and turn		
5000ft - no more work	Shake head to indicate no more work and maintain heading	
3500ft - wave	Signal intention to open	Observe/assist/signal as necessary
"arch"	Emphasise body position	
"touch/pull"		Observe/assist/signal as necessary
"arch"	Emphasise body position	
"2000"		
"3000"		
"check"	Look and point up	

Exit 11000ft, min 9000ft
Wave at 3500ft
No backloop below 6500ft
No turns or delta below 5000ft
Min. opening for student 3000ft then Instructor takes over
Min. opening for Instructor 2000ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL EIGHT SKYDIVE – SOLO SKYDIVE

Objectives:

- Student to deploy own parachute.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Student to do half series starting with backloop- start and continue at own discretion.
- Unassisted climb out, opposite of last exit i.e. dive/surf and unlinked.
- Student to clearly demonstrate safety and independence.

Repeat Level 7 skydive.

Sequence:

Student	**Action**
“ready, set, go!”	Arch
Heading	Alti check
If above 6500ft - backloop	
Heading	Alti check
If above 5000ft - turn 360 degrees Right	“look/bank/arch”
Heading	Alti check
If above 5000ft - turn 360 degrees Left	“look/bank/arch”
Heading	Alti check
If above 5000ft - Delta and turn	
5000ft - no more work	Shake head to indicate no more work and maintain heading
3500ft - wave	Signal intention to open
“arch”	Emphasise body position
“touch/pull”	
“arch”	Emphasise body position
“2000”	
“3000”	
“check”	Look and point up

Exit 11000ft, min 9000ft
Wave at 3500ft
No backloop below 6500ft
No turns or delta below 5000ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL NINE SKYDIVE – SOLO SKYDIVE – SPIN TEST

Objectives:

- Student to deploy own parachute.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Unassisted climb out.
- To teach the student to regain control at any time, i.e. being knocked unstable on break-off.
- Student to clearly demonstrate safety and independence.

Sequence:

Student	**Action**
Exit	Procedure depends on aircraft
Heading	For 10 seconds
Start 360º turn	Grab ankle with one hand and "salute" with opposite hand If the turn is to the right, the right ankle must be grabbed and the salute done with the left hand and vice versa for the left turn
Recover from spin	Arch hard and force turn in opposite direction
If no recovery within 5 seconds	Arch and pull
3500ft - wave	Signal intention to open
"arch"	Emphasise body position
"touch/pull"	
"arch"	Emphasise body position
"2000"	
"3000"	
"check"	Look and point up

Exit 11000ft, min 9000ft
Wave at 3500ft

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

LEVEL TEN SKYDIVE – SOLO SKYDIVE – CLEAR AND PULL

Objectives:

- Student to deploy own parachute.
- Student must be altitude aware.
- Student to have good body position.
- Student to show general awareness.
- Student to demonstrate safe canopy control including the landing.
- Student to show control and open within 10 seconds of leaving aircraft.
- Unassisted climb out.
- Student to clearly demonstrate safety and independence.

Student	**Action**
Exit 4500ft min	
Deploy	Within 10 seconds of exit

The student is now an AFF graduate skydiver.

ALWAYS REMEMBER THE THREE PRIORITIES OF FREEFALL

PULL
PULL AT THE CORRECT ALTITUDE
PULL PREFERABLY STABLE

Evaluation questions review and critique

The Student is now a graduate skydiver for all disciplines. He is known as an Intermediate parachutist. (See PASA SOPs Section 2, 1.4)

AFF Instructor to note this in student's logbook and to explain further progression to student. CI to countersign in logbook. The AFF Instructor must continually develop the student's safety and independence skills from level 1 to level 10. By level 6 he should ideally be performing all required checks, drills and routines without prompting. The AFF graduate should clearly understand his own responsibilities and limitations, and have an idea of the route forward.

SECTION 5

INTERMEDIATE SKILLS PROGRAMME

TRAINING PROGRAMME - BASIC STUDENT EXERCISES

METHOD OF TEACHING FORMATION SKYDIVING TO BEGINNERS

CONTENTS

INTERMEDIATE CANOPY CONTROL PROGRAMME

The following 4 canopy control exercises must be incorporated within the 7 jump Intermediate Skills Programme:

EXERCISE 1

OBJECTIVE

- To be able to fly slowly in all directions.

EQUIPMENT

- Current parachute size approved by Chief Instructor.

PRESENTATION

- PASA ISP Coach to brief student prior to load.
- Canopy deployment no lower than 3500ft.
- Proper canopy checks to be practised.
- Brief traffic awareness and landing pattern.
- To commence above 1500ft in current holding area.
- Both steering toggles should be held in the palm of your hand.
- Check for traffic.
- Pull both toggles to shoulder level; commence with right turn 360° pulling the right toggle to chest level and returning to shoulder.
- Check alti.
- Both toggles still at shoulder level; commence turning left 360° pulling the left toggle to chest level and returning to shoulder level for a second before both toggles back to the top.
- Check alti.
- Repeat if altitude allows.
- Dirt dive the canopy exercise prior to load.
- Stress priorities of landing.

REVISION

The lesson content should be revised by the Coach with active participation by the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the canopy ride afterwards including logbook entry.

LAND WITH A FLAT WING
IN A CLEAR AREA
MUST FLARE FOR THE LANDING
PREFERABLY LAND INTO WIND

EXERCISE 2

OBJECTIVE

- To be able to steer your canopy using the rear risers.

EQUIPMENT

- Current parachute size approved by the Chief Instructor.

PRESENTATION

- PASA ISP Coach to brief student prior to load.
- Canopy deployment no lower than 3500ft.
- Proper canopy checks to be practiced.
- Brief traffic awareness and landing pattern.
- To commence above 1500ft in current holding area.
- Both steering toggles should be held in the palm of your hand.
- Check for traffic.
- Pull right rear riser down until movement is achieved, turn 360°; return to straight and level flight.
- Check alti.
- Pull left rear riser down until movement is achieved, turn 360°; return to straight and level flight.
- Check alti.
- Repeat if altitude allows.
- Dirt dive the canopy exercise prior to load.
- Stress priorities of landing.

REVISION

The lesson content should be revised by the Coach with active participation by the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the canopy ride afterwards including logbook entry.

LAND WITH A FLAT WING
IN A CLEAR AREA
MUST FLARE FOR THE LANDING
PREFERABLY LAND INTO WIND

EXERCISE 3

OBJECTIVE

- To be able to control your canopy with your front risers.

EQUIPMENT

- Current parachute size approved by the Chief Instructor.

PRESENTATION

- PASA ISP Coach to brief student prior to load.
- Canopy deployment no lower than 3500ft.
- Proper canopy checks to be exercised.
- Brief traffic awareness and landing pattern.
- To commence above 1500ft in current holding area.
- Both steering toggles should be held in the palm of your hand.
- Check for traffic.
- Pull both front risers down at least until a faster canopy speed is achieved; lean towards the right and pull the right front riser down until a right corkscrew sensation is achieved for 360°; stress to look ahead during the turn; return to straight and level flight.
- Check alti.
- Pull both front risers down at least until a faster canopy speed is achieved; lean towards the left and pull the left front riser down until a left corkscrew sensation is achieved for 360°; stress to look ahead during the turn; return to straight and level flight.
- Check alti.
- Stress the danger of fast altitude loss.
- Dirt dive the canopy exercise prior to load.
- Stress priorities of landing.

REVISION

The lesson content should be revised by the Coach with active participation by the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the canopy ride afterwards including logbook entry.

LAND WITH A FLAT WING
IN A CLEAR AREA
MUST FLARE FOR THE LANDING
PREFERABLY LAND INTO WIND

EXERCISE 4

OBJECTIVE

- To know where your stall point is and how to recover from a canopy stall.

EQUIPMENT

- Current parachute size approved by the Chief Instructor.

PRESENTATION

- PASA ISP Coach to brief student prior to load.
- Canopy deployment no lower than 3500ft.
- Proper canopy checks to be exercised.
- Brief traffic awareness and landing pattern.
- To commence above 1500ft in current holding area.
- Both steering toggles should be held in the palm of your hand.
- Check for traffic.
- Induce a 90° toggle turn; pull both steering toggles down as far as you can reach (this could take a few moments); look at the canopy and take note what happens to the canopy; when a full collapse is reached, slowly feed the toggles back to the full speed flight position.
- Check alti.
- Repeat if altitude allows.
- Dirt dive the canopy exercise prior to load.
- Stress priorities of landing.

REVISION

The lesson content should be revised by the Coach with active participation by the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the canopy ride afterwards including logbook entry.

LAND WITH A FLAT WING
IN A CLEAR AREA
MUST FLARE FOR THE LANDING
PREFERABLY LAND INTO WIND

INTERMEDIATE SKILLS PROGRAMME

The first formation skydiving jump should be regarded as the first step in a new progression sequence, NOT as the last stage of the original student progression chart. Therefore, the student should have already progressed onto non-student gear and become thoroughly familiar with it in order to be taught basic Formation Skydiving techniques right from the beginning.

The Intermediate Skills Programme may be done before or after the hand-deployed pilot chute conversion.

JUMP 1

OBJECTIVE

- To fall in the correct body position i.e. straight down.
- To do no-contact relative work.
- To do a straight approach and a good dock.
- To be able to release and redock without backsliding.

EQUIPMENT

- Jump suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- PASA ISP Coach to hold the student, or vice versa; high grip on shoulder essential; student to exit in base or pin position, at Coach's preference.
- After exit, Coach to release student only after correcting body position by means of in-air signals.
  N.B. Discuss in-air signals. If there is a problem, the whole jump is to be spent on correcting body position.
- If all OK, release student for no-contact FS; if a problem, redock and start again; if no problem; backslide approx. 2m (not more); student to approach, straighten legs to initiate forward movement.
- Stress flying right up to the Coach nose to nose before docking; student to dock, not Coach; stress not reaching, and explain why; after docking, student to check altimeter - if OK, do again - student to release; stress looking at altimeter.
- Explain wave-off (VERY important) and to stop work at 4500ft. Turn, track, wave and deploy by 3000ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (box); fall straight down.
- Dirt dive the jump thoroughly; keep repeating that this costs nothing; stress relaxation; dirt dive from the aircraft to be used, from exit to break-off.
- Altitude awareness - discuss its importance and relevance to this and all future jumps; stress that altitude is not to be sacrificed for anything.
- Make the task at hand seem simple.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY THE MAIN PARACHUTE
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 2

OBJECTIVE

- To start learning how to pin from the aggressor's position.
- To practice no-contact FS.
- To approach and dock correctly i.e. head on.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Unlinked exit - Coach to be base; stress importance of close exit (hand on the Coach); N.B. exit must be close, head up, legs tucked up in good dive exit, keep eye contact.
- Help student by compensating for altitude and moving towards him if he is far away; let student do the dock.
- If exit was bad, and time is being wasted, Coach to pin student.
- Check body position as per Jump 1.
- Either student or Coach releases; Coach backslides approximately 2m and turns 90 degrees to right or left and then backslides another 2m; student must redock correctly i.e. from the front, checking altimeter after each dock; stress straightening of legs before student releases Coach, and nose to nose docking; repeat as per Jump 1.
- Explain wave-off (VERY important) and to stop work at 4500ft. Turn, track, wave and deploy by 3000ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (box); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY THE MAIN PARACHUTE
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 3

OBJECTIVE

- To turn maintaining eye contact, and not to drift away.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Coach exits as base, student pins in unlinked exit; if time is being wasted, Coach can pin.
- Either student or Coach releases; settle in no-contact FS position. Student does 90 degree turn to the left and 90 right followed by 90 degree turn to the right and 90 degree left to face the Coach again. Eye contact should be maintained. Dock, check altimeter; if time permits, student does a proper 360 degree turn i.e. very close, with eye contact; explain the centre point as being the navel; redock; if there is still time, do no-contact FS.
- Explain wave-off (VERY important) and to stop work at 4500ft. Turn, track, wave and deploy by 3000ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (box); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief brief the dive thoroughly afterwards including logbook entry.

DEPLOY THE MAIN PARACHUTE
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 4

OBJECTIVE

- To teach student to compensate for changes in fall rate i.e. hips down to go faster, de-arch to go slower.
- To dock from the pin position.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Coach goes out base, student pins after unlinked exit.
- Student pins, then release and both do no-contact FS; Coach demonstrates fast fall by arching harder and dropping a maximum of 2m; student to attempt same. Student checks altimeter. Coach demonstrates slow fall by de-arching and moving up a maximum of 1.5 m; student attempts same. Check altimeter.
- Repeat exercise if altitude permits.
- Explain wave-off (VERY important) and to stop work at 4500ft. Turn, track, wave and deploy by 3000ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (box); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This jump involves practical demonstration of the skills described above. Debrief the dive thoroughly afterwards including logbook entry. If student fails to perform fast and slow falls adequately, he may practice these skills on a solo jump.

DEPLOY THE MAIN PARACHUTE
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 5

OBJECTIVE

- To perform a 360 degree turn and re-dock the Coach whilst maintaining proximity and levels.
- To test and confirm existing abilities and skills.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Coach goes out as base, student pins after unlinked exit; student pins Coach and not vice versa; student releases, does a 360 degree turn and redocks. Student to check altimeter. Wave-off is at 4 500ft. Student does 180 degree turn, tracks, waves off and pulls.
- Explain wave-off (VERY important) and to stop work at 4500ft. Turn, track, wave and deploy by 3000ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (box); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY THE MAIN PARACHUTE
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 6

OBJECTIVE

- To become familiar with a different PASA ISP Coach, their mannerisms and skills.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Repeat of Jump 3 but with a different Coach.
- Explain wave-off (VERY important) and to stop work at 4500ft. Turn, track, wave and deploy by 3000ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (box); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY THE MAIN PARACHUTE
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 7

OBJECTIVE

- Final test and confirmation of skills to become a Category I skydiver.
- Test to be completed with the same Coach as in Jump 6. It must be a different Coach to the one in Jump 5.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers
- PASA FS Video

PRESENTATION

- Repeat Jump 5, but with the same Coach as in Jump 6.
- Explain wave-off (VERY important) and to stop work at 4500ft. Turn, track, wave and deploy by 3000ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (box); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY THE MAIN PARACHUTE
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

SECTION 6

FORMATION SKYDIVING

CONTENTS

1 GENERAL

The category system is designed to teach student skydivers the specific skills in Formation Skydiving (FS) necessary to enable them to become competent in FS.

Through a system of periodic updates, coach evaluation and currency requirements, the category system strives to keep the skills taught current with international FS trends.

Taught correctly by an experienced FS Coach, the student can make rapid progress in just a few jumps. Each skill in turn must be successfully completed before the student is recommended to progress and each FS level adds more information, therefore expanding the pool of knowledge.

THE CATEGORY SYSTEM IS DESIGNED FOR:

- The student who has obtained Category I status through the successful completion of the Intermediate Skills Programme.
- Any skydiver wishing to choose FS as a discipline.

1.1 WHO CAN INSTRUCT ON THE CATEGORY SYSTEM

The FS category system involves a tremendous amount of personalised coaching, with the emphasis on having fun while learning rapidly. Only current and competent PASA rated FS Coaches, who need not be PASA instructors, can teach and perform the Category II coaching jumps. Provided that the teaching is standardised (taken directly from the manual) the student should be able to visit any drop zone in the country and receive the same coaching and information. The holder of a current coach rating must jump with the student on the Category II progression jumps and tests. Only the holder of a current coach rating may sign off the Category II progression jumps, the Category II tests and the Category III test.

Category system Coach's objectives

- To provide information before, during and after each skydive.
- To teach the necessary FS skills as laid down in the PASA manual.
- To communicate in the air by using in air signals. To teach and remedy mistakes as they happen in order that the student may carry on learning throughout the dive.
- To introduce the skydiver to contemporary FS as a discipline and its context, locally and internationally.
- To give the student a good deal.

1.2 COACH'S TEACHING FORMAT

Before the jump

- Check student's logbook - look for indication of student's ability.
- Talk through student's objectives - applicable to the skydive.
- Talk through the jump sequence - show the PASA FS video of the skydive, if possible.
- Teach each new skill in turn - applicable to the skydive.
- Dirt-dive the jump sequence from exit to pull - talking the student through.
- Dirt-dive the jump sequence from exit to pull - the student talking you through.
- Confirm in air signals - practice with student on the creeper.
- Confirm emergency procedures - during the skydive and under canopy.

In the aircraft

- During the climb (at approximately 5000ft) ask the student to talk you through the skydive from exit to pull.
- Suggest that the student mentally dirt-dives periodically until run-in.
- On run-in check pins.
- Take student to the door and observe the spot.

Exit and skydive

- Linked exit or unlinked exit.
- Before the release give in air signals to correct body position.
- Nod to indicate that you are going to release the student.

- Release the student for 3 seconds of no-contact - to ensure that the student is not moving away.
- Signal for the student to commence the task - student must be trained to have discipline to wait for a signal between each task.
- Altitude check between each manoeuvre.
- Track, wave-off and pull - Coach to observe that student does wave-off.

NOTE: Observe the student under canopy, land and walk back together.

After the jump

- Debrief - first the student's version and then the Coach's version. (Dirt-dive exactly what happened from exit to landing) **NOTE:** Acknowledge if you have made a mistake. The student will appreciate an honest debrief. Keep the debrief positive and employ the debrief technique "what you did well and what you can improve on".
- Corrective training - establish the student's weak points and give corrective training. Advise the student what to practice on the next jump.
- Logbook - student to fill in the logbook making comments on each part of the jump sequence. Coach must write in their recommendation for a repeat or pass on the dive. **NOTE:** Valuable information can be obtained by the next Coach if the logbook has been filled in correctly.

1.3 COACH'S NOTES

Suits, shoes and weight belts

- Gauge very carefully the fall rate of your student and the size of jumpsuit before the skydive. If necessary, give your student a weight belt to wear or wear one yourself if the student is obviously a heavy, fast faller. Students should not wear restrictive footwear like heavy boots which may be detrimental to their flying. It is recommended that students wear a FS bootie suit.
- The FS coach should always be properly dressed in an FS bootie suit. Coaching requires demonstrating the correct skills with the correct equipment for successful FS.

During the launch

- Brief your student to present to the relative wind on the exit. Arching more will assist in salvaging a poor exit. The student must react immediately to salvage a poor exit.

NOTE: Exit practice on the ground, from the mock-up or plane, is very important to ensure a good start to the dive.

After exit

- Before releasing the student, use signals to communicate to the student to ensure that there is no tension in the two-way. Get the student to fly in the FS Optimised body position (head up and arms slightly forward and below shoulder level with increased pressure on the legs) - straight down the tube.
- After the initial set of in-air signals nod to indicate that you are about to release.
- Fly no-contact for 3 seconds to ensure that the student is not moving away.
- Now you can signal to the student to start the next task.

In-air signals

- Make sure that the student understands the correct response to all in-air signals. Maximum learning is achieved during the freefall so practice the student these signals on the ground so that the desired response is achieved.

Notes:

Very often a problem that you can't pick up will be picked up by another Coach - work together with the other FS Coaches.

Always give your student as much information as is possible. In your FS coaching refer to these notes and ensure that you give the student a good deal. They are here to learn, and you are here to teach.

Jumps 1-5 may be completed in a wind tunnel with the holder of a current FS coach rating, provided video evidence of the jumps is retained, but jumps 6 and 7 must be completed on skydives with the holder of a current FS coach rating.

2 EQUIPMENT

Recommended Guidelines:

- Full face helmet or hard helmet with goggles.
  Helmets should fit and fasten properly.
  Vision must never be restricted by poor goggles; lack of good visibility can be hazardous.

- FS with grippers and booties
  A good FS bootie jump suit, fitted correctly, will aid control.

- Gloves
  Use of gloves will offer better protection against the cold and other hazards, but
  – should never be bulky enough to cause poor gripping, and
  – should be snug enough, or snapped on, to avoid having a glove come loose.

- Instruments
  Requirements and possible combinations are outlined in the PASA SOPs. They should be mounted in a manner that eliminates drag (possible vacuum). Wrist instruments should be mounted so they do not interfere with grips.

3 PROCEDURES AND RULES OF THE SKY

3.1 DEFINITIONS

The following terms are used to describe the different FS positions:

Base Man
Man in the air that all others work toward.

Pin man
The aggressor who will make the initial contact with the base man.

Aggressor
A skydiver who is at a different altitude than the base and works towards base.

Base
Short form for base man or can be used in reference to the initial base formation. Example: A 4-man Star is considered as the base for a larger star.

3.2 GENERAL AND SAFETY TIPS

Preparation
All formation skydives must be thoroughly planned in every detail. Minimum preparation recommended is:

- Selection of base, pin, 3 and 4 etc., aggressors.
- Exit technique, planned manoeuvres. Thorough planning of manoeuvre sequence including the aggressor descent pattern, if required.
- Break off, activation and canopy descent procedures.

Jumping
Throughout a skydive, planned procedures should be followed as closely as possible. A sudden change of plans just prior to exit or in mid-air can create confusion and turn the jump into a hazardous situation.

Exit
Proper planning of both order and method of exiting can be the determining factor of successful FS. Generally, the faster the exit is achieved (less separation), the easier it is to accomplish the planned manoeuvre sequence.

Communication
Hand signals and visual motions are a valuable aid to successful relative work. Coach should discuss in-air signals to be used to jump.

Break Off
Separation at 4000 feet, to allow spacing for opening, usually includes the following steps:

- Wave-off - visual wave with both hands or shaking the other parachutist if in contact with him.
- Turn - 180º turn out of the formation.
- Track - move away for 3 - 5 seconds to attain adequate horizontal separation.
- Check - perform a thorough visual check of the sky around, below and above you for the presence of other parachutists.

NOTE: On two man or group jumps, an attempt should be made to visually locate each parachutist prior to pulling. In mass jumps this becomes impossible. In either case, the parachutist should give a second wave, while checking, as a further indication to other parachutists that he intends to pull.

Activation
Break off at 4000 allows 5 seconds of fall to 3000 feet. This is adequate time for a proficient parachutist to separate, check and pull. Novice formation skydivers should break off at 4500ft with 4000ft as an absolute minimum break off altitude.

As soon as possible during deployment keep a sharp visual check for other canopies in the vicinity. Release the toggles as soon as possible after deployment so that you are prepared to turn if necessary. Front riser turns are even quicker.

Spaced Openings
If a pull sequence is planned, parachutists can pull in a predetermined order, starting at sufficient altitude to allow the low (bottom) man to be under a fully inflated canopy by 2200 feet.

NOTE: A combination of separation and spaced openings should be used for mass FS jumps.

Canopy Charge
All modified canopies surge forward with inflation. NEVER deploy your parachute level with and facing another parachutist if you are within 150 feet horizontally.

Emergency Activation
If failure to break off at 4000 feet has placed a parachutist low (below 2000 feet) the emergency break-off and activation procedure should be:

- Break and quickly turn 180º
- Check
- Pull
- Grasp toggles IMMEDIATELY and prepare to avoid a possible canopy collision

Canopy Descent
Throughout the descent, maintain a sharp visual look out for other canopies. The following right-of-way rules should be applied:

- Low man has preference
- Allowing smaller/faster canopies to land before the bigger/slower canopies is good airmanship

Canopy Collision
Failure to attain adequate separation before pulling or lack of visual observation during descent can result in a canopy collision.

- Collision on Opening

  Immediately:
  - Attempt to clear any entanglements that restrict movement.
  - Attempt to verbally inform the other parachutist of your planned procedures.
  - Release the damaged main canopy (if pilot chute equipped).
  - Allow momentary separation (altitude permitting).
  - Activate the reserve when clear.

Parachutists using manual reserve procedures should exercise extreme caution that the reserve doesn't become entangled with the other canopies. Release the damaged canopy after reserve inflation.

- Collision during descent

  Immediately:
  - Attempt to clear any entanglements restricting movement.
  - Verbally inform the other parachutist of your intentions.
  - Activate the reserve if necessary.

  NOTE: A serious canopy entanglement at 500 feet or lower will usually not allow adequate time for reserve procedures and could be fatal to both parachutists.

Canopy Wash

Immediately above and behind all modified canopies there is an area of displaced air that can suddenly increase the rate of descent of another parachutist encountering it. Exercise caution in passing other canopies at close range.

Body burble

All free-falling parachutists create turbulent air directly above them. Moving into a position directly above another parachutist (within 6 feet vertically) can result in a sudden vertical drop onto the back of the bottom parachutist that can injure both parachutists involved.

Closing Speeds

High closing speeds can be extremely dangerous to all parachutists involved.

4 CATEGORY II JUMP PROGRAMME

INTRODUCTION

The first FS jump should be regarded as the first step in a new progression sequence, NOT as the last stage of the original student progression chart. Therefore, the student should have already progressed onto non-student gear and become thoroughly familiar with it, in order to be taught correct FS techniques right from the beginning. The student will have completed the ISP programme so has an understanding of basic FS skills.

JUMP 1

OBJECTIVE

- To practice the FS optimised body position.
- To fly in a head up position, arms slightly down and forward.
- To practice leg turns.
- To maintain proximity and keep eye contact with the coach.

EQUIPMENT

- Jump suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student. FS bootie suit recommended as it provides more efficient surface area for leg turns.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Linked exit to give maximum working time on body position. Student to exit in base or pin position, at Coach's preference.
- After exit, Coach to release student only after correcting body position by means of in-air signals and demonstration. (**N.B.** - Discuss in-air signals: straighten legs, bend legs, arch harder, arms forward, eye contact, altitude reminder.)
- If all OK, release student for no-contact FS; if a problem, redock and start again; No contact flying focusing on FS optimised body position. Student to lift head up to get better visuals. Arms slightly forward and down.
- Once happy with body position student to do 90º turns using leg turn technique. To turn right student pushes left knee down and does a leg layover to the right (drops foot to the right) and/or raises the other leg. Repeat 90º turn back to star then in other direction.
- Explain wave-off (VERY important) and to stop work at 4000ft. Turn, track, wave and deploy just under 3000ft to be under a fully inflated canopy by 2200ft.
- Dirt dive the jump thoroughly; stress relaxation; dirt dive from the aircraft/mock-up to be used, from exit to break off.
- Altitude awareness - discuss its importance and relevance to this and all future jumps; stress that altitude is not to be sacrificed for anything.
- Make the task at hand seem simple.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY MAIN CANOPY
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 2

OBJECTIVE

- To start practising Cat III test skills.
- To do unlinked exit.
- To approach and dock correctly i.e. head-on. Dock using palming technique rather than solid grips.
- To do 180º turns from star to cat position keeping eye contact with the Coach.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Unlinked exit - Coach to be base; stress importance of close exit (hand on the Coach); N.B. exit must be close, head up, good presentation to the relative wind, keep eye contact.
- Help student by compensating for altitude and moving towards him if he is far away; let student do the dock.
- If exit was bad, and time is being wasted, Coach to pin student.
- Check body position as per Jump 1.
- Either student or Coach releases; student does 180º turn to cat position. Keeping eye contact with the Coach all the time. The student is not encouraged to do a head switch. Student then turns back to star and repeats in the other direction.
- Explain wave-off (VERY important) and to stop work at 4000ft. Turn, track, wave and deploy just under 3000ft to be under a fully inflated canopy by 2200ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (FS optimised); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY MAIN CANOPY
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 3

OBJECTIVE

- To work on side sliding and eye contact.
- To do unlinked exit and dock safely.
- To side slide in front of Coach from opposed stairstep to opposed stairstep

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Unlinked exit. Coach exits as base, student pins in unlinked exit; if time is being wasted, Coach can pin.
- Check body position as per Jump 1.
- Either student or Coach releases; settle in no-contact FS position. Coach and student turn to make opposed stairstep i.e. student hold Coach's right hand with his right hand - formation to be parallel - student then releases grip and side slides to make opposed stairstep with the other hand. Student side slides by dropping elbow and knee on the same side of their body (e.g. to move right use elbow and knee on right side) and/or raising opposite elbow and leg. Student to focus on keeping parallel with the Coach. Coach to sit completely still and not turn towards student. Student repeats task for whole jump.
- Explain wave-off (VERY important) and to stop work at 4000ft. Turn, track, wave and deploy just under 3000ft to be under a fully inflated canopy by 2200ft.
- Stress looking at altimeter after each move.
- Stress at all times a relaxed attitude and concept of a good body position (FS optimised); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY MAIN CANOPY
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 4

OBJECTIVE

- To do unlinked exit and dock on Coach safely.
- To practice fast and slow fall movements specific to small FS jumps (i.e. 2 and 4 way). Hips down to go faster, de-arch (lifting hips) to go slower. Alternative fall rate techniques and the context for each should be discussed.
- The focus is on accurate small movements creating anticipation during a jump

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Coach goes out base, student pins after unlinked exit.
- Student pins, then release and both do no-contact FS.
- Check body position as per Jump 1.
- Student to do 90º turn to sidebody position. Student to match Coach's fall rate. Coach to de-arch slightly by lifting hips and bending spine and student follows immediately. Coach to fall faster by pushing hips outs and student follows immediately. Coach to dock between each movement once the student is on the same level.
- Repeat exercise if altitude permits.
- Explain wave-off (VERY important) and to stop work at 4000ft. Turn, track, wave and deploy just under 3000ft to be under a fully inflated canopy by 2200ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (FS optimised); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This jump involves practical demonstration of the skills described above. Debrief the dive thoroughly afterwards including logbook entry. If student fails to perform fast and slow falls adequately, he may practice these skills on a solo jump.

DEPLOY MAIN CANOPY
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 5

OBJECTIVE

To practice super positional movement.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Unlinked exit. Student to dock Coach.
- Student to turn to right hand opposed stairstep formation. Coach to stay still and not turn for whole dive.
- Student to do a 360º turn right to finish in a left hand opposed stairstep. The student will have to do a superpositional (sideslide and 360º turn) move to cover the distance between the opposed stairsteps.
- Student to focus on eye contact and proximity during the skydive.
- Explain wave-off (VERY important) and to stop work at 4000ft. Turn, track, wave and deploy just under 3000ft to be under a fully inflated canopy by 2200ft.
- Stress looking at altimeter after each movement.
- Stress at all times a relaxed attitude and concept of a good body position (FS optimised); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY MAIN CANOPY
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 6

OBJECTIVE

To obtain Category II FS - Cat II test part 1.
To perform 180º and 360º turns with eye contact.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light students.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Coach goes out as base, student pins after unlinked exit; student pins Coach **and not vice versa**; student releases, does a 180º turn to Cat formation. With no head switch, the student then does a 360º turn back to Cat formation keeping close proximity to Coach. No head switch. Student then does a 180º turn back to star formation.
- Explain wave-off (VERY important) and to stop work at 4000ft. Turn, track, wave and deploy just under 3000ft to be under a fully inflated canopy by 2200ft.
- Stress looking at altimeter after each movement.
- Stress at all times a relaxed attitude and concept of a good body position (FS optimised); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY MAIN CANOPY
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

JUMP 7

OBJECTIVE

Final exercise for becoming a Category II Formation Skydiver.
To obtain Category II FS - Cat II test part 2.
To perform a 360º turn and dock onto Coach's legs and side, maintaining proximity and controlling levels.

EQUIPMENT

- Jump-suits - size relative to each other, taking into consideration the following: weight, height, reach, type of rig; this should be explained to the student.
- Weight belts - if necessary, for light girls.
- Training creepers.
- PASA FS Video.

PRESENTATION

- Coach goes out as base, student pins after unlinked exit; student pins Coach **and not vice versa**; student releases.
- Student does a 360º turn at the same time the Coach does a 180º turn to Cat formation. Student to dock on Coach's legs.
- Coach does 90º turn to sidebody. Student docks on Coach in sidebody formation.
- Coach does 90º turn back to star formation. Student to dock on Coach.
- Student must maintain proximity to Coach and control levels.
- Eye contact is essential.
- Explain wave-off (VERY important) and to stop work at 4000ft. Turn, track, wave and deploy just under 3000ft to be under a fully inflated canopy by 2200ft.
- Stress looking at altimeter after each dock.
- Stress at all times a relaxed attitude and concept of a good body position (FS optimised); fall straight down.

REVISION

The lesson content should be revised by the Coach with the active participation of the student.

TEST AND CONSOLIDATION

This involves practical evaluation and the objectives must be achieved. Debrief the dive thoroughly afterwards including logbook entry.

DEPLOY MAIN CANOPY
DEPLOY AT THE CORRECT ALTITUDE
PREFERABLY DEPLOY STABLE

5 CATEGORY TESTS

The successful completion of each category test shall be logged in the student's logbook and signed by his DZ Chief Instructor based on the feedback logged and signed by the holder of a current coach rating who completed the jump with the student.

CAT I

The student shall have successfully completed the Intermediate Skills Programme (ISP) as contained in Section 5 of the PASA SOPs.

CAT II

The student shall have completed all tasks described in jumps 1-5 with the holder of a current FS coach rating, either in a wind tunnel or in the sky.

The student shall have successfully completed the following tasks on two different skydives using the correct optimised techniques taught in the Cat II programme: (see jumps 6 and 7 of point 4 above)

Cat II Test - part 1
- Exit unlinked with a Coach.
- Pin the Coach.
- Do 180º turn to Cat formation.
- Do 360º turn back to Cat formation.
- Do 180º turn to star formation.
- Pin the Coach again.
- Wave off at correct altitude.
- Turn and track away from Coach.
- Stop, wave and deploy.

Cat II Test - part 2
- Exit unlinked with a Coach.
- Pin the Coach.
- Do 360º turn to Cat formation (Coach does 180º turn). Student to do all docks, to maintain proximity and to control levels.
- Dock in sidebody formation on Coach (Coach does 90º turn)
- Dock in Star formation on Coach (Coach does 90º turn)
- Wave-off at correct altitude.
- Turn and track away from Coach.
- Stop, wave and deploy.

CAT III

The student shall have successfully completed the following tasks:
- Exit fourth after a 3-way star.
- Pin the 3-way in a pre-designated slot.
- Complete break.
- Perform a 180º turn in place to form a Murphy star while the other 3 jumpers hold a 3-way link.
- Complete break.
- The 3-way forms an arrowhead and the student closes the formation on the legs of the wings, forming a 4-way diamond. An alternative is to build an opposed diamond with the head of the diamond facing the student.
- The student must give the shake at the correct altitude, indicating altitude awareness.
- The student must turn, track, stop, wave and deploy at the correct altitude to pass the test.

6 LICENCE REQUIREMENTS

A Licence
As per Section 2 (PASA SOPs)

B Licence

As per Section 2 (PASA SOPs)

Note: Category III test must be done in accordance with paragraph 5 of this section.

C Licence

Must have met all C Licence requirements as per Section 2 (PASA SOPs) and:

- Have, on at least four separate occasions, successfully docked fifth or higher on the first point in formations of five or larger.
- Have, on at least one occasion, successfully closed 8th or later on the first point in an eight person or larger formation.

D Licence

Must have met all D Licence requirements as per Section 2 (PASA SOPs) and:

- Have safely docked fifth or higher on the first point on at least 10 formation skydives.
- Have participated in at least three eight way or larger formations where at least two distinct non-repeating sequential points were successfully completed.
- Have successfully participated in one of the following formation skydives
  - 5 points in an eight way, drawn and assessed as per the current IPC Formation Skydiving competition rules and dive pool;
    OR
  - 3 distinct non-repeating sequential points in a ten way or larger formation [unlinked exit by the candidate jumper];
    OR
  - 1 point in a sixteen way or larger formation [unlinked exit by the candidate jumper].
- One night Formation Skydive.

7 COACHES

The coach rating is designed to give a formal qualification to those who teach FS jumpers up to Cat III level. All applicants for coach ratings must be recommended by a CI and endorsed by the FS committee of the SSA (see Form 19).

An applicant for a FS Coach Rating must:

- Have a minimum of 300 jumps.
- Hold a PASA C or D licence.
- Hold a PASA Jumpmaster rating.
- Have done a minimum of 50 FS jumps in the previous 12 months (two or more people turning prescribed formations on non-coaching skydives).
- Have attended a FS sanctioned coaching seminar in the previous 12 months.
- Have observed all Category II FS briefings (7 levels).
- Have given 3 Category III FS briefings under the supervision of a current FS coach.
- Have successfully completed the following 3 evaluation jumps with a current PASA FS Cat II Coach Evaluator:
  Jump 1: Demonstration of FSO body position and correct FS technique (as a minimum, all turns and movements covered in the Cat II programme).
  Jump 2: A Cat II coaching jump simulation using the evaluator as the student (Cat II level of the applicant's choice), including briefing and debrief.
  Jump 3: A Cat II coaching jump simulation using the evaluator as the student (Cat II level of the evaluator's choice), including briefing and debrief.
- It is highly recommended to have participated in an SSA–sanctioned FS event, such as SA Nationals.

To remain current as a FS Coach the rating holder must:

- Have completed 10 FS Category II or Category III coaching jumps in the previous 12 months.
- Have done 50 FS jumps in the previous 12 months (two or more people turning prescribed formations on non-coaching skydives).
- Attendance of a FS sanctioned coaching seminar in the previous 12 months is highly recommended.

SECTION 7

ARTISTIC EVENTS

CONTENTS

1 GENERAL

Artistic Events (AE) incorporates freeflying and freestyle and is set to absorb emerging disciplines, should this become necessary.

The category system, will take the student through a fun and natural progression of basic VRW (Vertical Relative Work) skills, before allowing them to progress naturally into an experienced jumper. Each new skill must be successfully completed before the student is permitted to progress, as each dive adds more information and a new skill, or tests an existing one. Once a skydiver has a D licence in AE one can be sure that they can safely fly in large Head Down or Head Up formations. Each prescribed jump must therefore be completed in order to progress.

The logical progression of skills is:
1 mastering the new body positions,
2 maintaining freefly speeds,
3 falling straight down the tube,
4 adjusting speeds,
5 horizontal movement,
6 vertical movement,
7 rotating around one of the three axes in one place,
8 transitions into the various body positions.

The category system teaches the student the basic positions of AE flight, before testing the skills accumulated over time in the C and D Licence jumps.

It is recommended that students do as many solo jumps as possible, with the correct briefing beforehand from an AE Head Up (HU) coach or AE coach, to practise the test jumps in this section.

1.1 THE CATEGORY TEST JUMPS ARE DESIGNED FOR

The student who has obtained Category I status through the successful completion of the Intermediate Skills Programme.

1.2 ARTISTIC EVENTS COACHES

The AE category system is instruction based. In order for students to progress safely and without learning bad habits, it is essential that coaches participate actively. Current and competent PASA rated AE Coaches, who need not be PASA instructors, can teach the entire progression. Current and competent PASA rated AE Head Up Coaches can teach the AE Head Up progression jumps, i.e. up to the end of the C Licence jumps. Provided that the teaching is standardised (taken directly from the manual) the student should be able to visit any drop zone in the country and receive the same coaching and information. The holder of a current AE Head Up Coach rating can sign off Category II and Category III progression jumps, as well as C Licence qualifying jumps. The holder of a current AE Coach rating can sign off Category II and Category III progression jumps, as well as C and D Licence qualifying jumps. Note that only AE Coaches are permitted to progress or instruct students on Head Down / D Licence qualifying jumps. All coached jumps should be recorded in the student's logbook. All successful progression jumps must be recorded in the student's logbook and signed off by the AE or AE Head Up Coach who jumped with the student.

1.3 CATEGORY SYSTEM COACH'S OBJECTIVES

- To provide information before, during and after the skydive.
- To provide students with appropriate footage of the correct way to perform a progression jump.
- To provide students with footage of their own jump in order to comment and correct.
- To teach basic AE and further discipline skills, as laid down in this section.
- To teach SAFE AE flying in any one of the disciplines in a way that both the coach and student never lose sight of having fun.
- To communicate in the air by using "in air" signals.
- To teach and remedy mistakes as they happen in order that the student may carry on learning throughout the skydive.
- To give the student a good deal.

NOTE: Acknowledge if you have made a mistake – the student will appreciate an honest coach.

1.4 TEACHING FORMAT

Before the jump:

- Check student's logbook - look for indication of a student's ability.
- Talk through student's objectives - applicable to the skydive.
- Talk through the jump sequence and show a video if possible.
- Teach each new skill in turn - applicable to the skydive.
- Dirt dive the jump sequence as best as possible from exit to pull (talking the student through).
- Confirm in air signals (practice these with student).
- Confirm emergency procedures.
- Check equipment and dirt dive more.

In the Aircraft:

- During the climb (approximately 5000ft AGL) ask the student to talk you through the skydive from exit to pull.
- Suggest that the student mentally dirt dives periodically until run-in.
- On run-in and before exit check pins and puffs.
- Take student to the door and observe the spot.

After the Jump:

- Debrief – first the student's version then the coach's.
- Debriefing should happen before the next coached jump takes place.
- Corrective training – establish the student's weak points and give corrective training. Advise the student what to practice on the next jump.
- Logbook – student to fill in the logbook making comments on each part of the jump sequence. Coaches must write in their recommendation for a repeat or pass on the skydive.

NOTE: It is essential that the coach jump with a camera. Video is one of the best training tools and the only method of the student linking their feeling of the jump with the reality of their execution.

NOTE: The next coach can obtain valuable information if the logbook has been filled in correctly.

2 EQUIPMENT

Every AE skydiver's nightmare is a premature opening. Firstly, the jumper may be transitioning and become entangled. Secondly, they will be going faster than the recommended canopy opening speed; potentially fast enough to hurt or seriously injure themselves or even damage the canopy.

2.1 CONTAINER

Containers must be tight fitting and should never allow for exposure of risers, pins and, most importantly, the bridle and pilot chute. Exposed risers are not recommended. Ensure that all pin protection flaps and riser covers are secure so that they will not move during the higher speeds of AE flight.

2.2 DEPLOYMENT SYSTEM

Bottom of container (BOC) throwout or a pullout deployment are vital as the pilot chute and bridle must be stowed tightly away from the airflow. NO leg strap throwouts allowed. Keep your closure loop tight and in good condition, inspect it for wear on a regular basis (every pack job) and check Velcro for wear.

2.3 ALTIMETERS

It is mandatory for every participant to wear both a visual and audible altimeter on any AE skydive. The reason for this is that, unlike in FS, one loses sight of the ground and, with this, comes the danger of losing altitude awareness.

2.4 CLOTHING

It is important that clothing does not restrict movement and that it does not cover handles. In Head Up flying, it is recommended that drag about the lower body is minimised, as too much drag (i.e. heavy material, baggy pants) can make keeping your feet down that much more difficult. Conversely, drag about the lower body can assist the Head Down skydiver tremendously.

2.5 AAD (AUTOMATIC ACTIVATION DEVICE)

An AAD is highly recommended. The potential for high-speed collisions exists.

2.6 RESERVE HANDLES

Ensure that Velcro is in a good condition. One can also decide to change the metal D – handle to a puff the same as the cutaway puff. However, if you prefer to jump with your alti on your palm the D – handle is the preferred option.

2.7 GOGGLES

Should not limit visibility and should be securely tightened, as the varying body positions and higher speeds easily dislodge them.

2.8 HELMET

A hard-shell helmet is compulsory for all AE skydivers during the category jumps and highly recommended thereafter.

3 PROCEDURES AND RULES OF THE SKY

3.1 DEFINITIONS

Student refers to the person performing the test.

Coach refers to the coach of the test, as well as the reference point or base for the student. It is the responsibility of the student to appoint a capable coach / cameraperson and confirm it with the CI.

Base refers to the person in the sky toward whom the student or the rest of the formation is working.

Basic Sit Position (BSP) refers to a position where the feet are oriented toward the relative wind and 90-degree bends are maintained at the knees, hips, and shoulders.

Back Down Stable refers to the recovery position used in order not to 'cork'. It is a back to earth position - like an inverted 'box man' in FS - which allows the flyer to maintain freefly speeds.

Ball Down Stable (BDS) refers to the recovery position used in order not to 'cork'. It is a bum to earth position - like a human shuttlecock - which allows the flyer to maintain freefly speeds.

Head Up Flying is flying with your feet lower than your head; i.e. sit flying, stand ups and knee flying.

Head Down Flying is a position when your head is lower than your feet, with legs either in a split or a "daffy".

VRW stands for Vertical Relative Work.

Barrel Roll refers to tracking and turning on the axis running through the head and feet to look if there is clear sky above you prior to opening. It is essential that the student learns this at an early stage and make it part of every skydive, to ensure safe deployment.

Break Off separation in the sky prior to opening altitude. It is recommended that the break off altitude is 4500ft AGL to allow for good separation and time to slow down.

Layout refers to a back or front loop with the body in a fully stretched position to be recovered in an alternative body position.

Freefly Track is a track that includes a full barrel roll. All AE students are to perform a freefly track on every test jump in order to pass the jump.

Sit Stand refers to a stable Head Up position where the knees are not locked into position, but ready to compensate for vertical separation at all times.

Corking is when a jumper falls flat out of a faster body position and thereby slowing down rapidly whilst the other jumpers continue falling at the increased speeds of AE flight. This is extremely dangerous and is the primary lesson taught in AE jumps.

Hand Dock is when a jumper uses his hand to dock onto another jumper's hand. This can be attained by holding in a grip or by just touching hands.

Foot Dock is when a jumper uses his feet to dock onto another jumper's feet. This can be attained only by inter-locking feet and holding it securely. Touching of feet only is not classified as a dock.

Freefly Exit refers to an unlinked exit.

3.2 RULES AND PROCEDURES

- Recommended minimum break-off altitude 4500ft AGL.
- Due to the nature of the jumps prescribed in this section and for C and D Licence qualifying jumps it is highly recommended that these jumps be done from a minimum of 11000ft AGL.
- All jumpers participating in any AE discipline and the progression have to wear both a visible and audible altimeter.
- Jumpers must successfully complete all C Licence progression jumps in AE before attempting Head Down with anyone other than an AE Coach.
- Skysurfing may not be attempted until the jumper has obtained their C Licence in AE.
- Tests and instructional dives are to be done with an appropriately qualified AE Coach or AE Head Up Coach.
- Fun and safety are the key words.
- Students should be encouraged to practice all the set jumps with at least 5 – 10 solo attempts first, as this will raise confidence levels and ensure a more relaxed frame of mind.
- Until such time as a Cat III is obtained in AE, intermediates are not permitted to participate in formations larger than 3 ways.

3.3 GENERAL AND SAFETY TIPS

- Smaller groups and slower speeds.
- Planned procedures should be followed as closely as possible throughout a skydive. A sudden change of plans just prior to exit or in mid-air can create confusion and turn the jump into a hazardous situation.
- Check pins and puffs before boarding, in the plane and again before exit.
- Emphasise the importance of relaxing and breathing during the skydive.
- AE involves many different flying positions and relates to many different speeds ranging from 180 to 400km per hour. A logical progression is to learn how to fly your body in the slower positions first, before moving to faster ones. Learning to control speed, direction and proximity at slow speeds increases awareness and reactions.
- Furthermore, it is important to remember that one-on-one flying is the safest way to experience flight with someone else. It allows flyers to maintain visual contact with each other at all times.
- It is important that the basic rules of AE are maintained, as laid down in this section.
- Never link exits on progression jumps. Try to ensure that eye contact remains the means of staying together on exits. This is so that the student develops the art of flying his body to remain relative to the base.
- It is usually easier for students to begin exiting with their backs to the prop. The student must be encouraged to just drop away from the plane, rather than launching off it.
- Students must be taught to fly as the Base for all Category II and Category III Jumps. This means that it is the AE Head Up Coach or AE Coach who will close any gaps after exit, to avoid 'zooming'. From the First C Licence jump, students will be using the vertical and horizontal movement skills they have been taught in order to fly in proximity to the base.

4 TRAINING PROGRAMME – BASIC STUDENT EXERCISES

4.1 CATEGORY II

Your Cat II in AE should be attainable by 15 - 30 AE free falls, and enables one to jump in a BSP with one other Category II jumper. On completion of these tests jumps, the coach should be satisfied that the student can maintain the speed required for safety in AE jump, without corking.

These jumps must be recorded in the student's logbook and signed off as 'passed' by a current AE Coach or AE Head Up Coach. The briefing for this jump is of extreme importance, as it forms the basis of the student's understanding of the safety, theory and practice of Head Up skydiving.

The objective is to prove that the student is going down the tube and will not cork into anyone else. Note that, by passing this jump, the student is permitted to freefly with other skydivers who may be fairly junior. Make sure the student is able to always recover in a fast position if they 'lose it 'on their feet before passing their Category II jumps.

FIRST AE JUMP BRIEFING:

- Reiterate additional safety concerns when Head Up as opposed to flat.
- Encourage student to always exit back to prop even when doing practice solo jumps.
- Entire body out of aircraft before exit.
- Don't launch, drop off/let go (avoid going into the skydive with a rotation or too much energy).
- Exit with feet to prop (explain relative wind) with upper body drag and anchored legs.
- Allow time for position to take effect.
- Try to show the exact position you are aiming for: open chest, chin up, chin back, back in the wind, anchored feet (toes up).
- Encourage student to hold the position and familiarise themselves with a new sensation – a bit of a turn is no problem initially.
- Spinning / instability is always due to asymmetry (one foot not pressing down enough, one arm too much).
- Explain the symmetry, 90 degree angle in knees, arms, hips, elbows.
- Explain the difference in leaning too far forward or too far back.
- Explain that the student will act as the 'base' and must not try to alter their position to follow the coach.
- Stress the importance of a BDS recovery position. This will allow the student to maintain the fall rate whilst being in a stable position.
- We teach Ball Down Stable initially in the air for the following reasons:
  Ball Down Stable
  - Easier position to get right up front.
  - Easier to maintain fall rate.
  - Ideally a combination Back Down and Ball Down is necessary to effectively get back into a vertical orientation.

  Back Down Stable (Once the Ball Down position is learnt)
  - Can be very slow (like corking on your back).
  - Harder to control as more surface areas is in the airflow.
- Regular alti checks due to increased fall rate.
- No more work from 4,500ft by waving off.

Jump 1: Basic Sit Position (BSP) / Ball-Down Stable (BDS)

Objectives

- To introduce the student to the speed of freefly and the BSP.
- To introduce the BDS as the new recovery position.
- Ensure altitude awareness.
- Introduce the freefly track.
- Safe method of recovery back onto belly for deployment.

Jump Sequence

- Student to give the exit count and initiate exit.
- After exit the student adopts the BSP. Student to use BDS position each time he falls out of the BSP.
- Student to complete 3 altitude checks during the dive.

- At 5000ft AGL the student shakes his head indicating ‘no more work’.
- At 4500ft AGL the student performs a freefly track on his back before performing a barrel role and deploying.

Jump 2: Maintaining Vertical Speeds

Objectives
- To refine the BSP.
- Ensure altitude awareness.
- Ensure that ‘corking’ does not occur.
- Ensure that the student is acting as the ‘base’ and not trying to move to the coach.
- Refine the freefly track.

Jump Sequence:
- Student to give the exit count and initiate exit.
- Student to exit with his back to the prop in the BSP. Altitude check.
- If the student falls off the BSP position at any stage, he must adopt the BDS Position. Reiterate the dangers and meaning of ‘corking’.
- The coach is to sit in front of the student, showing a good picture to reciprocate giving ‘in-air’ signals all the time.
- Student completes a minimum of 3 altitude checks during the dive.
- At 5000ft AGL the student shakes his head indicating ‘no more work’.
- At 4500ft AGL the student performs a freefly track on his back before a barrel roll onto his belly for deployment.

4.2 CATEGORY III

Your Cat III in AE should be attainable by 75 – 100 AE free falls and enables jumpers to receive their B Licence. On completion of these test jumps, the coach should be satisfied that the student is in control of both vertical and horizontal movement and can maintain a heading on exit.

These jumps must be recorded in the student’s logbook and signed off as ‘passed’ by a current AE Coach or current AE Head Up Coach.

It is important to stress that the reason fall rate is taught first is that all separation must be closed, first in the vertical, and then in the horizontal plane, in order to avoid collision with the formation / group one is approaching.

Jump 1: Fall Rate Control

Objective
- To teach and evaluate the student’s ability to move vertically in the Head Up flying body position.
- To refine the BSP.
- Ensure altitude awareness.
- Create heading awareness.
- To refine the freefly track.
- Student to act as base and fall ‘down the tube’ only,

Jump Sequence:
- Student to give the exit count and initiate exit.
- Freefly exit in sit-stand position with back to the prop.
- Student to attempt to maintain heading on exit.
- Once settled, the student must perform an altitude check.
- Coach to go below the student (approximately 5m) by standing / adopting a faster falling position.
- On signal from the coach, the student to adopt a faster falling position and stop on level with coach.
- Student performs altitude check.
- Coach will prompt a repeat if necessary. Otherwise, coach to initiate a fall slow manoeuvre, stopping about 5m above the student.

- On signal from the coach, the student to initiate a fall slow manoeuvre, and stop on level with coach.
- Student performs an altitude check.
- At 5000ft AGL the student shakes his head indicating ‘no more work’.
- At 4500ft AGL the student performs a freefly track on his back before a barrel roll onto his belly for deployment.

Jump 2: Horizontal Movement

Objective:
- Maintain heading awareness on exit.
- Forward and backward movement.
- Ensure altitude awareness.
- Proximity flying.
- Perfect the freefly track.

Jump Sequence:
- Student initiates exit count and exit.
- Student preferably maintains heading on exit, from a ‘back to prop’ exit where possible.
- Student completes an altitude check once settled.
- Coach to move backward, about 5m away, from student.
- On signal from the coach, the student is to move forward and close the gap.
- Student performs altitude check.
- On signal from coach, student to initiate backward movement and stop approximately 5m away from the coach.
- At 5000ft AGL the student shakes his head indicating ‘no more work’.
- At 4500ft AGL the student performs a freefly track on his back before a barrel roll onto his belly for deployment.

5 LICENCE REQUIREMENTS

A Licence:
As per Section 2 of the PASA SOPs.

B Licence:
As per Section 2 of the PASA SOPs.

Note: Category II and Category III test jumps must be done in accordance with paragraph 4 of this section.

C Licence:
As per Section 2 of the PASA SOPs.

Must have completed all jumps in the C Licence progression as per this section.

Your C Licence in AE should be attainable by 200 – 300 AE jumps and enables one to jump in Head Up with large groups of Head Up flyers. On completion of these C Licence jumps, the coach should be satisfied that the student can maintain a heading on exit, perform turns, transitions and basic docks on level and in proximity. Once a C Licence is achieved, a student can safely participate in Head Down jumps with one other freeflyer who holds a C Licence.

From the First C Licence jump, students must be taught to use the vertical and horizontal movement skills they have been taught in their progression in order to fly in proximity to the base. The coach can help to close any separation after exit but must remain in one place when the student performs turns and transitions. In this way the student will notice any level or separation problems in performing these manoeuvres.

These jumps must be recorded in the student’s logbook and signed off as ‘passed’ by a current AE Coach or current AE Head Up Coach.

Jump 1: Proximity

This is a three-way HU jump with a student, a HU/AE Coach and one other skydiver.

Objectives:
- To test the student's ability to perform 180° turns.
- To utilise the skills learned in Category III jumps to fly in proximity with the base.
- Perfect heading awareness using turning ability.

Jump Sequence:
- Exit is unlinked and in Head Up position.
- Student to give the exit count.
- The 3-way to fly in proximity in an unlinked round formation.
- Student performs alti check
- Student to fly through the space between the two other jumpers and perform a 180 degree turn in the process, thereby creating a new unlinked round formation (swopping slots).
- Student to maintain levels and proximity throughout.
- Alti check.
- The other jumper and coach each have a turn to do this too.
- Student to break-off the formation by 4 500ft.

Jump 2: Docking

This is a three-way HU jump with a student, a HU/AE Coach and one other skydiver.

Objective
- To utilise the skills learned in Category III jumps to fly in proximity with the base.
- To test the student's ability to join a formation.
- Formation is not specified but stair-step is recommended as the easiest.

Jump Sequence
- Student gives the exit count.
- Student may not be linked to the base on exit.
- Coach and other jumper to form a base by docking.
- Student performs alti check.
- Student docks the formation and the formation continues to fly for 3 seconds.

D Licence:
As per Section 2 of the PASA SOPs.

Must have completed the D Licence requirements of this section.

Your D Licence in AE should be attainable by 500 AE jumps and enables one to jump in Head Down with large groups of Head Down flyers. On completion of these D Licence jumps, the coach should be satisfied that the student can perform turns, transitions and basic docks on level and in proximity and that a safe method of tracking away from a larger Head Down group is developed.

These jumps must be recorded in the student's logbook and signed off as 'passed' by a current AE Coach. Only current AE Coaches are permitted to pass D Licence progression jumps and footage of this must be available should the SSA AE Committee or PASA require it before awarding the licence.

Jump 1 : Tracking

This is an angled flight jump in which the student adopts a back-flying position, and where the student has taken a dock on the 'leader' of the skydive, who should be in a more earth facing position.

Objectives
- To test the student's ability to fly in unusual orientations.
- To display docking skills.

Jump Sequence
- Student to exit in a ‘floating’ slot from outside of the aircraft.
- After exit student is to fly in an angled position, with back facing down.
- Student to fly to the earth facing leader of the skydive.
- Student to dock the leader.

Jump 2 : Proximity

This is a three-way Head Down jump. One jumper must be an AE Coach. The student exits unlinked and docks last on the two-way formation formed by the other two jumpers.

Objectives
- Forward and backward movement.
- Proximity flying.

Jump Sequence
- Student to initiate exit count and launch.
- The other two skydivers exit a linked Head Down two-way formation, but the student may not be linked to the formation on exit.
- Student to fly to the round formation and open it to form a 3-way round Head Down formation.
- Student breaks the formation off and performs a 180 degree turn before tracking away on their back.

Jump 3 : Formation Work

This is a three-way Head Down jump. One jumper must be an AE Coach.

Objectives
- Testing the ability to exit in a linked formation.
- Testing the ability to make small rotations and take docks.
- Tests fall rate control.

Jump Sequence
- Student to initiate exit count.
- Grips are changed to form a ‘Round’.
- Jumper 1 & 2 form an accordion off jumper 3.
- Grips are changed to form a ‘Round’.
- Then Jumper 2 & 3 form an accordion off jumper 1.
- Grips are changed to form a ‘Round’.
- Then Jumper 3 & 1 form an accordion off jumper 2.
- Student breaks the formation off and performs a 180 degree turn before tracking away on their back.

6 COACHES

6.1 AE Coach

The AE Coach rating is designed to give a formal qualification to those who teach AE jumpers up to and including D Licence level. All applicants for AE Coach ratings must be recommended by a CI and an AE coach and endorsed by the AE committee of the SSA (see Form 19).

An applicant for an AE Coach Rating must:
- Have a minimum of 500 jumps.
- Hold a PASA AE D Licence.
- Hold a PASA Jumpmaster rating.
- Have been recommended to the AE committee of the SSA as competent to coach by a current AE Coach.
- Have attended an AE sanctioned coaching seminar, approved by the SSA.

To remain current as an AE Coach the rating holder must:

- Have performed at least 50 jumps in the previous 12 months of which 25 must be AE jumps.
- Attendance of an AE sanctioned coaching seminar in the previous 12 months is highly recommended.

6.2 AE Head Up Coach

The AE Head Up Coach rating is designed to give a formal qualification to those who teach AE jumpers up to and including C-Licence progression jumps. All applicants for AE Head Up Coach ratings must be recommended by a CI and an AE coach and endorsed by the AE committee of the SSA (see Form 19).

An applicant for an AE Head Up Coach Rating must:

- Have a minimum of 300 jumps.
- Hold a PASA AE C Licence.
- Have successfully completed a PASA approved Jumpmaster, Static Line Instructor or AFF Instructor Course.
- Have passed two check out jumps with two separate AE Coaches, where the AE Coach takes the student's slot. At least one of these jumps should be a first AE jump briefing and simulation.
- Have attended an AE sanctioned coaching seminar, approved by the SSA.

To remain current as an AE Head Up Coach the rating holder must:

- Have performed at least 50 jumps in the previous 12 months of which 25 must be AE jumps.
- Attendance of an AE sanctioned coaching seminar in the previous 12 months is highly recommended.

SECTION 8

CANOPY FORMATION

CONTENTS

1 GENERAL

Canopy Formation (CF) may be described as the intentional manoeuvring of two or more parachutists under canopy in close proximity to one another. The most basic manoeuvre in CF is the hooking up of two canopies in flight. This formation is known as a "Stack". Night CF, large stacks, plane formation, and other advanced relative manoeuvres are now being accomplished by experienced Canopy Formation skydivers. The increase in this facet of sport parachuting has made the need for guidelines vitally important.

The concept of CF is that of smooth flow and grace between two or more jumpers and their canopies. Collisions that result in deflated canopies or entanglements, fast closing speeds, and sudden break-offs are potentially very dangerous, not to mention aesthetically undesirable. Entanglements between two or more canopies in flight are the greatest danger in CF, as they can easily result in serious injury or death.

The purpose of this section is to recommend certain procedures that experienced Canopy Formation skydivers have determined to be safe methods of conducting aerial manoeuvres under canopy

2 EQUIPMENT

Correct equipment

- 2 x hook knives (“Jack” type knife is preferable).
- Cross connectors or stirrups (recommended for larger single dimension jumps only).
- Helmets that do not restrict hearing, with no hook-up points and with quick release catch (optional for D Licence).
- Gloves.
- No sharp hook-up points on any equipment (altimeter mounts etc.).
- Shortened bridle cords or retractable pilot chutes.
- Compatible canopies (preferably purpose designed for CF).
- Functioning altimeter.
- RSL disconnected (if fitted).
- Puff type reserve handle (recommended).
- Reserve flap cover (recommended).
- Foot and ankle protection.

Note: Consider pros and cons of using AADs.

3 PROCEDURES AND RULES OF THE SKY

3.1 BRIEFING

Ensure that all jumpers on the load are capable and are briefed as to the dive sequence and safety procedures.

Ensure that the pilot is briefed as to what you are doing (warn other air traffic).

The following points should be covered:

- Exit order.
- Time between exits.
- Length of delays.
- Designation of base/pin.
- Order of entry.
- Direction of flight and techniques of rendezvous.
- Docking procedures.
- Formation flight procedures.
- Verbal commands and other communication.
- Break-off and landing procedures.
- Emergency procedures.

3.2 GENERAL FLIGHT

- Stay out of free fall air space.
- Only land formations in perfect weather conditions.
- Never fly in front of the formation.
- Never lose sight of the formation (dive turn out on front risers if you do).
- Steer clear of turbulent air.
- Standard commands:

– UP	apply brakes
– DOWN	front risers
– GO	break-off/go
– CUTAWAY	self-explanatory
– DROP ME	drop canopy
– PLANE	commence planing
– HOLD ME	hang on, don't drop
– CLEAR NOSE	clear your canopy's nose
– ALTITUDE	check altitude
– TO ME	turn to me
– HEADING	steer towards the DZ
– SASHAY, LEFT, RIGHT	self-explanatory
– BRAKES	apply brakes

NB: use person's name to avoid confusion.

- When a collision is imminent, TURN RIGHT.
- Do not dock on, transition, or break formations below 1500 ft.

3.3 DOCKING ON FORMATION

- If the bottom jumper has crossed legs, do not dock.
- Do not dock on a formation that contains a collapsed canopy or on a formation that is oscillating.
- Do not dock with sideways motion to the formation.
- Avoid hard and fast docks.
- Never overshoot the formation and try and dock from the front.
- A centred, high line-dock is preferred, otherwise a centred body-dock (avoid off-centre docks).

3.4 WRAPS

- Climb out of lines and/or canopy as quickly as you possibly can, preferably prior to the wrap settling.
- Protect your handles.
- Establish communication and do not panic.
- The wrappee (person in the wrap) is in command (if he can communicate) or else the person with the best visibility.
- Maintain altitude awareness.
- Never drop a person that is in a wrap unless requested to do so: **hang on with all your strength, someone's life depends on you doing so.**
- Only drop a collapsed canopy when it is clear of traffic below.
- Only cut away when the bottom is clear and you have been instructed to do so by the wrappee.
- Only cut away when you are totally free of any wrapped canopy or lines and open reserve when clear. If too low, get out as much canopy as possible, perhaps even without cutting away.
- Once you cut away from a wrap, freefall for several seconds (if your altitude allows you to do so) so as to ensure nothing drops into your reserve.
- Preferably do not cut away below 1000 ft: make a call as to whether the canopy combination can be landed with a chance of survival.

Wraps are discussed in more detail in paragraph 6: Emergency Procedures, below.

3.5 BREAK-OFF

- Break-off above 1500ft (downplane above 500ft due to automatic separation inherent in this formation).
- Establish communications before break-off.
- Break-off in an orderly fashion, alternating in direction, staying aware of other traffic.
- Ensure pilot chutes are not entangled, before break-off.
- Lift your canopy off the lines by applying brakes (i.e.: don't drag across) before turning away from the stack.
- After break-off, ensure that you know where all the other canopies are until landing.

3.6 PILOTING FORMATIONS

- Communicate with the formation you are piloting.
- Avoid radical manoeuvres.
- Do not stall your canopy.
- Maintain heading.
- Always stay in the vicinity of the DZ.

3.7 LARGER FORMATIONS

- Keep your nose clear (unrolled).
- Control washing canopies:
  - Full drive on top.
  - Control specific canopies using some brake.
- Control oscillation:
  - Do not pull front lines forward while planing (causes noses to roll).
  - Plane evenly to avoid oscillations.
- Be particularly aware of traffic when lining up to dock and when breaking off.
- Communication to be passed, person to person, up and down the formation.
- Be aware of pilot chutes being sucked forward by the burble.
- Even tension ensures smooth flight.
- Never hit a large formation hard or from the side.
- Be aware of canopies stalling within the formation.
- Never drop a collapsed canopy or a wrapped piece until the bottom is clear.

3.8 NIGHT CF

- It is recommended that night CF be planned for full moon evenings.
- Jumpers should wear light coloured clothing.
- Strobes are not recommended, as they interfere with night vision and depth perception. Constant beam red lights are preferred.
- A torch attached to the hand/wrist is recommended so that it is constantly pointing to and illuminating your canopy while flying.
- Other night jump PASA SOPs will apply.

4 TRAINING PROGRAMME – BASIC STUDENT EXERCISES

4.1 GROUND TRAINING – CF BASICS

The student is encouraged to engage in discussions throughout the training programme pertaining to the following:

- **Survival -** How, When, and Why to cut away, or ride it.
- **Air Awareness -** centre/scrimmage line approaches.
- **Docking -** lockup, centre, wing top centre, or end.
- **Linework -** trim, tension, float and body position.
- **Riserwork -** front and rear, speed and finesse, with toggles in hand.
- **Planes -** Involuntary dancing, line lengths and float.
- **Break-off -** single, pairs, starburst and unintentional.
- **Dirt diving -** planning, rotation, speed and sequential.

- **Specialty formations -** parabatics and possibilities.
- **No contact flying -** enjoying perfect relativity.
- **Grips -** catching, delivering (docking) and burble effect.
- **Landing on the drop zone -** spot, piloting and clouds.
- **Large load organising -** multiple aircraft.
- Doing **CF** at a primarily **freefall drop zone.**

4.2 DAY ONE JUMPS

Note: The first dive must be performed flawlessly by the coaches, in the specified sequence, otherwise, student confidence may suffer.

Jump 1 - Introduction

The student exits first and is promptly docked on top by Coach A. Coach B docks on the student from below, on Coach B's centre cell. The student will catch Coach B's centre cell and take foot grips in his centre lines. On command from Coach B, the student drops the grip. Coach B will re-dock on the student, approaching from the right side. Emphasis should be placed upon the student's technique in properly and smoothly catching Coach B's centre lines and getting quick foot grips, then returning to toggles in hands.

Coach B is then released by the student and docks the student from the left. After the third dock by Coach B, the student then releases his grip on Coach B and then retreats when Coach A releases him.

The two Coaches to then form a biplane and the student will set up low, on centre, and float up for a centre dock.

Jump 2 - Base Setup Repetitions

Coach A exits. Student follows 5 seconds later. Student positions canopy next to Coach A. Coach B positions himself behind and below. Student leaves Coach A and positions himself next to Coach B. The Coaches continue to provide various approach angles for the student to practice.

Jump 3 - Sashay Wing Rotations - No Grip

Student exits first. Coach A docks right wing. Student turns out to the left and back, then down and over to dock left wing on Coach A. Coach B then docks left wing on student. Coach A leaves and student turns out to the right and back, then down and over to dock as right wing on Coach B. Coach A waits for student to dock. Coach A then descends to make contact as right wing on student.

Jump 4 - Sashay Centre Rotations with grip

Student exits first. Coach A docks the student on top; Coach B docks student on bottom. Rotation begins with emphasis placed on keeping the formation on heading.

Jump 5 - Tri-Plane piloting exercise

360, 180 and 90-degree turns. Emphasis is placed on recognising formation appearance, taking proper grips, and observing the leading edge characteristics of other canopies and how to handle them.

4.3 DAY TWO JUMPS

Jump 1 - Top Dock, Plane - Repetition

Student spots the jump run. He exits 3 seconds after Coach A to set up for a top dock. Coach A follows student. Emphasis is on keeping the student's focus on Coach's canopy leading edge. The Coach's leading edge should be kept level with the student's body while the student approaches.

The student will be given every opportunity to complete his top dock. After the dock, the formation heading is changed intentionally. The student then descends the Coach's lines to form a bi-plane.

Coach B sets up behind, low and to the side on heading and the student leaves the top to go back and get him.

Jump 2 - Stack-Plane-Side by Side Repetition

A downplane is performed at the conclusion of the Repetitions. Student is positioned on the bottom at the beginning of the exercise. Emphasis is on smooth, clean docks, creating smooth planes and smooth side by sides with clean break-offs and quick comebacks. The downplane follows an on-heading side by side, flying at 3000ft.

Jump 3 - End to End, top or bottom

With the student at the leading edge of Coach A's end cell, the student taps the outside edge of Coach A's canopy with his foot. Then he flies towards the opposite end cell without passing it with his foot. Then he flies towards the opposite end cell without passing it and taps it with his other foot. Then the student returns to the opposite end cell without going past. Coach B is relative and preventing him from going past Coach A's end cell (Coach B is 1/2 span distance from Coach A, level with student, on heading). Then student sashays out across, back and down into a wing position on the bottom of Coach A and flies from end cell to end cell on the Coach's body. The Coach will then sashay into a wing position on the bottom and the dive repeats. Emphasis is placed upon flying relative to the Coach.

Towards the end of the dive, with the student on top, the student uses a foot-grip only walking method to get to the other side of the canopy, while maintaining his heading, and he practices until break-off.

Jump 4 - Wedge Rotation - No Grip

Student starts as left wing, then rotates to the pilot position, then rotates as right wing, then pilot again, then rotates as left wing, etc. Emphasis is on proximity flying with contact, where required (you can place your canopy on his hip but he keeps his legs together and away from any grips, when he rotates as wing on you, you let him touch your body at the hip more or less, but do not take a grip - just fly relative). From the pilot position, the student learns to rotate diagonally across the top skin of the adjacent canopy and down, taking the wing position (as in dive 4 with coaching by Coach B). In the wing positions, the student is encouraged to make contact with his canopy end cell on the Coach's waist area, while staying to his side of the centreline of the pilot.

4.4 Day Three Jumps

Jump 1 - Three Stack Rotation

Emphasis is placed on over-the-top rotations, staying on centre and docking with minimal momentum.

Jump 2 - Wedge Rotation with Grips

Emphasis is placed on promptly acquiring grips, preferably with feet *only,* and maintaining the proper position relative to the other canopy. Hence the hand grip, *if used,* must be quickly obtained, so that the student can quickly return his hands to his toggles, enabling him to stay relative and on heading. Remember that, when docking as wing, it may be necessary to use both toggles and risers to maintain position relative to the target canopy.

Jump 3 - Tri-Plane Rotations

This exercise involves building a tri-plane. Student is pilot, Coach A second, Coach B third. Student leans forward in his harness and applies brakes to float up, creating a two stack with a third canopy planed (called a "One-Two") formation. He then releases his foot grips and rotates up, back and over the top of the biplane, and uses risers to get his canopy level with the shoulders of Coach B. He then docks on Coach B and applies brakes to plane cleanly. Emphasis is placed on a smooth and timely transition from plane to stack, and risering to shoulder level as described.

Jump 4 - Two-Stack Rotation

Initially, the student will serve as the pilot of a three-stack. Coach A is second. Coach B docks third.

After the initial formation is completed, Coach A drops Coach B. The student keeps his grip and flies his two-stack up, over, down and behind to dock on Coach B. After the student docks his stack on Coach B, Coach B will then release grips and rotate to the bottom of the formation to create another three-stack, with the student on top as stack pilot. The student then repeats the two-stack rotation again. Emphasis is placed upon smoothness, acquiring proper grips, and good, clean riser work.

Jump 5 - Student organises

Dive ends with a drag-plane with student on bottom.

5 4-WAY ROTATIONS

When using front risers, your movement relative to your target is forward and down. The amount that you move forward versus the amount you move down is dependent on how far down you pull the front risers. It's pretty obvious: Pulling the front risers down will steepen your approach, increase your airspeed and increase your descent rate.

For the purpose of this article, the pursuing canopy is considered to be directly behind the target and flying in the same direction. An angled approach can be made by pulling one front riser more than the other.

Adding blocks to your front risers will make it easier to grip them. Wearing gloves is a necessity for this and other CF manoeuvres.

You'll want to use toggles built with a double loop. This will allow you to keep your hands in the toggles while making riser inputs. Otherwise, you will counteract the effects of the risers.

The idea is to crank in the right amount of front risers in the beginning and then adjust it as you approach your target. Your goal is to position yourself behind and below your target. From there, you might use some of the other basic manoeuvres to close the distance and dock. Pulling and releasing the front risers should be done smoothly.

It's helpful to define three types of front-riser approaches: steep, medium and shallow.

- Pulling a small amount of front risers will increase your forward speed without greatly increasing your descent rate. If you are behind and slightly above the formation this manoeuvre will help you get to a better docking position. A shallow approach is any that doesn't exceed about 30 degrees relative to the horizon.
- Pulling more front riser puts you in the medium approach where both forward speed and rate of descent are greatly increasing. If you are at approximately a 45-degree angle, behind and high on the formation, this manoeuvre will once again help get you to a better docking position. You'll use a medium approach when your target is below you, at an angle of about 30 to 60 degrees.
- Lastly, pulling the front risers all the way down will decrease your forward speed relative to the formation, but it will increase your descent rate to the maximum. This technique is used during the 4-way rotation event, when the top jumper leaves the formation and dives behind and below it to redock. If you need to descend at an angle that's greater than 60 degrees, you'll use a steep approach.

The idea is to begin your approach by pulling down your front risers and holding them steady until your pursuit path stabilises. Calculate where that path is taking you and adjust it as necessary.

All this takes practice, because it's not easy at first to judge your pursuit path. And only practice with your own canopy will familiarise you with how far to pull the risers in any situation. You might even consider practising these approaches on a solo skydive.

The fastest way to learn the front-riser technique is to hire the services of a CF coach. One morning or afternoon of focused instruction will do wonders.

Very rarely will you find yourself directly behind and above your target. Usually you'll be off to one side, or your target will be in a slow turn. In such situations, you'll find yourself pulling one riser down more than the other to create a curving path.

6 EMERGENCY PROCEDURES

The first step towards successfully surviving an emergency situation is to have a plan, prior to the onset of the emergency. It must be a well-considered plan, based on experience gleaned from the wisdom of experts and analysis of fatal errors committed by others. Do not limit yourself to a single course of action, however.

A primary plan is necessary, but don't limit yourself to a single emergency procedure and kid yourself that it is going to work every time, all the time.

The second step is to practice it. You should practice your emergency procedures so that they become second nature to you. You should review your emergency procedures prior to each skydive. You should also quickly review your emergency procedures whenever you become involved in a rapidly deteriorating situation. This will replace potentially paralysing fear with action. The middle of an emergency is not the time to become confused or indecisive.

6.1 TYPES OF EMERGENCIES

CF emergencies are divided into two categories, Wraps and Entanglements. A Wrap occurs when a canopy becomes wrapped around a jumper's body. An Entanglement occurs when two or more canopies become entangled with each other.

Wraps
A wrap can be compared in severity to a low speed free fall malfunction. With sufficient altitude, you will have time to consider the problem and solve it. The canopy of the jumper above you, who is wrapped, *should* remain inflated. This gives you substantially more time to deal with your malfunction than you would have during a high-speed freefall emergency.

Unless you have absolutely no choice, do not land a modern square canopy with two people suspended under it. You will have incredible forward speed because of the increased wing loading on the still-inflated canopy. Landing impact will be severe, particularly to the bottom jumper.

The rule for wraps: The bottom jumper cuts away first. The top canopy usually remains open, so there is no reason to release it. Also, if the person who is wrapped cuts away, (the top jumper), he will go into freefall with the bottom jumper’s canopy wrapped around him. That will only make the situation much worse.

Usually, you can extricate yourself from a canopy that has wrapped you by sliding it down your body. If not, then the bottom jumper will have to cut away. That will release the tension and make it easier for you to extricate yourself and get free of the fabric.

Entanglements
An entanglement usually results from one person passing through the lines of another person's canopy. This causes the two canopies to become entangled, with the jumpers dangling beneath the partially inflated or completely collapsed canopies. This situation almost always requires both jumpers to cut away. This can result in both jumpers being subjected to sudden and extremely violent G forces. Usually, one person is suspended higher than the other.

The general rule for entanglements is for the top person to release first. If the bottom person releases his lines first, the risers may recoil upward and wrap the other person. When the top person releases first, he may impact the bottom person on the way past, but he won't have much momentum.

The top person is usually the one who passed through the lines of the bottom person, and, many times, his canopy will pull itself out of the mess after it is released. This is a bonus for the bottom person.

Sometimes the entanglement begins to spin, and one person will be hanging downward while the other one is orbiting the entanglement. This spin may accelerate rapidly. In this situation the orbiter should cut away first. This will fling the orbiter clear of the entanglement and does not alter the other person's orientation to the entanglement. If the jumper who is hanging downward releases first, it can cause the orbiter to change orientation to the mess and could make the situation worse.

6.2 COMMUNICATION

When jumpers become involved in a wrap or an entanglement, the first thing to do is to communicate. You need to communicate the altitude, the problem and the plan. When someone has a canopy wrapped around him they may not be able to read their altimeter. In all the excitement they may have forgotten what the altitude was the last time they checked. You certainly don't want them to panic and cutaway. It is very reassuring to hear the altitude called out every 500 feet when you are totally engulfed in nylon. It can also be encouraging to hear that your canopy is OK.

If you cannot get any response from the person wrapped up in your canopy, then you should go ahead and cut away. They probably have nylon across their face or around their neck and can't respond verbally. You need to release the tension by releasing your risers.

If you are the person who is wrapped in a canopy, you should communicate that you are working on the situation, if you can. This information should be conveyed at regular intervals. Be cautious of your terminology. Don't say to the other person, "Don't cutaway!", or anything else that could be misunderstood.

Once the decision to cutaway has been made, don't panic. Do it right!

First, get your hands on both handles and ensure that you are clear of any lines. You should peel your cutaway handle off the Velcro, but leave the reserve handle in its pocket, If you have a hard pull on the cutaway handle, you can momentarily release your grip on the reserve handle and use both hands to cutaway. Keep your eyes on the reserve handle, so you can regain your grip quickly. Be prepared to do a freefall delay, if you have sufficient altitude.

If there is going to be more than one person cutting away, the first one out needs to freefall for five to ten seconds, altitude permitting! This will provide sufficient vertical separation for the next person who cuts away to safely deploy a reserve.

The most important thing that can be done to maintain a margin of safety is to remember your altitude!

6.3 DOCKING

Most problems begin during docking or break-off. The minimum altitude for docking is 2500 feet.

What causes wraps and entanglements? Usually, bad docking techniques. The three factors most often involved are speed, (closure rate), angle, and distance from centre. If you have too much speed, your body continues to travel forward after you have docked. The point where the target jumper grabs your canopy remains stationary, but the rest of the canopy continues to move in your direction of travel. The canopy may then lose pressurisation and wrap the person you docked on. Because objects tend to swing in an arc, it is common for the canopy to dissipate its momentum by wrapping securely around the jumper that you docked on.

There are good and bad angles to dock from. Docking from straight behind, a zero-degree angle of approach, is the safest angle. Docking head-on is obviously the worst angle. A head-on dock can result in injury.

Docking with your canopy heading 90-degrees to the target jumper's heading will still give you too much speed. The most efficient angle is 45-degrees to the side of straight behind. Docking unintentionally with an end cell is more likely to generate a wrap than docking with a centre cell. These three factors combine to make a dock safe or unsafe.

6.4 FORMATION FUNNELS

Another cause of wraps and entanglements is when the formation "funnels." This can be the result of the unanticipated collapse of a mismatched or misflown canopy. It can also occur if a canopy in the formation stalls.

In a plane formation, the nose of the canopy below you is pushing on your brake lines. Your canopy can stall if you apply as little as half brakes.

If someone docks and wraps the corner of a formation, it can cause part of the formation to funnel. It can also funnel at break-off because the trim of the formation changes as canopies leave it and the stress distributed throughout the formation changes.

Another problem is carelessness. Some people don't look where they are going. You should always look before you turn. Don't fixate on the formation. After all, it should be behind you.

(Many people have gotten wrapped on a freefall jump by not looking where they were going after opening. If you are looking at your toggles right after your canopy opens, you may experience a sudden and violent encounter with someone else who is doing the same thing).

6.5 AVOIDING PROBLEMS

What can we do to prevent wraps and entanglements? The foremost preventative measure is thorough planning. Perform a thorough dirt dive. That is the time to share techniques that will work for the type of formations and transitions that you are planning to accomplish.

CF is very three dimensional and, therefore, quite complex. Participants can easily miscalculate a manoeuvre, if they are trying something new. Don't just dirt dive the formation. Share what you know. If someone is approaching too hot, you can spread out your arms and prevent the canopy from wrapping you.

Even if it does wrap, you can extract yourself easier because you won't be cocooned so tightly. Nylon will stick to itself like a Chinese finger trap when it is wound tightly around you. If you can give it some slack it will come loose. You can grab the area of nylon with the most tension, then lift it, if only an inch, then as you let it down it will loosen and start sliding down your body.

If you are in a formation and someone below you gets wrapped, hold on to him until he can sort things out. Do not drop them unless they expressly request it. This gives them more time and less to worry about, as it will keep their canopy on heading.

If you are planed on the jumper above you and they have become entangled in your lines, you can apply light front-riser pressure. This re-tensions your nose and tends to keep your canopy from spinning. They may then be able to slide up your lines, which will allow their canopy to stay inflated. This front risering must be done initially, as the problem occurs. Once the two canopies become entangled, one or both of you will have to cut away.

If an end cell wraps around your foot, it can be difficult or impossible to release. You can't lift the jumper's weight up with one leg. Attempting to do so can injure you. As a canopy starts to wrap around your foot, you should stick the other foot in there, also. This will enable you to lift the jumper who is fouled on you and will allow you to get your hands on the canopy to relieve the tension on your legs and feet. This can help prevent injury.

If you have just one foot wrapped, you can grab your risers and turn yourself away from the wrapping canopy and backwards under your canopy. Now you will have a 180-degree wrap around your ankle instead of a 360-degree wrap. It may then be easier to shake off.

If the canopy is collapsing and reinflating, you don't want to fight it. Have the bottom person cut away. The snatching action of the rapidly inflating-deflating canopy can really damage your ankles.

The best strategy to prevent or reduce the possibility of wraps and entanglement is to wear proper equipment. All participants should wear thin, leather gloves, shoes, socks and long pants or a jumpsuit. Wrist mounted altimeters are not recommended.
You need a CF parachute to do safe and sane CF. The time to learn CF is not after completing a freefall opening at 2000 feet on your little micro-lined skyrocket. Learn CF from an expert, using the proper equipment, and at the proper altitude.

7 CATEGORY TESTS

The successful completion of each category test shall be logged in the student's logbook and signed by his DZ Chief Instructor based on the feedback logged and signed by the holder of a current coach rating who completed the jump with the student.

CAT I

The student shall have completed the Intermediate Skills Programme and at least 50 jumps on a ram air canopy as well as have been cleared to participate in CF by a competent Cat III CF Coach before proceeding to Cat II.

The student must also have been cleared to jump the canopy size that will be used for the CF jumps. The student must have jumped this canopy size regularly and be competent in landing this canopy size.

CAT II

- The student shall have successfully completed the following task on two different skydives:
  - 3 successful bi-planes as the passive partner (pilot) and;
  - 3 successful bi-planes as the aggressive partner (pin).

  The above two dives must be done with different CF Coaches.

- Demonstrate a working knowledge of the appropriate safety regulations and safety doctrine associated with CF.

- Have successfully landed a 2-way stack both as pilot and pin.

CAT III

- The student shall have successfully completed the following task on a single dive:
  - A five-point rotation dive where the student docked 4th on the original quad-plane.

- On this dive the student should have demonstrated:
  - Safe docking techniques.
  - Correct communications during the dive.
  - Ability and understanding of piloting a quad-plane.
  - Safe rotation technique.
  - Altitude awareness and must indicate the break-off at the correct altitude.

8 LICENCE REQUIREMENTS

A Licence

As per Section 2 (PASA SOPs)

B Licence

As per Section 2 (PASA SOPs)

Note: Category III test must be done in accordance with point 6 above.

C Licence

Must have met all C Licence requirements as per Section 2 (PASA SOPs) and

- Have successfully closed lower than 4th on three separate occasions in plane formations of six or larger.
- Have successfully closed 8th on at least one occasion in an eight-plane formation.
- Demonstrate the ability to successfully pilot a plane formation of six of larger.
- Have participated in at least 3 separate 4-way rotation jumps in which the jumper did three successful rotations.
- Demonstrate a working knowledge of safety doctrine associated with two-dimensional formations.

D Licence

Must have met all D Licence requirements as per Section 2 (PASA SOPs) and

- Have participated in at least three successful 4-way bi-dimensional formation jumps.
- Have participated in at least three plane formations larger than eight in any position.
- Have participated in at least one 8-way bi-dimensional formation.
- Have participated in three 4-way diamond formations, one as pilot, one as wing and one as the bottom jumper.

9 COACHES

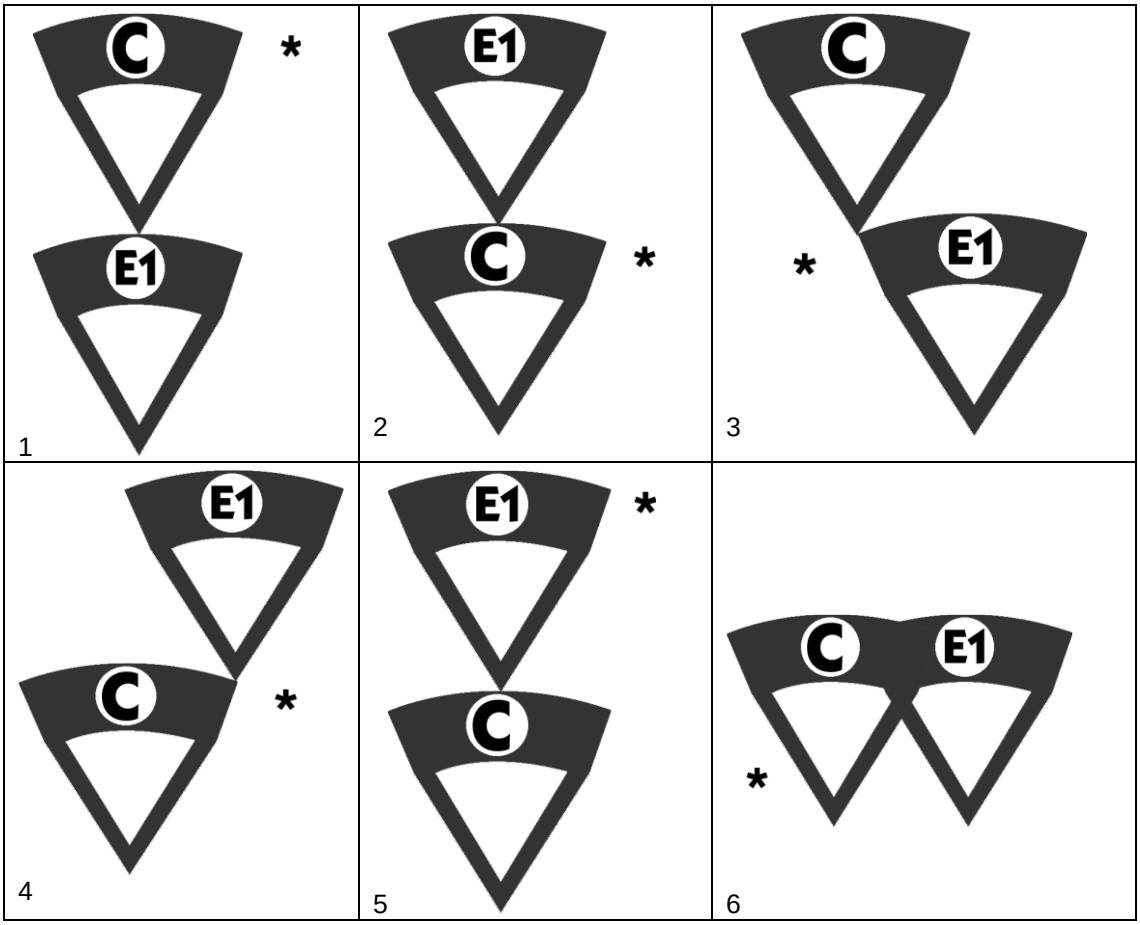
The coach rating is designed to give a formal qualification to those who teach CF jumpers up to Cat III level. All applicants for coach ratings must be recommended by a CI and endorsed by the CF committee of the SSA (see Form 19).

An applicant for a CF Coach Rating must:

- Have a minimum of 300 jumps (100 of which in the previous 12 months).
- Hold a PASA C or D licence.
- Hold a PASA Jumpmaster rating.
- Have received a recommendation from a current coach.
- Have demonstrated an ability to assemble a CF-specific canopy, especially the retractable pilot chute system.
- Have demonstrated an ability to pack a non-bagged CF canopy.
- Have observed a CF first jump briefing.
- Have observed all Category II and Category III briefings.
- Have given at least one first jump briefing, under supervision.
- Have given at least two other Category briefings, under supervision.
- Have completed the following 2 evaluation jumps:

  - **Jump 1: 7000 ft: 2 way**

    The candidate must show a thorough understanding of the equipment and the specific differences between CF-specific and other skydiving equipment.
    The candidate is to brief the existing coach on the exit and do a pilot briefing and the physical spot.
    The existing coach exits first, candidate second and then top dock the existing coach.
    The candidate is to rotate on the existing coach and to do a centre low dock.
    The existing coach rotates on the candidate and do a wing dock on the candidate (own discretion to be used), the candidate must maintain the heading for ten seconds.
    The candidate is to rotate and do an opposite wing dock and fly this formation for twenty seconds.
    The existing coach is to slide across and take centre dock, and then the candidate should initiate a side-by-side.



- **Jump 2: 10 000 ft: 4 way**

  The candidate must show a thorough understanding of the equipment
  The candidate is to brief the existing coaches on the exit and do a pilot briefing and the physical spot.
  The participants are to exit competition style, with the candidate as the base, and the coaches should build a 4-stack.
  The participants should do at least twelve rotations.
  The candidate should spiral the 4-stack as pilot doing a staged release.

To remain current as a CF Coach the rating holder must:

- Have performed at least 10 Category jumps in the previous 12 months.
- Have performed at least 20 Canopy Formation jumps in the previous 12 months.
- Attendance of a CF sanctioned coaching seminar or skills camp in the previous 12 months is highly recommended.

SECTION 9

FREEFALL STYLE, ACCURACY LANDING AND PARA-SKI

CONTENTS

1 GENERAL

Freefall Style and Accuracy Landing were the first two competitive events in the history of sport parachuting. The two events are often referred to as Style and Accuracy, and the discipline is often referred to as Classics. In both events the competitor is required to demonstrate his precision abilities relative to the ground. In Freefall Style the competitor manoeuvres his body in freefall, as accurately and as quickly as possible, using a target on the ground as reference, and in Accuracy Landing the competitor tries to land as close as possible to a target on the ground.

In essence both events are individual events where the participant competes against his own, and other competitor's, skills.

In training it is possible to do accuracy after a style jump, if an accuracy parachute is worn. In competition, style and accuracy always take place on separate jumps. It is possible to compete in only one of the disciplines. However, an overall position in the competition is only given to those competitors who compete in both disciplines.

Accuracy Landing is also combined with Giant Slalom Skiing to form a discipline called Para-Ski. The two events are competed for separately and a combined score and position are given.

The purpose of this section is to recommend certain procedures and training methods that experienced style and accuracy jumpers have found to be safe and effective methods of conducting the events. The contents of the accuracy section are heavily based on the Classic owner's manual (*with kind permission of Jimmy Hayhurst; US Style and Accuracy team, and John Eiff; designer of the Classic accuracy canopy*).

2 FREEFALL STYLE

2.1 EQUIPMENT

2.1.1 COMPULSORY EQUIPMENT

- Dual parachute harness system (container)
- Square reserve
- Square main
- Protective footgear
- Eye protection
- Altimeter

2.1.2 RECOMMENDED EQUIPMENT

- Gloves
- Head protection

2.1.3 OPTIONAL EQUIPMENT

- RSL
- AAD
- Hook knife

2.1.4 EQUIPMENT DESIGN

- Parachute
  Any parachute you are comfortable with, that opens satisfactorily at high speed is good for style. Many people do style wearing their accuracy canopy, so that they can do accuracy afterwards. However, the fastest style times are being achieved wearing a small container, which means wearing a small parachute. The larger the container and parachute, the heavier it is and therefore the more inertia it has. A smaller parachute weighs less so has less inertia, which will make your turns and loops faster for the same arm input.

- Container
  Any container you are comfortable with, that opens satisfactorily at high speed, and has no tendency to open prematurely, is good for style.

However, the fastest style times are being achieved wearing small containers because they weigh less and therefore have less inertia, which makes your turns and loops faster. Containers specifically designed for style are available which give the optimum shape when in the tucked freefall position used in style.

- Jumpsuit
  The faster you are falling, the quicker your turns and loops are for the same arm input. Therefore, a tight jumpsuit is preferable. To give the best effect to your arm inputs, the forearm material should be thick, while the rest of the suit is slick. Backward facing lower leg pockets are incorporated on some suits to accelerate your loops.

- Footwear
  Relatively small shoes are preferable because they give less drag and are less likely to cause your legs to be pulled out of the tuck position in the high-speed airflow.

- Handwear
  The style rules do not make any specific regulations regarding handwear. Gloves that give a reasonable amount of drag should be worn, to give the best effect to your arm inputs. Some top style jumpers use composite 'paddles' that attach to the forearm and cover the hand area. Webbed gloves are also effective.

- Goggles
  You need clear vision to do good style because you have to keep accurate track of the ground marker. The marker is 200 sq m in size, and brightly coloured. You need to be able to see the ground marker from 7500ft while diving, turning and looping so goggles without scratches or damage are a must.

- Altimeter
  A normal skydiving altimeter is satisfactory for style. The altimeter should be worn where it can be seen clearly when in a style tuck. Wrist altimeters are unsuitable because the hands are not in direct view when doing style. A chest strap or leg strap mounted altimeter is best.

2.2 PROCEDURES AND RULES OF THE SKY

- Briefing - ensure that all jumpers on the load are capable and are briefed as to the dive sequence and safety procedures.
- Ensure that the pilot is briefed as to what you are doing
- The following points should be covered:
  - Run in Direction
  - Exit order
  - Exit commands for style
  - Time between exits
  - Emergency procedures
  - Correct style series

2.3 TRAINING PROGRAMME - BASIC STUDENT EXERCISES

- **Abbreviations and terms specific to Style**

Base Time	Time the series was completed in.
Penalty	Time added to the base time for mistakes and inaccuracies
Under	Turn penalty for less than a 360° turn
Over	Turn penalty for more than a 360° turn
Minus	Loop penalty for less than a 360° loop
Plus	Loop penalty for more than a 360° loop
Deviation	Body roll penalty
Arrow	Direction penalty

- **General**
  A style jump is a series of freefall manoeuvres performed as fast as possible, in relation to a ground marker. The time is judged from the ground marker in real time by judges using telemeters or, more commonly, after the jump from video taken by a video camera positioned at the marker. Time is added for mistakes and inaccuracies. Each jump consists of four flat turns and two backloops, which results in four different style series:

Series 1	-	Left Set	-	Left-Right-Loop-Left-Right-Loop
Series 2	-	Right Set	-	Right-Left-Loop-Right-Left-Loop
Series 3	-	Left Cross	-	Left-Right-Loop-Right-Left-Loop
Series 4	-	Right Cross	-	Right-Left-Loop-Left-Right-Loop

  A competition consists of five jumps. The first four jumps are the four series above, in a drawn order. The fifth jump is one of the series above, chosen by the competitor.

  Each jump breaks down into five sections: Exit, Fall-away, Settle, Series, and Canopy.

  - Exit
    Style run-ins are usually downwind, so that the jumper is facing the target on exit. The exit point is early, the throw forward of the aircraft taking the jumper to the opening point. If the winds are very light the run in can be made into wind but the exit will be well before the overhead of the DZ so that the jumper will still face the target on exit. The run in is at 7200ft.

    The run-in direction, corrections, and exit commands are given by the judges on the ground over the pilot's radio. When the aircraft is nearing the exit point and judges and video are ready for the jumper, the judges radio "Standby, Standby". This is immediately relayed to the jumper. When the aircraft is at the exit point, the judges radio "Exit, Exit, Exit". This is immediately relayed to the jumper who must immediately leave the aircraft.

    On run in look out of the door well before the exit point to pick up the style ground marker. Look ahead on the run in to pick a horizon marker or prominent object, and then look back along the run in to pick another horizon marker or object. A line between the two markers must run straight through the style ground marker. These markers will help you during your turns and loops. As you get near to the exit point, look at the pilot to receive the standby and exit commands. Be ready in the door to jump immediately. As soon as you get the command look out and re-acquire the style ground marker, and then jump.

    Style is only judgeable within a 60° - 80° elevation angle from the style ground marker. Outside of this zone it is not possible for the judges to see the manoeuvres clearly enough. Dropping below the 60° angle, or passing over the 80° angle, can be caused by the judges giving the exit command too early or too late, in which case you will get a rejump. However, if you delay your exit and then go over the 80° angle, or you exit early and then drop below the 60° angle, you will <u>not</u> get a rejump.

    If you experience freefall drift of more than 10° during your style series you will get a rejump. This can be caused by the judges choosing the wrong run-in direction, the pilot flying inaccurately, or upper winds. However, don’t give up on your series just because you *think* you have had 10° drift, keep going and deal with it. The drift is recorded by the judges and they may assess your drift as less than 10°, which means no rejump.

  - Fall away
    The fall away is the time that you pick up speed so that you can perform the series as fast as possible. It is acceptable to stay flat, dive head down, sit, or stand, but in all cases, you must stay on the style ground marker heading. It is not acceptable to fall on no particular heading and then line up before starting the series. The judges will start the clock if you make an obvious turn.

If you dive do not go into a true head down because it will be impossible to keep the style ground marker in sight. Keep your head slightly back so you can see the marker (Figure 1). Use the fall away to get to the maximum controllable speed possible while still holding the style ground marker heading.

During the fall away, since you know which direction the first turn is going to be, offset slowly very slightly away from the turn, about 5 degrees (this will not cause the judges to start the clock). This will avoid Arrow penalties at the start of the first turn.

- Settle
  At the end of the fall away, settle yourself into your style position. How you settle into the position will obviously depend on what position you used in the fall away. For many top jumpers the settle is only for a fraction of a second. The best position to do style is the tuck position (Figure 2) because it keeps the body as small as possible, which allows very fast turns and loops to be performed. However, a flat position is acceptable. Whatever position is used, the body must be in the horizontal plane and facing the ground.

- Series
  Start your series positively, so the judges can easily see when you are starting. As you get 3/4 round the first turn begin to stop the turn. Aim to overshoot the heading slightly (about 5°) as this avoids Under penalties. Do the same for the second turn. As you start the loop, keep your head tucked in and keep the style ground marker in view as long as possible. This will help to keep your position small which will make the loop faster. As you get 3/4 round the loop begin to stop the loop and set up for the next turn. Try not to sit up when finishing the loop, as this will result in Plus penalties. Similarly, starting the turn before completing the loop will result in Minus penalties. Try to come out of the loop on a heading about 5° away from the next turn to avoid Arrow penalties. Do the second half of the series in the same way as the first half. Try to keep your body position tight throughout the series.

  The left and right cross series are often slower than the left and right series because the first loop in the cross series often puts you on the Arrow penalty side of the third turn. This is because the slight overshoot at the end of the second turn, followed by a perfect loop, will put you slightly into the third turn. To get a good time in a cross series, it is sometimes necessary to correct the loop heading during the loop, which takes a lot of practice.

- Canopy
  As soon as you finish the last loop of your series, come out of your style position and prepare to pull. Don't track, there is no one else near you and, if you have planned your jump correctly, you don't have time.

  As soon as your canopy is open, get on the toggles and fly away from the run-in line. Make a habit of doing this even if you are the only canopy in the air. In competition, another style competitor will be jumping within 20 seconds of your opening. If you stay on the run-in line you may get in get in the line of the video camera filming the next jumper.

  Do not land near the style ground marker or video.

- **Planning**
  Always plan your jump. Base your plan on your experience in style. Don't try to go faster than you are used to doing, it will only result in a lot of penalties. Your plan should be specific and clear in your mind and cover all the sections of the jump (exit, fall away, settle, series, and canopy). Specific planning for a style jump should begin about 20 minutes prior to take off, not earlier.

  To work out the timings for the fall away, settle, and series sections of the jump, work backwards from the required opening altitude.

You are exiting at 7200ft, which gives you about a 23 sec freefall if you are in a tight style tuck, or 28 seconds in a flat position, for an opening height of 2500ft.

Decide how many seconds you want from the end of the series to opening the parachute. 3 seconds is reasonable.

Then decide approximately how fast you can do a series.

Then decide how much time you want to settle before starting the series.

Add all three figures together and subtract from 23 or 28 as appropriate. That will tell you how many seconds you can fall away for.

As an example: A jumper who pulls 3 seconds after finishing the series, does a series in around 9 seconds in a tight tuck, and does a 1 second settle, has 10 seconds spare to do the fall away.

Obviously the more you stay in the fall away, the faster you are falling when you do your series, so the faster your series is likely to be. With experience, and faster series, your timings will change and will also become second nature. Top style jumpers can fall away for 14 seconds, settle for less than half a second, do a series in under 6 seconds, and pull immediately after the last loop.

Once you have your timings planned, decide how you are going to fall away. A flat position is easiest when starting style, but you will soon find that you want to gain more speed, by using a different position, as you become more experienced.

Then concentrate on the series. Make sure you are planning to do the right one! Visualise the whole series, try to identify the potential penalty areas, and decide how you are going to avoid the penalties. Go to the style ground marker and check the run-in direction being used. Then look around the outside of the drop zone so that you can pick out potential markers on the run-in line.

Practising style can be done using a style training harness - a hanging harness that allows the jumper to turn and loop in a tucked position. However, in the absence of a training harness, practice your series by kneeling on the ground and making all the arm movements you will use, while visualising the series.

- **Execution**

  - Exit
    On every run in, check the direction in case it has changed from the last jump, and pick up horizon markers ahead and behind. Look at the pilot as you near the exit point. As soon as the exit command is given, acquire the style ground marker and immediately leave the aircraft

  - Fall away
    Get on heading and into whichever fall away position you are going to use, and then focus on the series you are going to do. Treat the jump as a 100m sprint, and the fall away is when you are in the blocks and ready to start. Concentrate on getting as fast as possible during the fall away while remaining controlled and on heading.

  - Settle
    Quickly get your position as you want it and get on with the series. Don’t spend too much time getting your position; it will only make your fall rate slow down. Don’t waver either side of the heading because the judges will start the clock at the first sign of a turn, even if it is the wrong one.

  - Series
    Start your series like you are leaving the blocks for a 100m sprint. Be forceful and powerful. As soon as you start the series your control must be intuitive. There is no time to think your way through the series, it has to be done as you planned and memorised. Go fast and controlled and keep your body position

as small as possible. Do not stop to correct small mistakes, accept them and carry on. Work hard to make the second half of the series as fast as the first half. Focus on speed, control, body position, and the ground marker, all the way through the series. When you come out of the last loop, make sure you don't sit up - stay level and come out of your style position to get ready to pull.

- Canopy
  Remember to fly clear of the run-in line as soon as you have the canopy under control.

- **Exercise 1**

  7200ft exit. Fall away for 5 seconds. Stay in a flat position throughout the fall away and series. Do a half series (turn, turn loop). Do this exercise until you can consistently complete a half series in under 8 seconds. As your times start to get quicker, increase your fall away time so that you finish your half series no more than 1500ft above opening height. Open at 2500ft.

- **Exercise 2**

  7200ft exit. Fall away for 5 seconds. Stay in a flat position throughout the fall away and series. Do a full series. Do this exercise until you can consistently complete a full series in under 16 seconds. As your times start to get quicker, increase your fall away time so that you finish your series no more than 1300ft above opening height. Open at 2500ft.

- **Exercise 3**

  7200ft exit. Fall away for 10 seconds. Do a full series. Do this exercise until you can consistently complete a full series in under 14 seconds. Start by using a flat position throughout the jump. Then, as your times start to get quicker experiment with different fall away positions to find the one you prefer. When you have found a fall away position that suits you, start to increase your fall away times until you finish your series no more than 1100ft above opening height. Open at 2500ft.

- **Further training**

  Fast style comes with practice and it is very much a personal task to get under 14 seconds. Following the guidelines in this document will get you to under 14 seconds without a great deal of coaching. When you are consistent to 14 seconds, coaching can get you faster. Contact the Freefall Style & Accuracy Landing and Para-Ski committee of the SSA for more information.

  Here is an example of an ambitious but achievable set of style goals:
  - Four series with a 16sec average after 100 style jumps
  - Four series with a 14sec average after 300 style jumps
  - Four series with a 12sec average after 500 style jumps
  - Four series with a 10sec average after 700 style jumps
  - Four series with a 8sec average after 900 style jumps
  - Four series with a 7sec average after 1000 style jumps

3 ACCURACY LANDING

3.1 EQUIPMENT

3.1.1 COMPULSORY EQUIPMENT

- Dual parachute harness system (container)
- Square reserve
- Square main, of appropriate wing loading for accuracy
- Protective footgear
- Altimeter

3.1.2 RECOMMENDED EQUIPMENT

- Gloves
- Head protection
- Eye protection
- Accuracy shoes

3.1.3 OPTIONAL EQUIPMENT

- RSL
- AAD
- Hook knife

3.1.4 EQUIPMENT DESIGN

- Parachute
  An accuracy parachute is a specialist piece of equipment that is specifically designed to have a low descent rate and almost vertical sink, when on deep brakes, with a gradual change from flight to stall. The best accuracy is performed on these parachutes because it makes the final 30ft of the approach more predictable and slow. However, reasonably good accuracy can be performed on any lightly loaded parachute. The optimum sea level wing loading for accuracy is 0.7 lbs/sq ft, with a range of 0.65 to 0.75 lb/sq ft. Therefore, a student canopy is satisfactory for most people to learn the basics on and achieve metre accuracy. However, trying to do centimetre accuracy on a student parachute will result in heavy landings. Therefore, a proper accuracy canopy should be used when attempting to get closer than 5 metres to the target. Some of the canopies specifically designed for accuracy are the Parafoil, Classic, CCL, and Da Vinci.

- Harness
  Don’t waste jumps. Get set up properly in a suspended harness on the ground. Your harness should be snug, symmetrical (hanging evenly left/right), and a plumb line dropped from your chin should pass abeam your insteps - meaning that you are hanging upright not leaning back (Figure 3). Select a harness with diagonal straps, or a container design that forces you against the chest strap and main support webbing.

- Jumpsuit
  Fabric should be snug from knees to ankles. No loose material blocking your view of shoe or heel.

- Footwear
  The Accuracy Landing competition rules state that 'In order not to damage the AMD, suitable footwear must be worn'. Judges can inspect shoes at any time and can disqualify the competitor or require the shoes to be changed. Therefore. it is important to follow some basic rules when choosing shoes. The heel should be flat and well defined and be at least 1cm diameter. No pointed heels are allowed. The rear strike point should be visible, not hidden under the heel cup. Because no manufacturer makes specific shoes for this event, it is usual to modify a pair of commercially available shoes. A good pair of track spikes, with an accuracy heel added, the spikes removed, and the spike area covered with a stick-on sole, make

good accuracy shoes. Check the shoes of an experienced accuracy jumper and find out where they were modified.

- Toggles and Gloves
  Hard toggles with an offset hole are recommended. Loop toggles bite into the hands when held at 50% brake for most of the jump. The offset hole in hard toggles makes the steering line go between your first and second fingers, and gives the most natural, and therefore least stressful, hand position for accuracy. Combining the hard toggles with thin leather gloves provides the optimum feel for controlling the canopy.

- Glasses and Goggles
  You need 20-20 vision to do good accuracy. If you wear glasses normally you should wear them to do accuracy. You should be able to see the AMD at around 1000ft. If your eyes water excessively, wear goggles - most top accuracy jumpers do.

- Altimeter
  A normal skydiving altimeter is sufficient to learn with. However, it does not have a very detailed scale from 1000ft to the ground and can be difficult to use for the approach pattern. More accurate altimeters exist, having 3000ft or 1000m for one turn of the needle, specifically for accuracy. The altimeter should be worn where it can be seen clearly when looking down at the tuffet. Wrist altimeters are unsuitable because the hands are not in direct view when looking down. An altimeter mounted on the chest strap, leg strap, or, most effectively, on the thigh is best.

3.2 PROCEDURES AND RULES OF THE SKY

- Briefing - ensure that all jumpers on the load are capable and are briefed as to the dive sequence and safety procedures.

- Ensure that the pilot is briefed as to what you are doing (warn other air traffic as well as other jumpers who might cross your flight plans as you set up for finals in accuracy).

- The following points should be covered:
  - Run-in direction
  - Exit order
  - Time between exits
  - Length of delays
  - Designation of leading man
  - Order of landing
  - Emergency procedures

3.3 TRAINING PROGRAMME - BASIC STUDENT EXERCISES

- **Abbreviations and terms specific to Accuracy**

AMD	Automatic Measuring Device
Pad	Another name for the AMD
Tuffet	Padded or inflatable landing area, approximately 5m diameter
Dead Centre	The target in the middle of the AMD
Disc	Another name for the Dead Centre

- **General**
  An accuracy jump is a jump landing as close as possible to a pre-defined ground marker. The marker is 3cm diameter (although this may reduce as accuracy scores improve) on a 35cm diameter pad. The pad is placed in the middle of a padded or inflatable soft landing area (a tuffet) of approximately 5m diameter. The pad is an electronic device that records the point of contact and measures its distance in centimetres from the edge of the 3cm marker. The distance is measured out to a maximum of 16cm. Any landing outside 16cm receives a score of 16cm.

A competition consists of ten jumps. The first eight jumps are the team competition jumps, in teams of five, with the individual scores counting towards the individual places, and the total team score counting towards the team places. The last two jumps are the semi-final and final rounds and are done as individual jumps.

Each jump breaks down into sections: Spotting, Manoeuvring, Circuit, Approach Zone, Power Zone, Sink Zone, and Foot Placement.

- **Spotting**
  With the advent of GPS spotting, and the high-performance canopies that can recover from bad spots, jumpers are no longer used to spotting and rarely practice it. Learn to spot; it is critical for Accuracy Landing. Learn to adjust the parallel of the run-in, and the run-in direction. Spotting is outside the scope of this document and is something you should have learned in the ISP. Make sure the pilot knows the run-in direction you want before take-off, and that you might change it once on run-in. Remember that an accuracy spot can change from jump to jump. A good jump pilot will have no problem with you directing the spot and changing the direction during the run-in. However, a pilot only used to dropping jumpers from high altitude on GPS may not be used to jumpers directing the spot, and may not realise the spotting precision you require.

- **Manoeuvring**
  Figure 4 shows a plan view of the flight, from exit and opening, to the start of the approach zone. Manoeuvre as desired (crabbing, S-turns, holding and running) but stay fairly close to the wind line. It is basic, but the times you don’t are the jumps that go bad. Plan your manoeuvring to position yourself for a wind check at 1000ft. The stronger the winds, the further upwind this check must occur.

  Hold into the indicated ground wind at half brakes and check your canopy's penetration at 1000ft. Half brake airspeed, with your hands at 'ear level' is about 7m/s. Use this information to gauge the winds. For example, if you ground speed is zero, the winds at 1000ft are 7m/s. Make this check on every jump and you will soon become proficient at estimating the winds you will face on finals. The wind on finals is usually slightly less than the wind at 1000ft and can differ in direction.

- **Circuit**
  Now turn downwind at half brakes, aiming to pass 300ft to the side of the tuffet at 600ft. Start your base turn so as to end up behind the target at the correct angle for the winds. Keep looking at the tuffet throughout the circuit.

  Some jumpers work in feet for height and feet for distance, some in feet and metres, and some in metres and metres. Therefore, three separate approach angle graphs are shown here (Figures 5, 6, and 7). To make the numbers easier, the initial approach height is slightly different from graph to graph, but they all give a 45° approach angle in nil winds. Choose the one that suits you. The rest of this document will assume you have chosen the feet-metres graph.

- **Approach Zone**
  Complete your base leg turn so as to pass through the 'window' for your final approach - the initial approach height of your graph at a distance appropriate for the wind. In nil winds, your approach angle should be 45°. In stronger winds, a steeper approach angle will be required. If the winds are strong, start your approach well upwind of the target, sliding sideways into position only slightly behind the target. You are now in the Approach Zone. Spend the next 150ft (about 15 seconds) working to achieve a glide slope that will carry you beyond the target to +5m, at 66% brakes. Work hard - be a pilot not a passenger.

  If you are too steep for the wind conditions, try S-turns, sustained deep braking, or tap in and out of light sink to get down to the correct angle. Avoid stalling the canopy; it is unsafe and will only confuse matters. If you too shallow for the wind conditions, let up and fly at 25% brakes. Keep correcting until you have both 66% brake and a glide slope that will overfly the target.

- **Power Zone**
  As you approach 100ft, the first transition point in your approach, you are about 10 seconds from landing. It is time to aim a little closer to the pad, which you do by increasing brakes to 80%, hands level with your sternum, forearms about 30° above the horizontal.

  You are now in the Power Zone (Figure 8). The canopy is flying, your control pressure is firm, and the canopy responds in a linear fashion to your inputs. Let up, and you move forward, making the glide slope shallower. Push down, and you slow down, making the glide slope steeper. You are flying to just beyond the pad, aiming at the far side of the tuffet, about 2.5m beyond the disc. You are approaching 30ft, the second transition point in your approach, where you transition into the Sink Zone.

- **Sink Zone**
  Transition simply means changing from your slight overfly glide slope, increasing your braking, steepening your angle, and aiming for the dead centre. You are now in the Sink Zone (Figure 8). If you have flown your approach well, you'll arrive at about 15ft, with 100% brakes, or very light sink. At 100% brakes the canopy will remain stable, over your head, with no pre-stall rockback. This will maximise the accuracy of your foot placement.

- **Foot Placement**
  Foot placement is the most critical, and often least trained, aspect of accuracy. An excellent approach, from which a perfect dead centre could be scored, can easily be spoiled by poor foot placement. This is where the design of your shoes becomes critical. You must be able to see the part of the shoe you are aiming to put on the target, when looking down the back of the heel. As you start to transition, keep both legs bent and relaxed, with the lower legs straight down, as if sitting on a stool. Keep the toes up so the heels are the lowest point.

  Most people have a preferred foot to strike with. However, don’t discount the other foot, it may be necessary to strike with it on some occasions, like a gust over the target or inaccurate canopy control.

  As you sink onto the pad, raise the leg not being used to strike so it doesn’t hit the ground first. Raise it gently and forward. Don’t tuck it back behind you because it will probably hit the ground first and be off the pad. Keep the leg of the striking foot bent, aiming to fly the bent leg all the way to touchdown. This will give you freedom to move the foot to the correct position to hit the disc.

  Practising foot placement can be done using an accuracy training harness - a harness hanging on bungees that gives the correct approach angle and speed of the last 5 ft of an accuracy jump. However, in the absence of a training harness, practice foot placement by sitting in a chair that has arms. Put a practice pad on the floor in front of you, push down on the chair arms to lift yourself up, and raise your striking foot at the same time. Then move forward and strike the pad with a bent leg while still holding the chair arms. Practice with the other foot as well. This form of practice is free and will certainly improve your scores.

- **Planning**
  Always plan your jump. Base your plan on the conditions you observe at the DZ in the moments before you take off, plus an awareness of any trends. Your plan should be specific and clear in your mind, yet have flexibility for unexpected changes. The *process* of planning is important: it prepares you and forces you to anticipate what might happen. Specific planning for a jump should begin about 10 minutes prior to take off, not earlier.

  First learn to read a DZ. Locate the target, windsocks, flags, streamers, smoke etc. Study terrain, note buildings and trees that will generate turbulence on particular approach directions. Pace out the distance to prominent features, and note where an approximate 300ft radius circle falls around the target. Study the DZ map, learn the cardinal headings (north, south, east, and west), and talk to locals about typical wind patterns and exit points.

Now read the conditions. Observe low level clouds, cloud shadow movement, jump plane drift and speed over the ground, the wind drift indicator, canopies in the air, surface wind indications, thermals, and turbulence. Prior to any competition, a wind drift indicator is dropped directly over the pad from 2300ft. Watch the streamer closely. In addition to telling you the exit point it will also show any crosswinds. If winds from 2000ft to 600ft differ in direction significantly from the ground wind (i.e. there is a crosswind at altitude) then plan to fly your manoeuvring and circuit towards the upper wind.

Now answer these three questions:

- Where is the exit point?
- What is the average wind speed at 1000ft?
- What is the surface wind line and wind speed?

Now plan your jump in the following sections:

- Spotting
- Exit, and canopy flight to 1000ft (Manoeuvring)
- 1000ft to base leg, and turn to final (Circuit)
- Final approach (Approach, Power, and Sink zones)
- Foot Placement

- **Execution**

  Now you have a plan, follow it through. But be prepared to be flexible in case you misread the wind, or conditions change.

  Brief the pilot before take-off on the run-in you require, and make him aware that you will direct the spot and may require direction changes from the run-in you have given him. When you are spotting make sure you look straight down, assess the drift, and correct as required.

  From exit to 300ft you can follow your plan by talking yourself through it, and you have some time to think if you need to change it. Below 300ft your flying must become progressively less "rational" and increasingly more "intuitive". The closer you get to the pad, the less time you have for "mind talk" and the more you need to "just do it".

  Below 100ft, there is absolutely no time for "mind talk". The conscious mind focuses on the goal (the Dead Centre) allowing the unconscious mind to do the steering. Only experience will teach you the best responses to each situation, and early on you must learn to quiet your conscious mind, letting your unconscious mind learn by trial and error. Let your conscious mind go to work after the jump, analysing what went well and what can be improved.

  What happens above 30ft is not the most important part of precision (measured in centimetres) accuracy. What happens below 30ft is. There are many ways to fly your canopy into a workable short final position. Learn a method that works for you, and stick to it, so that you consistently arrive at the second transition point (30ft short final above and behind the pad) in stable flight and ready to go to work, shifting into intense "fine focus" for your flight down to, and foot placement onto, the dead centre.

- **Exercise 1**

  Nominate yourself a target point well away from the normal landing area that has clear area all around it out to 100m. Make sure the target point is easy to see from the air. Use a canopy loaded to a maximum of 1.0 lb/sq ft for this exercise. Plan an accuracy jump, as briefed above, for every jump, even when doing other disciplines. Then, after passing 2500ft, manoeuvre to get to the first transition point (100ft) as if you were doing accuracy to your target. As you get to the first transition point, don’t transition from 66% brakes into the 80% brake Power Zone. Let up on your brakes to get to full flight and then carry out a normal flared landing beyond your target. DO NOT attempt to hit your target. Do not let up on your brakes too rapidly to get to full flight as this can cause some canopies to dive (check the effect on your canopy at altitude). Do this exercise until you can consistently get to the first transition point for your nominated target, in as many wind conditions as possible.

- **Exercise 2**
  Nominate yourself a target point in soft ground well away from the normal landing area, that has clear area all around it out to 50m. Make sure the target point is easy to see from the air. Use a canopy loaded to a maximum of 0.85 lb/sq ft for this exercise. Plan an accuracy jump, as briefed above, for every jump, even when doing other disciplines. Then, after passing 2500ft, manoeuvre to get to the first transition point (100ft) as if you were doing accuracy to your target. As you get to the first transition point, don't transition from 66% brakes into the 80% brake Power Zone. Keep at 66% brakes and aiming at 5m beyond the target. DO NOT attempt to hit your target. Then carry out a flared landing from 66% brakes, to a point beyond your target. This will not be as effective as a full flare landing and the stall point will be higher than a full flare stall point (check the effect on your canopy at altitude). This approach should give you a landing within 10m of your nominated target. Do this exercise until you can consistently get to within 10m, in as many wind conditions as possible.

- **Exercise 3**
  Nominate yourself a target point in soft ground well away from the normal landing area, that has clear area all around it out to 30m. Make sure the target point is easy to see from the air. Use a canopy loaded to a maximum of 0.70 lb/sq ft for this exercise. Plan an accuracy jump, as briefed above, for every jump, even when doing other disciplines. Then, after passing 2500ft, manoeuvre to get to the first transition point (100ft) as if you were doing accuracy to your target. As you get to the first transition point, don't transition from 66% brakes into the 80% brake Power Zone. Put very slightly more brake on, to about 70%, and aim at 3m beyond the target. DO NOT attempt to hit your target. Then carry out a flared landing from 70% brakes, to a point beyond your target. This will not be as effective as a full flare landing and the stall point will be higher than a full flare stall point (check the effect on your canopy at altitude). This approach should give you a landing within 5m of your nominated target. Do this exercise until you can consistently get to within 5m, in as many wind conditions as possible.

- **Further training**
  Good accuracy comes with practice and it is very much a personal task to get within 5m. Following the guidelines in this document will get you to within 5m without a great deal of coaching. When you are consistent to 5m, it will be necessary to make approaches to a tuffet in order to get more accurate without injury. Once you are making consistent approaches onto a tuffet, coaching can get you onto the pad and improve your centimetres score. Find a drop zone that has a tuffet or contact the Freefall Style & Accuracy Landing and Para-Ski committee of the SSA for more information.

  Here is an example of an ambitious but achievable set of accuracy goals:

Ten jumps inside 10 metres	after 100 accuracy jumps
Ten jumps inside 5 metres	after 300 accuracy jumps
Ten jumps with a 15cm average	after 500 accuracy jumps
Ten jumps with a 7cm average	after 700 accuracy jumps
Ten jumps with a 4cm average	after 900 accuracy jumps
Ten jumps with a 1cm average	after 1000 accuracy jumps

4 PARA-SKI

This discipline combines the two events of Accuracy Landing and Giant Slalom Skiing. It has been an international event almost as long as Accuracy Landing and started in Europe with competitions between avalanche rescue teams in the 1950s. At that time the rescuers used to parachute into the mountains then ski to the avalanche site, because there were no helicopters. Many top European accuracy jumpers do Para-Ski in the winter.

Para-Ski accuracy is the same as normal accuracy, as described above, except that the tuffet is in the mountains on a snow slope of at least 25°. The sloping tuffet and mountain wind conditions make this a very difficult form of accuracy, therefore scores are given out to 1 metre. A competition consists of seven jumps.

The Giant Slalom Skiing is an individual race against the clock down a 1000m slope with a fall of 250m, and with approximately 35 gates. A competition consists of one seeding run and two competition runs. The Giant Slalom Skiing takes place under the rules and regulations of the International Ski Federation and is not covered in this document.

Contact the Freefall Style & Accuracy Landing and Para-Ski committee of the SSA for more information.

5 EMERGENCY PROCEDURES

In Freefall Style and Accuracy Landing, the parachute emergencies are similar to those discussed in the student's training and no unique emergencies are associated with the discipline. However, in competition, some specific procedures are followed.

Freefall Style: A premature opening is not grounds for a rejump. However, a malfunction after completing the style series does not affect the style score.

Accuracy Landing: A cutaway, or a parachute malfunction that creates control problems (for instance a locked brake), is grounds for a rejump. The jumper must signal immediately with arms and legs outstretched and make no attempt to approach the target or land in the target area. Immediately following a landing with a control problem, the parachute must be inspected by the judges; therefore, the problem must not be cleared by the jumper after landing.

6 CATEGORY TESTS

CAT I
The student shall have successfully completed the Intermediate Skills Programme (ISP) as contained in Section 5 (PASA SOPs).

CAT II
The student shall have successfully completed the following tasks in both disciplines:

Freefall Style. Two, pre-declared, Freefall Style series in no more than 16 seconds (after penalties) on two separate jumps.

Accuracy Landing. Two, pre declared, self-spotted jumps ending with stand-up landings within 10 metres of a pre-designated landing target.

CAT III
The student shall have successfully completed the following tasks in both disciplines:

Freefall Style. Two, pre-declared, Freefall Style series in no more than 14 seconds (after penalties) on two separate jumps.

Accuracy Landing. Two, pre-declared, self-spotted jumps ending with landings within 5 meter of the centre of a tuffet.

7 LICENCE REQUIREMENTS

A Licence

An applicant for an A licence shall:

- Have met all the A licence requirements in Section 2 (PASA SOPs)

B Licence

An applicant for a B licence shall:

- Have met all the B licence requirements in Section 2 (PASA SOPs)
- Passed the Category III test in Freefall Style, and in Accuracy Landing.

C Licence

An applicant for a C licence shall:

- Have met all the C licence requirements in Section 2 (PASA SOPs).
- Have performed Accuracy Landing with an average over five consecutive jumps onto an AMD of no more than 15cm.
- Have performed Freefall Style with an average over three consecutive jumps of no more than 13 seconds (after penalties).

D Licence

An applicant for a D licence shall:

- Have met all the D licence requirements in Section 2 (PASA SOPs).
- Have performed Accuracy Landing with an average over eight consecutive jumps onto an AMD of no more than 12cm, in a regional, or higher category, Accuracy Landing competition,
- Have performed Freefall Style with an average over four consecutive jumps of no more than 12 seconds (after penalties), in a regional, or higher category, Freefall Style competition.

8 COACHES

The coach rating is designed to give a formal qualification to those who teach Style and Accuracy jumpers up to Cat III level. All applicants for coach ratings must be recommended by a CI, and endorsed by the Freefall Style & Accuracy Landing and Para-Ski committee of SSA (see Form 19). Official results sheets from competitions, or the competition judge's signature against logbook entries, will be required to confirm performance requirements.

An applicant for a Freefall Style and Accuracy Landing Coach Rating must:

- Have a minimum of 300 jumps.
- Have successfully completed and passed a PASA approved Jumpmaster, Static Line Instructor or AFF Instructor Course
- Hold a PASA C or D licence, with performance minima obtained in any discipline.
- Have successfully completed a SSA recognised judging seminar in Freefall Style, and in Accuracy Landing.
- Have competed at regional level or higher in Freefall Style, and in Accuracy Landing
- Have performed Freefall Style with an average over three jumps of no more than 13 sec (after penalties) on three different series.
- Have performed Accuracy Landing with an average over five consecutive jumps onto an AMD of no more than 15cm.

To remain current as a Freefall Style and Accuracy Landing Coach the rating holder must:

- Have performed at least 10 Accuracy Landing jumps in the previous 12 months.
- Have performed at least 5 Freefall Style jumps in the previous 12 months.
- Have attended a SSA recognised judging seminar in Freefall Style, and in Accuracy Landing in the previous 24 months.

9 FIGURES

FIG 1 - THE DIVE POSITION

FIG 2 - THE TUCK POSITION

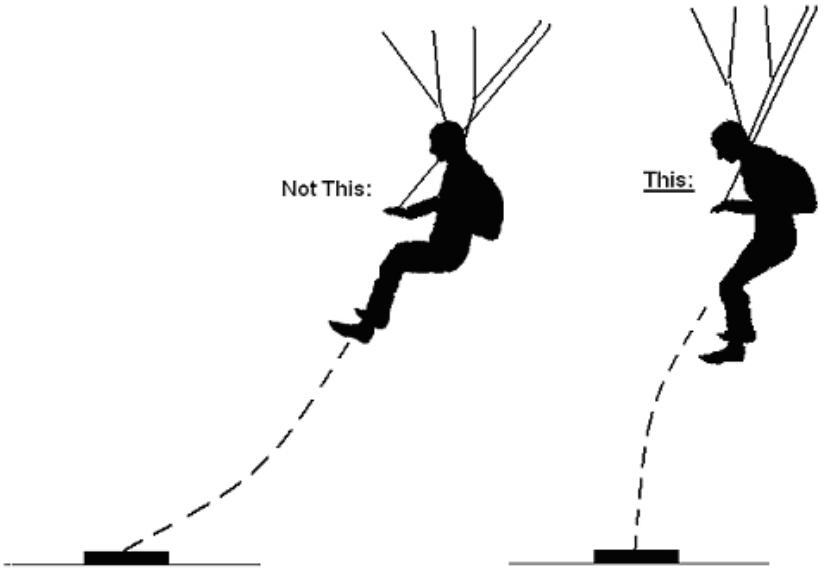


FIG 3 - HARNESS POSITION

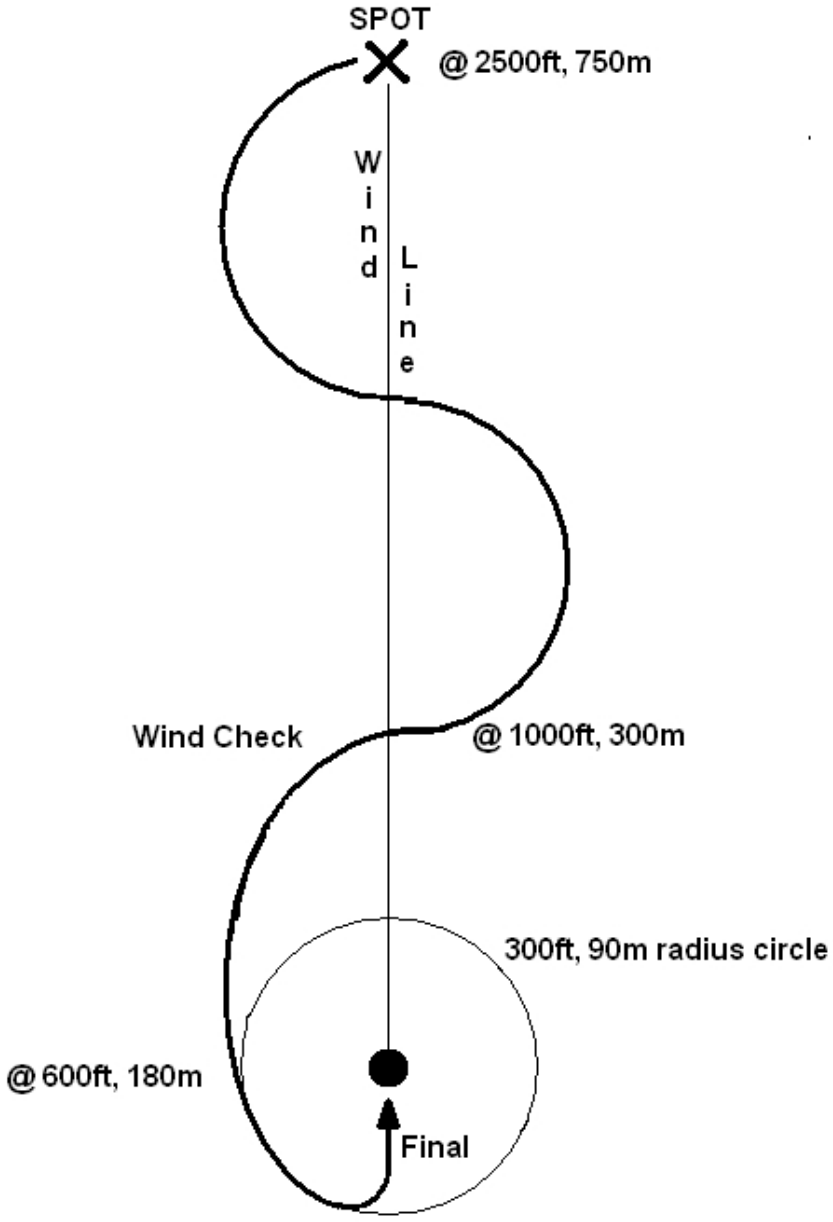


FIG 4 - MANOEUVRING AND CIRCUIT

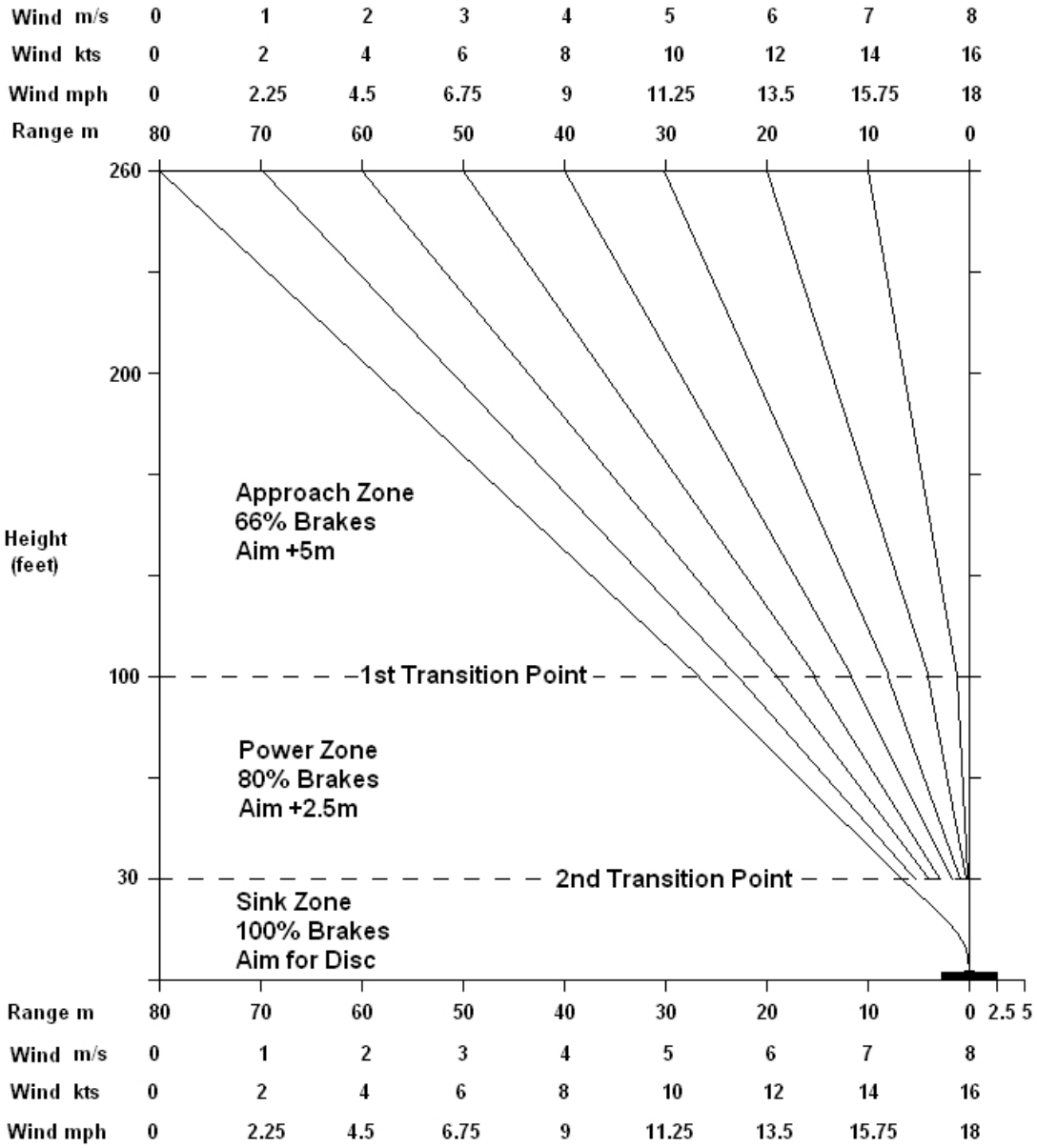


FIG 5 - APPROACH ANGLES - FEET/METRES

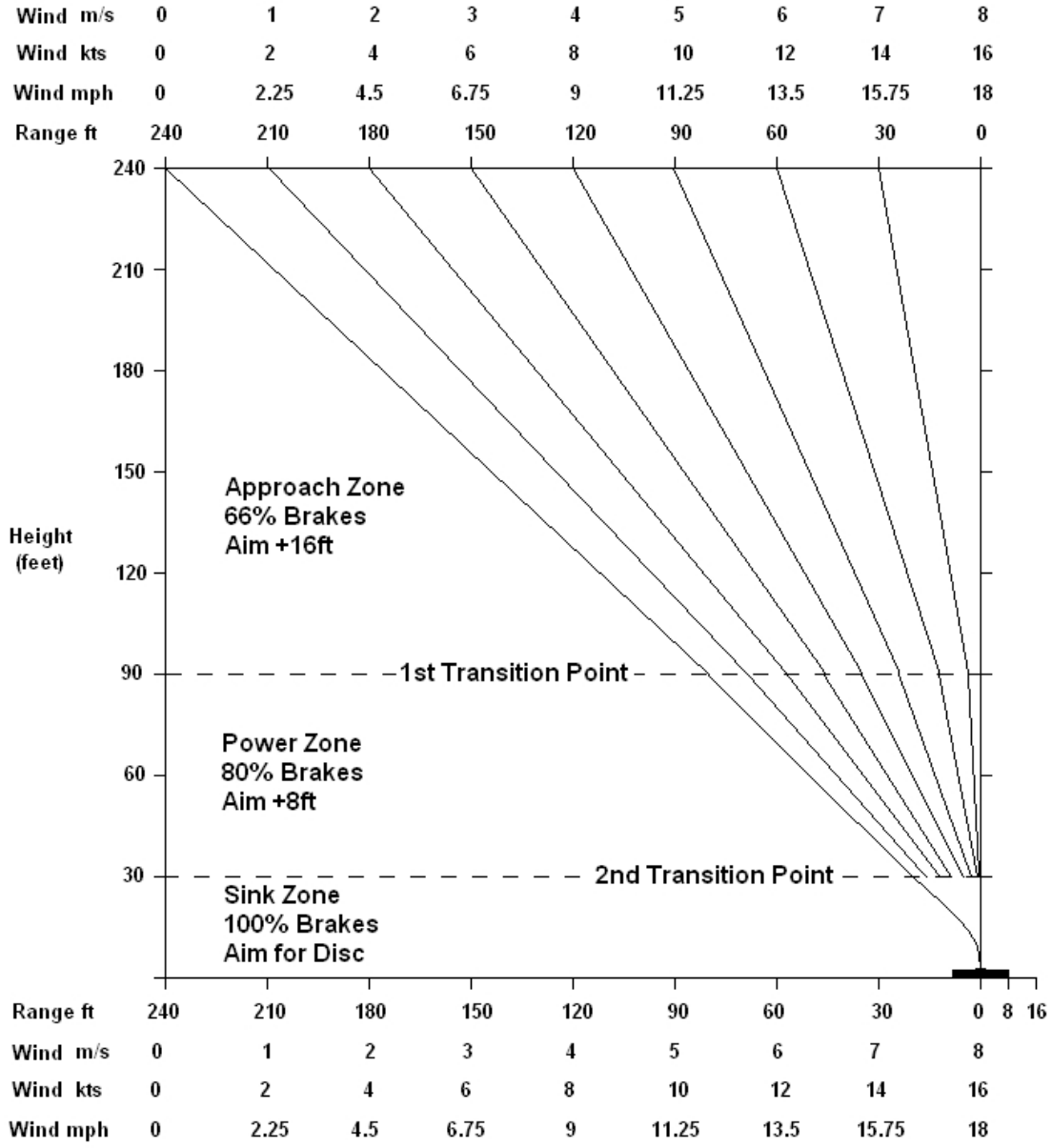


FIG 6 - APPROACH ANGLES - FEET/FEET

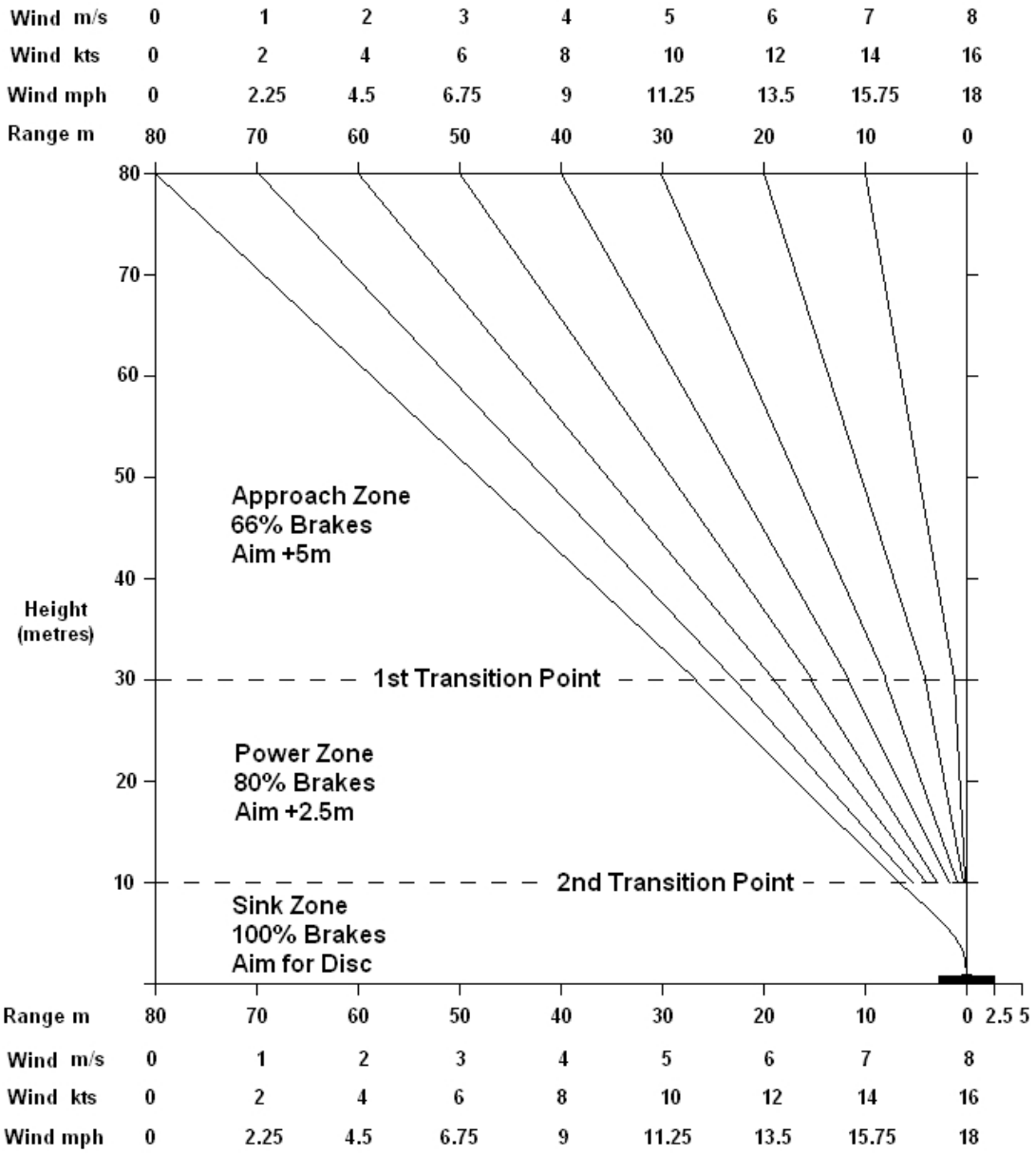


FIG 7 - APPROACH ANGLES - METRES/METRES

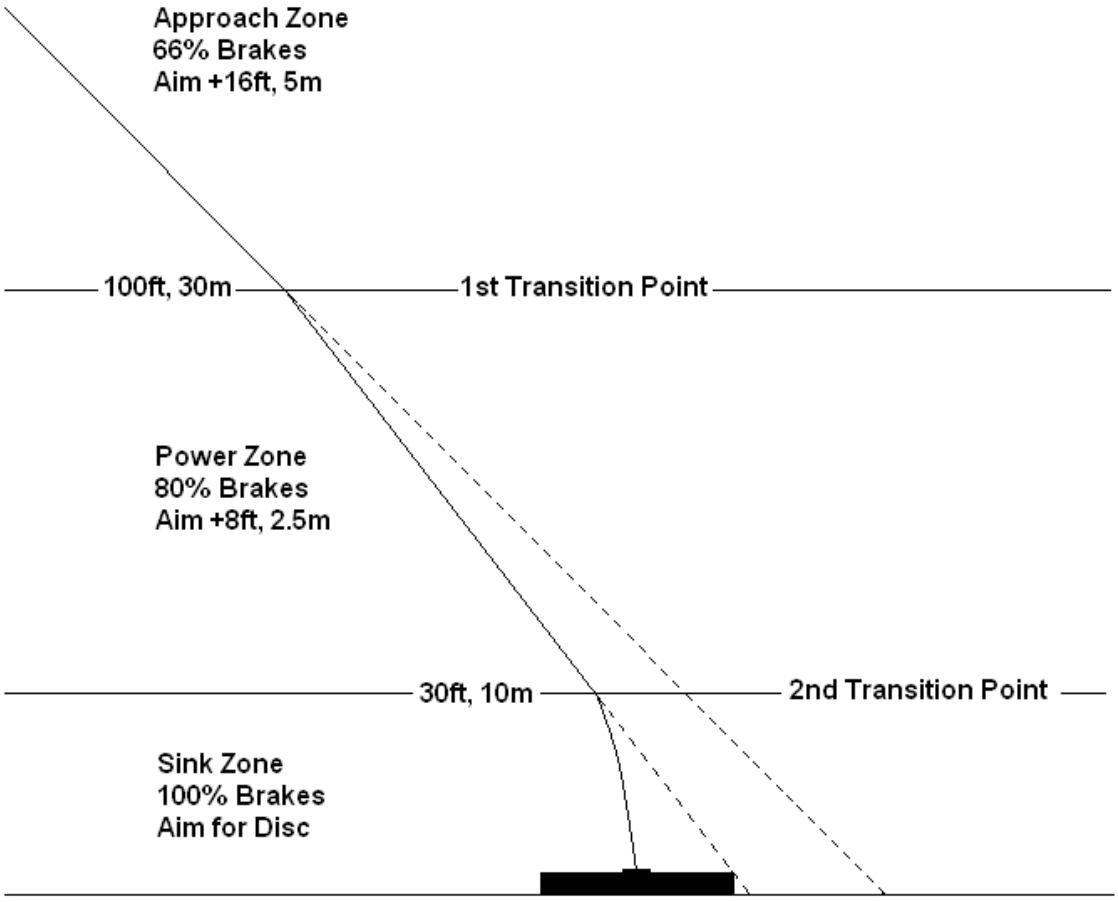


FIG 8 - FINALS - THE LAST 100FT

SECTION 10

CANOPY PILOTING

CONTENTS

1 INTERMEDIATE CLASS PILOTS, PRE-QUALIFIERS AND QUALIFIERS

An Intermediate Class Pilot is a Canopy Pilot that is not a student or Intermediate jumper and has to adhere to the pre-qualifiers for the Intermediate Class Pilot.

1.1 PRE-QUALIFIERS

Pre-qualifiers to be obtained prior to qualifying criteria for a competition:

- Have at least a C licence.
- Be cleared by a Canopy Piloting (CP) coach.
- Have a minimum of 500 ram-air canopy jumps.
- Turns are limited to 270 degrees.
- Hold a Pro rating or be signed off by a CP Coach.
- Have completed the Canopy Piloting Skills Programme (CPSP).
- Wing load limit and canopy size have to be signed off by a CP coach and the CI of the drop zone. The chart below can be used as a guideline by the CP coach:

Jump numbers	Suggested wing loading
500	1.4
600	1.5
800	1.6
1000	2.0

1.2 QUALIFIERS

Pre-requisites to participate in a CP competition:

- Must be cleared by CI and 2 coaches.
- Complete 30m course 3 times (pre-declared) 15ft high gates 15 metres apart, must have safe approach, no low turns.

2 OPEN CLASS PILOTS AND QUALIFIERS

An Open Class Pilot is a Canopy Pilot that is not a student, Intermediate jumper or an Intermediate Class Pilot and meets the qualifying criteria below.

2.1 QUALIFIERS

- Have taken part in the Intermediate / Open category at a previous PASA National Championships or SSA sanctioned competition.
- Have done a minimum of 1000 jumps.
- Cleared by a CP Coach for Open Class.
- Completed a 50m course 3 times with 5ft gates over water. Attempts must be pre-declared. A missed attempt will restart the count.
- Weight restrictions as per FAI.
- Competition rules as per FAI.

2.2 MINIMUM CURRENCY REQUIREMENT

- An Intermediate Class Pilot has to complete the intermediate qualifiers in last 3 months. An Open Class Pilot has to complete a 50m course 3 times with 5ft gates over water in last 3 months or be signed off by a CP Coach.
- **All** qualification jumps should be performed **before** competitions may be entered.

3 CP COACH AND QUALIFICATIONS

A CP Coach is an experienced Open Class Pilot that has the ability to teach, advise and assess less experienced Pilots with the intent of developing and improving their ability and to qualify them during the pre-qualifications in order to participate in competitions in a safe manner and according to the rules.

3.1 QUALIFICATIONS FOR A COACH

- Hold a minimum of a PASA C licence.
- 1000 jumps minimum overall.
- Hold a PASA Jumpmaster rating.
- Hold a current PRO rating.
- Have participated in CP Open Class at an IPC First Category Event, National Championships or SSA CP sanctioned competition.
- Complete 70m course on a CP committee recognised pond 3 times pre-declared.
- Be recommended by at least 1 current Coach.
- Signature and approval by Chief Instructor.
- Cleared by vote with 75% of current coaches.

3.2 COACH RATING RENEWAL

To remain current as a CP Coach the rating holder must:

- Have done 50 CP jumps over a CP committee recognised pond in the previous 12 months (or have done a minimum of 100 jumps in the previous 12 months, of which 25 must be CP jumps over a CP committee recognised pond).
- Have, in the previous 12 months, coached 2 candidates in the Intermediate Canopy Piloting Skills Programme.
- Have participated in CP Open Class at an IPC First Category Event, National Championships or SSA CP sanctioned competition in CP Open Class during the last 24 months.
- Have complied with Qualifications of a Coach.

4 CANOPY PILOTING SKILLS PROGRAMME (CPSP) FOR INTERMEDIATE CLASS

10 Jump programme (pre-declared).
All jumps to be debriefed by Coach and signed off in logbook. Must have hard open face helmet, digital altimeter, and closed shoes. Landings must be observed by a CP coach.

Task 1 (2 Jumps)

- Pilot to open above 8000ft.
- Explore canopy range on toggles and rear risers and determine stall point.
- Perform 3 x stall on back risers.
- 3 x stall on toggles.
- Canopy Pilot must alternate riser and toggle stall.
- No more work under 2500ft.
- Pilot to be briefed on the recovery of a stall by letting out brakes or rear risers after stall, just enough to regain flight.
- Fly student landing pattern.

Task 2 (2 Jumps)

- Pilot to open above 8000ft.
- Pilot to explore front riser pressure and altitude loss when pulling down dual front risers.
- No more work under 2500ft.
- Pilot to be briefed on altitude loss when pulling front risers.
- Pilot to determine how much altitude loss for 3, and 5 second riser dive on both front risers pulled simultaneously. Always flare after each manoeuvre. Pilot to provide altitude loss for 3, and 5 second dive on debrief with Coach.
- Fly student landing pattern.

Task 3 (2 Jumps)

- Pilot to open above 8000ft.
- Pilot to explore harness turns and altitude loss for period of turn.
- No more work under 2500ft.
- Pilot to be briefed on harness turns and explain that the turn will take some time to start on light wing loading.
- Pilot to perform at least 2 separate 180° turns with harness and always flare after each manoeuvre.

- Pilot to provide altitude loss on 180° turns and time taken to complete turn in seconds during debrief.
- Fly student landing pattern.

Task 4 (4 Jumps)

- Pilot to open above 8000ft.
- Pilot to explore turns combining riser and harness input.
- No more work 2500ft.
- Pilot to be briefed on turn rate with harness and riser input.
- Pilot to provide altitude loss for 180° turn with harness and riser turn combined.
- Perform at least 2 x 180° turns with riser and harness combined input and always flare after each manoeuvre.
- Report minimum recovery altitude for 180° turn.
- Fly student landing pattern.

5 COURSE THEORY OUTLINE FOR INTERMEDIATE CLASS

5.1 INTRODUCTION

What is canopy piloting? Explain distance, accuracy, carve, freestyle. Explain dangers. Slow progression is normal. Skills are important to acquire. Dedicated hop and pop jumps. Explain CPSP. Ultimate goal is to be safe and have fun.

5.2 EQUIPMENT

The importance of hard open face helmet, digital altimeter, type of canopy, wing load, flight plan, weights, reserve limitations, audible functions, medical cover.

5.3 AIR WORK

Separation and pull altitude in competition, wind direction and how this will affect setup. Have awareness of altitude and importance, check for traffic and landing order.

5.4 SETUP AND APPROACH

Why the student approach. Initiation point for turn and the importance of being at the correct altitude. Altitude loss and turn rate.

5.5 LANDING

Flare technique with rear risers and possible collapse of canopy when flaring with rear risers, recovery when turning low, rear riser flare should only be attempted when absolute confidence in flare technique has been acquired and should only be attempted near the ground when proficient.

6 EQUIPMENT

Hard open face helmet, digital altimeter, closed shoes, body protection and audible with swoop alarms recommended. Sufficient medical cover highly recommended. Swoop area should be clear of traffic, preferably swoop pond. It is recommended that, if an AAD is worn, it should be set to speed mode.

7 DOWNSIZING

Downsizing on a canopy of the same type should include the CPSP or 25 jumps on the downsized canopy. Changing from a 9-cell to a cross-brace canopy should include the CPSP or 100 jumps should be completed on the new cross-brace canopy before any competition may be entered.

All skydivers should be aware that if weights are used, the wing loading on the reserve should be kept in mind and not exceed manufacturer’s specifications.

All skydivers should realize that they should stay current in swooping as the risk escalates and the margin of error is small.

8 WARNINGS

Warnings as specified by the FAI/IPC will apply as well as the warnings below and will include qualifiers and competition jumps:

8.1 Only 2 yellow cards will be allowed. 2 yellow cards = red card (Low turn = red card, missed course = yellow card). Yellow and red cards for unsafe landings can be given by the CI, judges or a Coach.

8.2 No attempts may be made at the course if a red card has been given. Full briefing must be given before the next attempt.

8.3 A red card will suspend participation in competition. In the event of a red card in the qualifiers a re-brief of tasks must be given by a CP Coach.

SECTION 11

WINGSUITS

CONTENTS

1 GENERAL

Jumpers using wingsuits **must not** attempt to land without a fully open parachute.

NOTE: PASA recommends that all skydivers, regardless of jump numbers, seek out a qualified wingsuit coach for their first wingsuit jump.

NOTE: This section is not a course of instruction and should be read and understood in conjunction with thorough training on wingsuits.

A wingsuit is a piece of equipment that spans flexible material between a parachutist's arms and torso, and between their legs, creating the possibility for sustained forward movement through the air powered only by gravity. The parachutist's body forms the majority of the frame for the wings of the suit.

- Wingsuits must be worn correctly to ensure proper performance during the flight and that safe deployment and emergency procedures can be carried out.
- Arm-torso fabric membranes should include a release system that the jumper can operate in any flight mode.
- Leg-leg fabric membranes should be releasable to allow the jumper free leg movement during landing.
- All of the operation handles must be accessible when the jumper is wearing the suit.

Persons who intend to use wingsuits must be experienced, current and licensed skydivers. More important than the number of skydives is whether the skydiver feels comfortable in freefall, can show ability to control himself while in a long track, has the ability to observe airspace and altitude at the same time, and feels confident about his ability to perform under pressure.

Before attempting a wingsuit jump, a skydiver must:

- have a minimum of a PASA B licence or foreign equivalent.
- have a minimum of 500 freefall skydives; or
- have a minimum of 200 freefall skydives, of which at least 36 in the past 3 months, and receive one-on-one instruction from a wingsuit coach who is confident in the jumper's ability.
- have completely read and understood all documentation and training information provided with a wingsuit coach and the manufacturer.
- use a wingsuit of appropriate type and size as recommended by a wingsuit coach and the manufacturer.
- have the ability to perform exits and skydive in the deployment position described in this section before making a jump with the wingsuit.
- It is compulsory for any skydiver making a first wingsuit jump to get a briefing from a wingsuit pilot approved by the CI before his first jump regardless of the jumper's experience level.

Before attempting a tracking suit / pants jump, a skydiver must:

- have a minimum of a PASA B licence or foreign equivalent.
- have a minimum of 100 freefall skydives;
- have completely read and understood all documentation and training information provided with the tracking suit / pants by the manufacturer.
- have the ability to perform exits and skydive in the deployment position described in this section before making a jump with tracking suit / pants.
- It is recommended for any skydiver making a first tracking suit / pants jump to be approved by the CI and get a briefing from a wingsuit coach before his first jump regardless of the jumper's experience level.

2 EQUIPMENT

Because of the big burble behind the back created by the speed of the wingsuit flyer and the shape of the wings, and the fact that the wings restrict arm freedom, there are some restrictions about the equipment that the wingsuit flyer is recommended to use.

2.1 PARACHUTE

- Do not use any kind of parachute that you feel uncomfortable or unfamiliar with.
- The main canopy should be docile in nature with consistent opening characteristics.
- Problems such as abrupt heading changes or line twists on opening can become a much larger problem due to the jumper's limited extremity movement when wearing a wingsuit.
- A square or semi-elliptical parachute (not elliptical) is recommended because it will have fewer tendencies to descend rapidly if in twists.
- Maximum recommended wing loading is 1.3 for both the main and reserve parachutes.

2.2 RIG

DO NOT use a pull-out pilot chute system.
DO NOT use a collapsible pilot chute that uses a bungee type of collapsing system.
DO NOT use a rig that has the pilot chute mounted in the legstrap (ROL).
DO NOT use a ripcord activated, spring loaded pilot chute system for main deployment. Ripcord-activated, spring loaded pilot chute system is used for reserve activation only.
DO NOT use a pilot chute that has become worn and ineffective. The pilot chute should be at least 24" in diameter. Avoid heavy pilot chute handles since the handle can interfere with the bridle and choke the pilot chute. The handle must have more than one attachment point on the apex of the pilot chute and be firmly attached to the top of the pilot chute to prevent entanglement with the bridle cord.

Use only a BOC throw-out pilot chute, or suit mounted throw-out pilot chute, deployment method with a wingsuit.

Because of the large burble, a long pilot chute bridle is recommended. As a minimum the bridle should be 2.5m, but 3m is recommended.

2.3 AADs

Very slow vertical speeds with a wingsuit (32km/h or 20mph) can be achieved in efficient controlled flight which are lower than the activation speeds of AAD's possibly not deploying your reserve if below the AAD's activation height. However, your rig should still be equipped with an AAD because it will still function if you are incapacitated or flying steeply in uncontrolled flight. Visual altimeters are compulsory for all wingsuit jumps.

It is important to be aware when using big wingsuits that the sheer size of the wingsuit may result in freefall speeds that are slower than the activation speed of an AAD.

2.4 ALTIMETERS

Some audible altimeters and alarms may not function properly at slow vertical airspeeds. For these reasons, it is very important to wear a visual altimeter and to open at the proper altitude. Wear your visual altimeter as far away from your body as possible (a hand- or chest-mounted altimeter is recommended) for correct reading.

NOTE: PASA strongly recommends the use of AADs and audible altimeters.

2.5 HOOK KNIFE

An accessible hook knife should be worn. Hook knives on many rigs are not accessible when wearing a wingsuit. Therefore, it is recommended that a hook knife be attached to the wingsuit or to the chest strap

2.6 WINGSUIT

Many wingsuit types and designs are available. Aspirant first-time wingsuit pilots should obtain advice from a wingsuit coach on the type of suit recommended for their experience level. For at least the first 25 jumps a beginner suit with small surface area is recommended. Wingsuit manufacturers have a comprehensive range of wingsuits suited for beginner, intermediate and experienced wingsuit pilots. Only wingsuits recommended for beginner and intermediate can be used for the first 50 flights.

Different manufacturers have different systems and even the same manufacturers frequently change their designs. It is vitally important to thoroughly familiarise yourself with these systems and the recommended flying technique of all wingsuits before flight.

2.7 TRACKING SUIT / PANTS

Tracking suits / pants are included in the wingsuit section as they bear a number of similarities to wingsuit procedures and can be used in the progression to wingsuits.

Tracking suits / pants have air inlet vents that pressurise the suit / pants. The increased drag and area created by the pants around the parachutist's body create the possibility for sustained forward movement through the air powered only by gravity.

Persons who intend to use tracking suits / pants must be experienced, current and licensed skydivers. The skydiver must be able to show control and spatial awareness during a track, is expected to be able to manage their airspace and altitude in relation to the landing zone and be able to adjust his or her flight plan during the skydive.

3 PROCEDURES AND RULES OF THE SKY

It is necessary to practice a safe and stable exit, flight, pull and emergency techniques on the ground as well as in the air before you can do your first flight with a wingsuit. It is very important to read and understand the wingsuit flight manual before the first flight. It is also vital to understand the importance of communicating with the pilot and fellow jumpers about your flight plan.

NEVER FLY UP OR DOWN THE FLIGHT LINE.

Wingsuit Rodeo

Wingsuit rodeo jumps may be performed with prior approval from a CI and where the wingsuit pilot has at least 100 wingsuit jumps and a Cat III and the passenger has at least 100 jumps and a B licence.

Wingsuit "Fly-bys"

Wingsuit / tracking suit will not be permitted to fly within a 200m radius of tandems.

Wingsuit / tracking suit "fly-bys" to a sport skydiver under canopy must be sanctioned by the Chief Instructor and approved by the NSTO. A pre-jump briefing is required.

XRW

Extreme relative work (XRW) is flocking between a wingsuit and a high-performance canopy. XRW can only be done with the approval from the Chief Instructor and the NSTO. It is recommended that the canopy pilot have competed in canopy piloting at South African nationals at an open level or at a FAI first class event. Wingsuit pilot/s require at least 150 wingsuit jumps, a CAT III in wingsuit flying and must be comfortable and familiar with the wingsuit used. A pre-jump briefing is required by a person on the jump with previous XRW experience.

3.1 PREPARE FOR FLIGHT

- **Weather conditions**

  Because you can fly long distances with the wingsuit, make sure that the weather conditions allow you to have visual contact with the ground at all times during your flight. Remember that the same physical laws apply to you as to any non-powered flyer. Your travelling distance and ground speed could differ substantially depending on whether you fly with or against the wind.

- **Before boarding**

  Make a complete gear check before you enter the plane:
  - Wings correctly assembled and cutaway cables correctly routed.
  - Emergency handles in position and not covered.
  - Chest strap fastened tight enough.
  - Leg straps fastened inside the suit.
  - Arm zippers and swoop cords in good condition.
  - Pin check on your rig.
  - Throw out pilot chute in correct position.

  Make a few practice pulls before you enter the plane to ensure that you can reach your throw out pilot chute and to ensure that it is in the correct position. Touch your throw out pilot chute with your right hand while doing the same move with the left arm symmetrically. Return to the flight position symmetrically. Practice your opening procedure after practice pulls. Open both of your arm zippers in a fast, controlled manner all the way up and simulate reaching the risers. Repeat until you feel comfortable.

- **Briefing fellow jumpers, pilot etc.**
  Before entering the aircraft, you need to brief your fellow jumpers and the pilot about your flight pattern. Due to their forward speed and very slow descent rate, wingsuits always exit last after tandems AFF and “hop and pops”.

3.2 PLANE

- **Climb to altitude**

  For the climb to altitude make sure you are completely dressed for your skydive. This includes tight leg straps, tight chest strap and booties on. Due to the increased amount of equipment and checks a wingsuit pilot needs to do before exit, it is recommended to start preparing for exit at least 2 minutes earlier to avoid rushing.

3.3 FLIGHT TECHNIQUES

- **Exits**

  All aircraft: exit facing the relative wind. Never jump or fly upward while exiting. Practice all exits on the ground using mock-up or the actual aircraft.

  Rear side door aircraft: to prevent a collision with the horizontal stabilizer of the aircraft, perform a good poised exit with your wings CLOSED (arms tight to your body, legs together), and keep them closed for the first couple of seconds that you are exposed to the air. After you are safely clear of the aircraft, spread your wings (both arms and legs symmetrically at the same time) and start your flight.

  Tailgate aircraft: if backing out, leave with all wings closed, especially the leg wing, then open your arm wings FIRST. Leaving with the leg wing open can result in a very fast head down movement just as you leave the ramp, which can result in your head hitting the ramp. If diving out, the wings can be slightly open and then fully opened as you clear the aircraft.

  Front side door aircraft with step: a poised exit is possible, but it is very important that you receive proper training in this method of exit by a wingsuit coach. It is of great importance to clear the aircraft before spreading wings. If you fail to clear, you risk having an unstable exit and hitting the aircraft (body or tail) resulting in severe damage to yourself and the aircraft.

- **Flight**

  For the best performance of your wingsuit you should be familiar with the wingsuit manufacturer’s recommended body position and advice from a wingsuit coach that is familiar with that wingsuit. You should fly your arms and legs extended and spread while still feeling relaxed. You adjust the flight angle by using your torso and hips. For turns simply look in the direction you want to go. Use SMALL movements. Large movements may result in instability.

- **Separation**

  When jumping with other wingsuiters it is very important to get good separation. Much more separation is needed than in normal freefall. The unpredictable canopy opening direction coupled with the fact that for some time after opening you cannot steer the canopy, means that you will not be able to immediately steer away from another canopy in your vicinity

- **Wave-off**

  Since you cannot use your arms to wave off, you use your legs to do a wing flight wave-off: click your legs together twice while watching the airspace around you so that other jumpers can see your intention to pull.

- **Pull**

  The most crucial part of your wingsuit flight is the pull. The huge burble behind you (caused by your speed and the shape of the wings) may cause a pilot chute hesitation, and an unsymmetrical body position during pull time may cause a malfunction of your canopy. For these two main reasons it is critical that during the pull your body is stable and symmetrical and that you throw your pilot chute with a symmetrical vigorous pitch.

  It is recommended to use the **ABCD** deployment method below for all students below 100 wingsuit jumps as hard openings may occur if the wingsuit pilot flies at full speed through the deployment.

- **ABCD of deployment**
  - **A**rch.
  - **B**end knees.
  - **C**ollapse arm and leg wings symmetrically.
  - **D**eploy by reaching right hand to the pilot chute handle.
  - Throw the pilot chute symmetrically: the left hand makes a symmetrical “fake pitch” as the right hand throws the actual pilot chute.
  - Following release of the pilot chute, bring both hands forward symmetrically to the front of the harness.
  - Keep tail wing closed (knees bent and touching) until the canopy is fully deployed.

  Deployment procedures should be practiced on the ground until smooth and proficient.

- **Recommended deployment altitude**

  Beginner wingsuit flyers should initiate deployment no lower than 5000 feet. Once a jumper has become comfortable with the equipment and procedures, deployment is recommended by no lower than 3000 feet. Despite the lower rate of descent of a wingsuit, the same PASA SOPs minimum deployment altitudes apply to wingsuit skydives as to any other type of skydive.

  Attempting to land using a wingsuit without deploying the parachute would very likely result in serious injury or death.

- **After your canopy has inflated**
  - Control the canopy using the back risers to maintain heading and fly clear of traffic.
  - Release the arm wings (typically a zipper is provided for non-emergency situations) Unzip the arm zippers – all the way up – so your arms are completely free to reach the risers and toggles.
  - Leave your brakes on.
  - Still with your brakes on, stow your slider and release your leg wing. Continue to check the airspace around you is clear.
  - Once the wingsuit is ready for the remainder of the descent and landing, release the brakes for full canopy flight.
  - It is highly recommended to have released the brake toggles and have them in hand by 2200ft. Regardless of chosen deployment altitude, this sequence must be completed above the reserve drill hard deck. Failure to comply with this may result in insufficient time or altitude to complete reserve drills.

4 TRAINING PROGRAMME - BASIC STUDENT EXERCISES

4.1 GROUND SCHOOL

Training by a wingsuit coach for those with 200 to 500 freefalls, should cover the following topics and be in accordance with the wingsuit manufacturer's recommendations:

- Gear selection, especially type of wingsuit, canopy choice and the deployment device.
- Rigging and wearing the wingsuit.
- Aircraft pilot briefing and skydiver heading awareness during wingsuit flights.
- Aircraft exit techniques.
- Basic flight techniques for wingsuit flights and flying the pattern.
- Deployment procedures.
- Emergency procedures.

4.2 INITIAL WINGSUIT FLIGHTS

- Practice the leg click wave off and deployment position soon after exit on the first jump.
- Learn basic stable flight with the wingsuit before trying radical turns or barrel rolls.
- Learn to control fall rate and heading with solo jumps before jumping with other wingsuit skydivers.

4.3 SUGGESTED PROGRESSION FOR JUMPERS WITH MORE THAN 500 FREEFALLS

- 1 solo jump performing practice touches, stable flight, flying the pattern with heading control and fall rate control.
- 1 solo jump working on body position and flight performance while maintaining stable flight.
- 3 jumps with no more than 1 other experienced wingsuiter approved by the CI based on their experience.

It is recommended that experienced skydivers approach a wingsuit coach for further wingsuit progression jumps and an introduction to wingsuit flocking.

After demonstrating to the satisfaction of the CI that he is competent to wingsuit unsupervised, the following statement is to be written in the jumper's logbook by the CI; *'Cleared to jump wingsuits under PASA SOPs'*.

4.4 COURSE FOR JUMPERS WITH 200 TO 500 FREEFALLS

- Level 1- Student exits first, practice touches, fly pattern, safe deployment
- Level 2- Student exits first, optional practice touches, fly pattern, body position awareness, safe deployment
- Level 3- Student exits first, fly pattern, body position improvement (application of feedback from debriefs), adjustment of levels relative to coach, safe deployment
- Level 4- Student exits first, intro to flocking (eye contact, proximate flying)
- Level 5- Student exits after coach, flocks with coach (follows pattern, eye contact, proximate flying)

The student is not to jump unless the coach is on the drop zone, or in the aircraft with the student.

The coach will give the full wingsuit ground school, and brief and debrief each jump.

The coach will supervise suiting-up and ground checks, pre exit checks and flight plan.

The coach, or an experienced wingsuiter nominated by the coach, will supervise pre-exit checks and flight plan on his solo and formation jumps.

The student should wingsuit, to the exclusion of all other forms of jumping, until the course is complete.

If the student has not wingsuited for more than 2 weeks, repeat the last jump performed with the coach,

After completing the course to the satisfaction of the coach, the following statement is to be written in his logbook by the coach: *'Cleared to jump wingsuits under PASA SOPs'*. The jumper will then be allowed to continue jumping a wingsuit.

4.5 JUMPERS WITH 200 TO 500 FREEFALLS TRAINED OVERSEAS

- Jumpers who have successfully completed a recognised course of wingsuit instruction overseas, and have that fact written in their logbook by the coach who gave the course, are permitted to jump wingsuits.
- Before jumping, their logbook is to be inspected by a CI or wingsuit coach. If satisfied that the jumper is trained and capable, the following statement is to written in by the CI or wingsuit coach. *'Cleared to jump wingsuits under PASA SOPs'*.

5 EMERGENCY PROCEDURES

- If one wing comes loose in freefall, the other should be released immediately.
- Routine parachute emergency procedures should be planned and carried out with the wings of the suit still attached. Your suit should be designed to allow you freedom to reach and pull both your emergency handles without restriction. That means simply that you don't need to cut away your wings first before using your emergency handles (wasting valuable time and altitude). However, to reach the toggles and risers of your reserve parachute you must either open the zippers in your arms or cut away your wings.
- If the main canopy malfunctions and requires a cutaway, the legs should be closed together to collapse the wing before operating any of your handles. Having your leg wing inflated may cause instability and turbulence.
- Unless it becomes necessary, do not waste time releasing the wings in the event of an equipment emergency.
- Avoid water landings. Without immediate help it is extremely dangerous to land in water with the wingsuit. Should this occur, keep your hook knife ready, cut the wing away, undress from the suit and gear and be prepared to use the hook knife to get rid of the suit. All this can be very difficult and, in some cases, impossible. Again, avoid water landings.

6 CATEGORY PROGRAMME

6.1 CATEGORY I JUMP PROGRAMME

Awarded after successful completion of the wingsuit instructed course or has 500 skydives and completed the recommended progression jumps (see 4.3).

A Category I wingsuit pilot may only jump with 1 other Category III wingsuit pilot which has been cleared by the CI. A wingsuit coach must sign off the Category I status.

6.2 CATEGORY II JUMP PROGRAMME

Completion of a minimum of 25 wingsuit jumps and Category I programme,

To complete the Cat II requirements the jumper must satisfactorily complete 2 tests:

Test 1:

- Candidate to plan a wingsuit formation jump with 1 other wingsuiter,assumed to be a lesser experienced wingsuit flyer (role played by the wingsuit coach).
- Candidate must brief the other wingsuiter (wingsuit coach), pilot, jumpmaster and tandem masters on the load as well as manifest on the details of the jump (exit order, spotting, pattern to be flown, deployment altitude, etc.).
- Candidate to demonstrate a stable exit, good navigational/situational awareness, fly a safe pattern without dangerous manoeuvres (fast closing speeds, turning 180 degrees, etc.).
- Candidate to signal break-off clearly by using the leg click-off and perform a controlled break off/safe deployment.

- Candidate to debrief the wingsuit coach afterwards on all aspects of the jump, highlighting, in particular, how the actual flight deviated from what was planned. It is not expected that the candidate should fly perfectly and execute the jump exactly as planned, but rather, that the candidate is able to give a clear account of the positive and negative aspects of the jump and suggest applicable improvements to negative aspects, as a demonstration of his/her awareness of WS safety.

Test 2:

- Wingsuit coach to brief the candidate on a jump where his/her competence in basic wingsuit manoeuvres (adjusting speed/altitude/attitude) will be tested.
- Wingsuit coach or candidate to exit first, depending on which will allow closest proximity on exit and maximum working time with the particular candidate (e.g. light, floaty candidate to exit first.)
- Candidate to demonstrate a stable exit, good navigational/situational awareness, fly a safe pattern, without dangerous manoeuvres (fast closing speeds, turning 180 degrees, etc.)
- Candidate demonstrates his/her flying ability by maintaining his/her slot position next to the coach, as briefed, with the coach altering the speed/altitude/attitude of the flight.
- Candidate to signal break-off clearly, by using the leg click-off and perform a controlled break off/safe deployment.

A Category II wingsuit pilot may wingsuit with any number of Category III wingsuit pilots but not more than 2 Category II wingsuit pilots may jump together. A wingsuit coach must sign off the Category II status.

6.3 CATEGORY III JUMP PROGRAMME

Completion of 50 WS jumps and the category II programme.

To complete the Cat III requirements the jumper must complete 1 test:

- Candidate to exit last in a 4-way flock consisting of a wingsuit coach and 2 other Cat III wingsuiters.
- Candidate to demonstrate a stable exit, good navigational/situational awareness, fly a safe pattern, without dangerous manoeuvres (fast closing speeds, turning 180 degrees, etc.)
- Candidate to catch up with formation and get into position in his/her pre-determined slot.
- Suggested formation is a diamond pattern, with candidate flying one of the 2 inside corners (depending on pattern flown), with the coach opposite the candidate. Any other formation (arrowhead, line, stack, etc.) may be used as well, as long as the WS coach is flying in a slot where he/she can clearly observe the candidate for the duration of the flight.
- Candidate to signal break off clearly by using the leg click-off and perform a controlled break off/safe deployment.

A category III wingsuit pilot may jump with any other wingsuit pilot except category I which may only be done with approval from the CI.

7 COACHES

The coach rating is designed to give a formal qualification to those who teach wingsuit flying. All applicants for coach ratings must be recommended by a CI and endorsed by the wingsuit flying committee of the SSA (see Form 19).

7.1 DEFINITIONS

Skydiver cleared to jump wingsuits

Person with 500 or more free fall jumps in total.

Wingsuit Coach

Experienced wingsuit pilot that holds a wingsuit coach rating from PASA.

PASA Wingsuit Trainer

Experienced wingsuit coach approved by the NSTO to train PASA wingsuit coaches according to the wingsuit coach programme.

7.2 INTRODUCTION

The aim of this document is to stipulate the requirements for a wingsuit coach rating. Wingsuit instructors with appropriate manufacturer ratings can apply to PASA for PASA wingsuit coach ratings.

Only PASA rated wingsuit coaches are allowed to train skydivers, with permission from NSTO where applicable, to jump wingsuits.

7.3 WINGSUIT COACH RATING

The wingsuit coach will undergo the following progression:
- Complete wingsuit coach course.
- Apprenticeship.
- Obtain PASA rating.

7.4 WINGSUIT COACH COURSE

An applicant for a wingsuit coach rating must have:
- At least 100 wingsuit jumps.
- Hold a CAT III in wingsuit flying.
- Hold at least a PASA C licence.
- Hold a PASA Jumpmaster rating.
- Have attended at least 2 PASA wingsuit skills camps.
- Have helped with organizing at least 1 PASA wingsuit skills camp.

The wingsuit coach course material is available from the wingsuit flying committee of the SSA.

Candidate coach evaluation

Two evaluation jumps will be done with the candidate coach where a current wingsuit coach trainer will act as the student. The candidate will present the course to the student and then complete the two evaluation jumps.

Jump 1

The first wingsuit progression jump will be done. The flying skills of the candidate coach will be evaluated as well as his attention to the flight of the student.

Jump 2

The last wingsuit progression jump will be done where the candidate coach will be required to comment on the flying skills of the student and provide the student with the necessary feedback to better his flying skills. The candidate coach must give the student an introduction to wingsuit flocking (flying skills required to fly safely with other wingsuit pilots).

Evaluation criteria:

Presentation of first jump course

Safety
- Equipment
- Exit
- Pattern
- Dealing with emergency situations
- Spin recovery
- Other skydivers and canopies

In air skills on jump 1

- Proximity
- Attention to exit
- Attention to pattern
- Attention to student practice pulls
- Attention to student body position
- Student pull
  - Method
  - Altitude
  - Wave off
- Feedback to student

In air skills jump 2

- Proximity with student
- Help student to fly optimum body position
- Help student with flocking skills
  - Approach to formation
  - Staying with formation
  - Break off

Apprenticeship

The candidate coach will present the first jump course to at least one student while under supervision of a current wingsuit coach.

Obtain PASA rating

The candidate coach will complete the necessary documentation and apply to PASA for a PASA wingsuit coach rating.

To remain current as a wingsuit coach the rating holder must:

- Have, in the previous 12 months, performed at least 50 jumps of which at least 10 must be WS jumps.
- Have, in the previous 12 months, trained at least 1 full First Flight Course.
- Attendance of a WS sanctioned coaching seminar in the previous 12 months is highly recommended.

7.5 WINGSUIT COACH TRAINER

PASA will appoint experienced wingsuit coaches to train new wingsuit coaches. The minimum requirements to become a wingsuit coach trainer are:

- Be a current wingsuit coach.
- Have trained at least 25 wingsuit pilots.
- Have approval from the NSTO to train wingsuit coaches.

SECTION 12

CAMERAPERSONS

CONTENTS

1 GENERAL

Skydiving provides a wealth of visual stimulation that can be readily captured through still and video photography.

Video and still images can serve to promote and educate others of the sport, so it is important that a high level of quality and professionalism is maintained. A good camera flyer is a good ambassador to the sport.

Smaller and lighter cameras have made it easier and less expensive to take cameras on a jump. This does not make it inherently safer and so should be given due consideration.

Jumpers need to exercise caution with respect to camera flying and always prepare themselves, the equipment and each skydive well:

- Camera equipment and its interaction with the parachute system.
- Activities on the jump.
- Break-off procedures.
- Special emergency procedures for camera flyers.
- Canopy packing and deployment management techniques.
- The inherent danger of neck and spinal injuries from carrying extra weight on a helmet.

Once a camera flyer has become completely familiar with the equipment and procedures of the discipline, he will be able to experiment and perform creatively while keeping it safe.

Recommendations for flying cameras should educate potential camera flyers and those making jumps with them.

Jumpers should realise that flying a camera is a serious decision and that it requires additional effort and attention on each jump.

2 EQUIPMENT

A camera flyer should consult other experienced camera flyers, a rigger, and the DZ CI/SO before using any new or modified piece of equipment on any jump:

- Helmet.
- Parachute.
- Main deployment system modifications.
- Camera.
- Camera mount.
- Flash.
- Remote switch routing.
- Camera suit (wing type suits).

Prior to filming other skydivers, each new or additional piece of equipment should be jumped until the camera flyer is completely familiar with it and has adjusted all procedures accordingly.

2.1 CAMERA EQUIPMENT

- Small cameras are not necessarily safer to jump than larger ones.
- Regardless of location, any camera mount and remote switch should be placed and rigged with respect to the deploying parachutes and access to handles.
- All sharp edges and potential snag areas should be covered, taped, or otherwise protected.
  - Unavoidable snag points on helmet-mounted cameras should at least face away from the deploying parachute.
  - A pyramid shape of the entire camera mounting system may deflect lines better than an egg shape.
  - Deflectors can help protect areas that can't be otherwise modified to reduce problems.
  - All gaps between the helmet and equipment, including mounting plates, should be taped or filled.
  - Protrusions, such as camera sights, should be engineered to present the least potential for snags.

  - Ground testing should include dragging a suspension line over the camera assembly to reveal snag points.
- Sharp edges and protrusions can injure other jumpers in the event of a collision or emergency aircraft landing.
- Cameras mounted on a jumper's extremities need to be kept clear of handles and deploying canopies.
- Camera operation devices (remote switches, cables) need to be kept simple, secure and clear of handles.
- Each added piece of equipment needs to be analysed for its potential interaction with the overall camera and parachute systems.

2.2 HELMETS AND CAMERA MOUNTS

- All camera platforms, whether custom or off the shelf, should be evaluated for safety and suitability to the camera flyer's purpose:
  - by a rigger,
  - by an experienced camera flyer,
  - by the DZ CI/SO.
- The helmet should provide full visibility for the camera flyer:
  - in freefall,
  - under canopy,
  - during emergency procedures.
- Empty camera mounts should be covered and taped to prevent snags.

2.3 HELMET RELEASES

- An emergency release is recommended for camera helmets in the event of an equipment entanglement.
- Emergency helmet releases should be easy to operate with either hand.
- Using a reliable helmet closure or clasp that can also be used as an emergency release promotes familiarity with the system.

2.4 PARACHUTE AND HARNESS/CONTAINER SYSTEM

- Camera flyers should use a reliable parachute that opens slowly and on heading.
- The deployment system needs to be compatible with the camera suit, if used.
- Camera suit wings and lower connections must not interfere with the camera flyer's handles or main bridle routing in any freefall orientation.
- The pilot chute and bridle length must be sufficient to overcome the additional burble created by a camera suit, if worn.
- If the camera flyer generally opens higher than the other jumpers, a slower descending canopy may help reduce traffic conflicts.
- The camera flyer should weigh the advantages against the disadvantages of using a reserve static line (RSL).
  - Advantages: could assist after a low cutaway or when disoriented during cutaway procedures.
  - Disadvantages: could deploy the reserve during instability following a cutaway, increasing the chances for the reserve entangling with the camera system, or can cause a reserve activation while main is entangled with camera helmet.
- As always, proper attention to packing and maintenance, especially line stowage, helps prevent hard openings and malfunctions.

2.5 MANDATORY ACCESSORY EQUIPMENT

- Functioning altimeter.
- Audible altimeter.
- Hook knife.

A camera flyer must ensure they receive instruction in the use of both audible altimeters and hook knives if they are not already familiar with this equipment.

3 PROCEDURES AND RULES OF THE SKY

3.1 GENERAL

- Prior to jumping, a skydiver should have the minimum requirements as per Section 2 and enough general jump experience to be able to handle any skydiving emergency or minor problem easily and without stress.
- A camera flyer should possess freefall flying skills well above average and applicable to the planned jump:
  - Belly-to-earth.
  - Freeflying (upright and head-down).
  - Canopy formation.
  - Multiple (for skysurfing, filming student training jumps, etc.).
- The jumper should have made at least 20 recent jumps on the same parachute equipment to be used for camera flying.
- The camera flyer should know the experience and skills of all the jumpers in the group.
- Deployment:
  - The deployment altitude should allow time to deal with the additional equipment and its associated problems.
  - The camera flyer must remain aware of other jumpers during deployment.
  - The camera flyer is responsible for his own altitude awareness.
- Each camera flyer should conduct a complete camera and parachute equipment check before rigging up, before boarding the plane, and again prior to exit.
- Camera jumps should be approached procedurally, with the same routine followed on every jump.
- The priorities on the jump should be the parachute equipment and procedures first, then the camera equipment and procedures.
- Introduce only one new variable (procedure or equipment) at a time.
- A camera jump requires additional planning and should never be considered just another skydive.

3.2 AIRCRAFT

- Cameras should be worn or secured during take-off and landing to prevent them from becoming a projectile in the event of sudden movement. Attaching helmet to chest strap is an easy solution.
- A camera flyer needs to be aware of the additional space the camera requires:
  - Use caution when the door is opening to prevent getting hit by door components.
  - Practice climb-out procedures in each aircraft to prevent injury resulting from catching the camera on the door or other part of the aircraft.
  - The camera flyer should coordinate with the pilot before attempting any new climb-out position.

3.3 EXIT

- Unless the plan calls for the camera flyer to be part of the exit, he or she should remain clear of the group, being mindful of the airspace opposite the exiting jumpers' relative wind.
- A collision can be more serious with a jumper wearing a camera helmet.
- Student jumpers can become disoriented if encountering a camera flyer unexpectedly.
- A tandem parachutist in command requires clear airspace to deploy a drogue.
- Skydivers occasionally experience inadvertent openings on exit.

3.4 FREEFALL

- The jumpers should prepare a freefall plan with the camera flyer, to include:
  - The camera flyer's position in relation to the group
  - Any planned camera flyer interaction with the group
- The jumpers and the camera flyer should follow the plan.

3.5 BREAK-OFF AND SEPARATION

- All jumpers on the load should understand the camera flyer's break-off and deployment plan.
- Two or more camera flyers must coordinate the break-off and deployment more carefully than when only one camera flyer is involved.
- Filming other jumpers through deployment should be planned in consideration of the opening altitudes of all the jumpers involved and with their cooperation.

3.6 DEPLOYMENT

- The camera flyer must exercise added caution during deployment:
  - To prevent malfunctions
  - To ensure an on-heading deployment
  - To avoid neck injury
- New camera flyers should consult with experienced camera flyers for specific techniques to prevent accidents during deployment.
- Malfunction, serious injury or death could occur if the lines of a deploying parachute become snagged on camera equipment.

3.7 PARACHUTE EMERGENCIES

- The additional equipment worn for filming can complicate emergency procedures.
- Each camera flyer should regularly practice all parachute emergency procedures under canopy or in a training harness while fully rigged for a camera jump.
- Emergency procedure practice should include removing the helmet with either hand in response to certain malfunctions.
- When to release the helmet:
  - Equipment entanglements
  - Obstacle landings (water, trees, building, power lines)
  - Whenever a dangerous situation presents itself

3.8 CONSIDERATIONS FOR SPECIALISED CAMERA

- Refer to the PASA SOPs Section 2 for restrictions on camera work and category requirements for group skydives.
- A skydiver should have extensive camera flying experience with experienced jumpers prior to photographing or videoing student jumps.
- For AFF camera the Instructor supervising the jump should conduct a thorough briefing with the camera flyer prior to boarding.
- The instructor's full attention is required to be on the student and the student is incapable of considering the movements and needs of the camera flyer.
- The camera flyer should avoid the area directly above or below a student or instructor(s).
- Students may deploy without warning.
- Disturbing the student's or instructors' air could compromise their performance and the safety of the jumpers.
- During the exit, students often give erratic exit counts, making exit timing difficult for the camera flyer.
- When filming tandem jumpers, the camera flyer must remain clear of the deploying drogue.
- The camera flyer needs to maintain independent altitude awareness and never rely on the student or instructor(s).
- The camera flyer is responsible for opening separation from the student and the instructor(s).
- While dramatic, aggressive filming of openings can compromise safety. This should always be planned and briefed for accordingly.
- When using larger aircraft, student groups typically exit farther upwind, which may require a higher opening for the camera flyer to safely return to the landing area.

4 EMERGENCY PROCEDURES

An example of a recommended cameraperson reserve drill:
ARCH
CHECK HANDLES AND CAMERAS CLEAR
CUTAWAY
CHECK CAMERA HELMET IS CLEAR OF MAIN CANOPY.
IF CLEAR - GET STABLE (time permitting) AND DEPLOY RESERVE.
IF NOT CLEAR - JETTISON HELMET, GET STABLE (time permitting) AND DEPLOY RESERVE.

SECTION 13

TANDEM OPERATIONS

CONTENTS

1 INTRODUCTION

These requirements have been laid down by the PASA to govern the operation of Tandem parachute equipment within the areas of jurisdiction of PASA. These requirements can only be considered as minimum requirements for the operation of any manufacturer's equipment, in the sense that if any manufacturer's requirements exceed these in scope or depth, they will apply for that equipment.

2 EQUIPMENT

Only equipment approved by PASA may be used for the purposes of Tandem parachuting. Equipment should have been tested in accordance with TSO (or equivalent) standards for Tandem parachute equipment.

3 REQUIREMENTS FOR TANDEM PERSONNEL

(Note: a Tandem Master or Tandem Evaluator, as a person in sole control of a passenger and Tandem parachute equipment, may be referred to as the Tandem Instructor).

In order that Tandem personnel can be administrated, there are two levels of rating associated with Tandem parachuting:

TANDEM MASTER (TM)

- Have completed a PASA recognised Tandem Master Training Course.
- For pre-course requirements, see Form 13.

TANDEM EVALUATOR (TE)

- Have complied with the requirements as listed in Section 2 (PASA SOPs)

The requirements for each level are as defined in Section 2 (PASA SOPs). A holder of any one rating will have a number associated with it, similar to the normal parachuting licensing system. Furthermore, each rating will have a combination of letters associated with it indicating for which system(s) the rating is valid.

For example: TM 005 ST/V

This example implies that the holder of this rating is a Tandem Master, the rating number is 005, and the rating is valid for the Strong and Vector Tandem systems.

The codes for the various systems presently in use shall be:

ST	Strong System
V	Vector System
SG	Sigma
R	Racer

These ratings shall be issued by the PASA NSTO to the respective personnel on receipt of documentation showing that the candidates have complied with the requirements as laid down in Section 2.

4 TRAINING COURSE

A Tandem Evaluator shall conduct a Tandem Master Training Course in accordance with the minimum requirements of the relevant equipment manufacturer.

Examples: Uninsured Parachute Technologies (UPT) requirements for the Vector and Sigma Tandem Systems and Strong Enterprises requirements for the DHT System.

4.1 UNINSURED PARACHUTE TECHNOLOGIES (UPT) REQUIREMENTS FOR THE VECTOR AND SIGMA TANDEM SYSTEMS

Following ground training the Tandem Training Course consists of at least five jumps completed under the direct supervision of a qualified Tandem Evaluator (TE). The first two jumps are familiarisation jumps; the final three are proficiency jumps.

JUMP 1 (solo)

- Exit above 7 500ft AGL.
- Deploy drogue within 5 sec after exit.
- While maintaining a heading, make three practice drogue release pulls and one practice reserve ripcord pull. (To make a satisfactory practise pull, touch each handle, but take care not to remove it from the Velcro pocket.)
- Spend any remaining time practising turns.
- Pull drogue release handle by 5 500ft.

JUMP 2 (applicant as passenger)
(TM must be an Evaluator or current TM.)

- Stable exit from above 7 500ft.
- Drogue deployment within 5 sec of exit.
- Drogue release handle is pulled by 5 500ft.

JUMP 3 (proficiency jump)
(Applicant acts as TM while carrying an experienced jumper up front. This passenger must have at least 100 jumps and have been briefed in the operation of the equipment by the TE.)

- Stable exit from above 7 500ft.
- Deploy drogue within 5 sec after exit.
- While maintaining a heading, make 3 practice drogue release pulls and one practice reserve ripcord pull.
- Pull drogue release handle by 5 500ft.
- Make a comfortable landing.

JUMP 4 (On either this or the following jump, the passenger must be the TE or a current TM.)

- Stable exit from above 9 500ft.
- Stable drogue deployment within 5 sec after exit.
- Perform at least two alternate 360º turns and demonstrate heading control.
- While maintaining a heading, make 3 practice drogue release pulls and one practice reserve ripcord pull.
- Pull drogue release at 5 500ft.
- Complete a stand-up landing (wind permitting) within 50 metres of the target.

JUMP 5

- Unstable exit from above 9 500ft. Must regain control within 10 sec.
- Stable free fall to 7 500ft. Perform at least two alternate 360º turns and demonstrate heading control.
- Stable drogue deployment at 7 500ft.
- While maintaining a heading, make one practice drogue release pull and one practice reserve ripcord pull.
- Pull drogue release handle at 5 500ft.
- Complete a stand-up landing (wind permitting) within 50 metres of the target.

PROBATIONARY PERIOD

An applicant is on probation until he has completed 25 jumps, 20 of which are made after his initial training course. These jumps are divided into three sections: Section A, Section B and Section C. During probation, minimum drogue release altitude is 5 500ft AGL.

An experienced tandem photographer may accompany the tandem pair providing he can exit the aircraft without in any way interfering with them.

SECTION A: first five post-course jumps

- No formation skydiving is permitted.
- Passenger must be an experienced (100 plus) jumper who has been properly briefed on the correct response to tandem emergencies.
- Passenger signs log sheet only if he's satisfied with the tandem master's performance during the jump.

SECTION B: 11 - 15 post-course jumps

- No formation skydiving permitted.
- Passenger may be a first-time student.
- Log entry must be signed by Tandem equipment owner or licensed witness, if he is satisfied with the tandem master's performance on that jump.

SECTION C: 16 - 25 post-course jumps

- No formation skydiving.
- Passenger may be a first-time student.

FINAL CERTIFICATE

Upon the completion of the minimum of 25 certifying jumps, the applicant must obtain the signature endorsement of the equipment owner or, if the applicant is the owner, he should submit to the manufacturer video footage of at least three of the preceding 10 probationary jumps.

4.2 STRONG ENTERPRISES REQUIREMENTS FOR THE DHT SYSTEM

Phase I

Jump 1:
Candidate as passenger, deploys drogue, follows TM through two 360 deg turns and tracking, pulls student ripcord.

Jump 2:
Candidate as TM, deploys drogue, pulls student ripcord.

Jump 3:
Candidate as TM, deploys drogue, guides passenger through two 360 deg turns and tracking, pulls student ripcord.

Jump 4:
Candidate as TM, exit to induce unusual attitude, such as barrel roll, recovery, execute figure eight. TM deploys drogue 2 000 ft above main canopy deployment altitude. Pull ripcord on TM's harness.

Jump 5:
Candidate as TM, five back loops, TM deploys drogue upon regaining stability. Passenger performs random series of turns and tracking. TM pulls ripcord on TM's harness.

Phase II

Five jumps in total. Passengers to be experienced skydivers with a minimum of 100 jumps. Passengers to be fully briefed on all emergency procedures and have access to safety handles, an altimeter and the passenger main ripcord.

FINAL CERTIFICATE

Upon the completion of the Phase I jumps, the Evaluator will furnish the applicant with a Phase II form clearing the applicant to conduct Phase II jumps. Once the Phase II jumps have been completed, a copy of this form is to be submitted to the Evaluator while the original must be submitted to the manufacturer.

5 RATING REQUIREMENTS

5.1 RENEWAL AND REVALIDATION OF LAPSED RATINGS

- TM ratings must be renewed annually.
- If an applicant has not met the manufacturers' currency requirements for renewal, he must undergo re-currency training, as specified by the manufacturer. Requirements may vary from manufacturer to manufacturer, 5.2 and 5.3 below are those of UPT for the Tandem Vector and Sigma Systems while 5.4 and 5.5 below are those of Strong Enterprises for the DHT System.

5.2 VECTOR AND SIGMA CURRENCY REQUIREMENTS

If any currently rated Tandem Master has not made a tandem jump in the preceding 90 days, he must make one tandem jump with an experienced jumper acting as a passenger before a student passenger. The experienced passenger must first be briefed on how to respond to tandem emergencies.

If any currently rated Tandem Master has not made a tandem jump within the last 180 days, he must complete recurrent training before taking a student passenger.

5.3 VECTOR AND SIGMA RE-CURRENCY TRAINING

Vector and Sigma Tandem re-currency training consists of one solo drogue jump and one tandem drogue jump with an experienced passenger. During the tandem drogue jump, the applicant must make a stable exit from at least 10 000ft, with drogue deployment within 10 seconds and opening by 4 500ft. Applicant must demonstrate the ability to control heading during drogue-fall by making at least two opposite 360º turns. Landing must be a stand-up (wind permitting) within 50 metres of the target.

These two jumps must be witnessed and signed off by the Tandem equipment owner or a TE.

5.4 STRONG DHT CURRENCY REQUIREMENTS

To be current, a Tandem Master must have made three tandem jumps within the past ninety days, one of which must have been in the last thirty days.

5.5 STRONG DHT RE-CURRENCY TRAINING

If a Tandem Master has not made a tandem jump within the last six to twelve months, he must make at least three jumps, the first two of which must be with a Tandem Master as a passenger, and the remainder can be with an experienced skydiver.

After one year of not making any tandem jumps he must receive re-currency training from a Strong DHT Evaluator.

6 GENERAL OPERATING PROCEDURES

6.1 GENERAL

When flying in an aircraft with an open door, the passenger shall be seated in front of the Tandem Master, for ease of connection, and of control, of the passenger in the event of an emergency.

Passenger side attachment snaps should only be released under canopy one at a time, and then only to be lengthened for comfort purposes. The loose snap should be re-attached before the other is released for lengthening as above.

Canopy formation, head down, night jumps and intentional water jumps are expressly prohibited in Tandem parachuting.

Safety handles are to be used on all certification and re-currency jumps.

6.2 FORMATION SKYDIVING

- The Tandem Master shall wear either a hard helmet or a French leather (frappe) hat.
- The Tandem Master shall have done at least twenty-five (25) Tandem jumps with inexperienced passengers.
- Other jumpers participating in the formation shall have a minimum of five hundred normal formation jumps each; shall have completed a minimum of one hundred normal formation skydives in the last year; and shall have received permission of the CI and the Tandem Master to be on the jump.
- The formation shall be broken off at 5 500ft AGL, wave off for the Tandem pair at 5 000ft, and main Tandem deployment initiated at 4 500ft.

6.3 DEMONSTRATION JUMPS

- The Tandem Master must have demonstrated to his CI his ability to land accurately with a passenger on Tandem equipment and should have ample conventional demonstration jump experience into restricted DZs.
- The Tandem Master must have a minimum of 100 jumps on equipment type.
- A current Tandem Evaluator must clear the Tandem Master for the demonstration jump.
- The Tandem Master must hold a Pro rating.

SECTION 14

PASA PROFESSIONAL EXHIBITION (PRO) RATING

CONTENTS

This section specifies the procedures for obtaining and renewing the PASA Pro Rating.

1 PURPOSE

The Professional Exhibition (Pro) Rating serves as a certificate of proficiency. It is required for all demonstration jumps.

2 INITIAL REQUIREMENTS

- As a form of pre-qualification for the Pro rating the DZ CI or SO should make a candidate perform the following: (Once a B licence is obtained, a parachutist may start with this preparation)
- Make ten successive, pre-declared jumps into a circle 25 (twenty-five) metres in diameter.
- Make all jumps in front of at least three witnesses, one of whom is a PASA Instructor or DZ Safety Officer.
- Obtain signatures for each of the ten jumps from all 3 witnesses.

To qualify for the Pro rating, the applicant must:

- Be a current member of PASA.
- Possess a PASA C Licence.
- Hold a PASA Jumpmaster rating.
- Have at least 300 jumps on a Ram-Air type canopy of which 50 must be in the previous 12 months.
- Make ten successive, pre-declared jumps into a circle ten metres in diameter.

  Note: This means that these ten jumps must be one declared jump after another declared jump. If a jump is not pre-declared, then it does not count for or against meeting the requirements.
- Specific requirements of those ten jumps are listed on the Pro rating application form (Form 3).
- Make all landings standing up.
- Make all jumps in front of at least three witnesses, one of whom is a PASA Instructor.
- Obtain signatures for each of the ten jumps from all 3 witnesses.
- Forward the completed application form to PASA, together with a General Application form.
- The smallest canopy used during qualification on at least 5 jumps will be the smallest sized canopy to be used for demonstration jumps.
- PASA will issue a Pro Rating which must be renewed annually.
- If a Pro Rating holder's competence is questioned by a CI/SO or SJO, the Pro Rating holder may be required to reaffirm his proficiency.

3 ANNUAL RENEWAL REQUIREMENTS

All Pro rating holders shall renew their ratings on an annual basis along with their PASA membership renewal, using the official PASA General Application Form. Within the previous 12 months the Pro holder must:

- Perform 50 jumps of which 5 must be successful demonstration jumps
  OR
- Perform 50 jumps of which 5 must be re-qualification jumps as required in the Initial Requirements above.

A Pro rating having lapsed for more than two years the rating holder must redo all 10 qualifying jumps and have performed a minimum of 50 jumps within the previous 12 months.

If a Pro rating holder’s competence is questioned by a CI/SO or SJO, the Pro rating holder may be required to reaffirm his proficiency.

4 DEMONSTRATION JUMPS

4.1 DEFINITION

The presentation of Sport Parachuting made at a site other than a recognised permanent drop zone for the benefit, enjoyment, and entertainment of spectators and to promote the sport.

4.2 GENERAL

- No demonstration jump will receive SACAA or PASA approval unless first approved by a CI/SO or SJO.
- All demonstration jump requests must be made on the appropriate request form and shall emanate from an affiliated DZ or SJO. One copy to SACAA and one copy to PASA admin.
- All persons engaged in demonstration jumps should understand that these are the showpiece of Sport Parachuting, and they should conduct themselves accordingly.
- The Loadmaster shall be responsible for ensuring that all the parachutists are qualified for the jump proposed, and that all equipment is suitable. He must ensure that all PASA SOPs and Doctrine are complied with, and should pay particular regard to weather conditions, ground/air signals/communication and operating procedures.
- All Demonstration Jumps shall be conducted in compliance with the PASA SOPs as set forth by PASA.

4.3 ADMINISTRATION

The following documentation must be held on record by the DZO or SJO.

- Demonstration jump application form.
- Request from the organisers in writing.
- Local Authority permission in writing, if applicable.
- Written permission from the landowner.
- Plan/Map of the demonstration jump DZ and its environs, showing all potential hazards. (i.e.: buildings, power lines, motorways, water, etc.)

Third Party Liability Insurance shall be held by the requesting DZ or SJO, the policy having a minimum cover of One Million Rand (R1 000 000).

An inspection of all proposed demonstration jump DZ's must be carried out prior to the jump. The loadmaster for the jump must be aware of all details pertaining to the site.

4.4 DEMONSTRATION JUMP REQUIREMENTS

- All parachutists must possess a current Pro rating.
- No round canopy may be used without NSTO approval.
- The loadmaster shall not permit a demonstration jump unless he is in possession of written permission for the jump to take place.
- No demonstration jump will be made with a wind velocity in excess of 50kph.
- Crowd Control
  - Reasonable precautions will be made to keep spectators out of the immediate landing area. It will be the responsibility of the show organisers on the ground to provide temporary fencing, ground marshals, or loudspeaker warning or similar deterrents to keep spectators out and away from descending parachutists.
- Communications
  - It is recommended that a licensed parachutist be present at the landing area as part of the ground crew. Should this be impractical, a responsible member of the organisers should be thoroughly briefed regarding ground crew responsibilities.
  - In the absence of ground to air radio communication, the ground crew will communicate with the jump aircraft and the parachutist by means of ground panels or smoke.
- Recommendations
  - DZ’s should endeavour to carry out exhibition jumps and parachute displays at every opportunity. Properly executed they are one of the best means of public education towards the sport.

- Two key points to remember in the acceptance, organisation and performance of an exhibition are:
  - Safety of the spectators and parachutists involved
  - Public relations for the sport.
- An exhibition that is poorly organised or carried out under adverse conditions can do irreparable damage to the public image of the sport.
- The permission of the property owners and/or the local municipality is required prior to application for clearance.
- **SACAA clearance must be obtained for all demonstration jumps.**
- The CI/SO or SJO may place whatever restrictions he deems necessary on the demonstration jump. Namely:
  - Equipment used.
  - Experience level.
  - Maximum winds.
  - Safety back-up etc.
- Validity of liability insurance depends on the exact compliance of all doctrine, restrictions, clearances, waivers and PASA SOPs, issued to participants.
- Never accept an exhibition jump if you are not 100% positive that the jump can be performed safely within any limitations/restrictions set out for the jump by the CI/SO or SJO or property owners.
- High altitude jumping (above 7000 feet) is generally not recommended for demonstration jumps because of:
  - Poor spectator value.
  - Difficulty in spotting for small areas.
- The general rule to follow is that the smaller the intended DZ is, the lower the selected jump altitude should be.
- Smoke should be utilised whenever possible on demonstration jumps for spectator benefit.
- A commentator who is familiar with parachuting should be used at all exhibitions whenever possible.
- When convenient, always complete your exhibition with a packing display for the spectators.
- Always ensure that all your equipment such as smoke bombs etc. is attached in a fashion so that it cannot be dropped (accidentally) and endanger the spectators below.
- Always select an exit point that:
  - Would allow the emergency ejection of smoke bombs, etc. without endangering spectators
  - Would allow you to land on the DZ or alternate under your reserve in the event of a malfunction.
- Ensure that all jumpers and ground crew are neatly dressed for the exhibition and present themselves like sportsmen.
- Smoke on the target during canopy descent is an excellent ground wind indicator and is impressive to the spectators.

4.5 ORGANISATION CHECKLIST

- Pre-jump:
  - CI/SO or SJO clearance.
  - Property owner and/or municipal permission.
  - SACAA clearance.
  - Adequate Liability Insurance carried.
  - Agreement contract signed with sponsor, if required.
  - Selection of parachutists to be involved as jumpers and ground crew.
  - Check the participating jumpers have the proper equipment as required.
  - Book the aircraft and pilot for date and time of jump.
  - Collect all necessary equipment for the jump such as WDIs, target, smoke bombs. Pre-plan the jump with an alternate plan for low ceiling.
  - Arrange ground transportation. Boats if necessary.
  - Brief all participants on planned jump.
  - DZ. Alternates. Target signals to be used. Time. Individual responsibilities. Contact the sponsor periodically to confirm schedules etc.
  - Notify all local news media with pertinent details.

- Day of Exhibition:
  - Check weather conditions.
  - Confirm aircraft booking.
  - File flight plan if required.
  - Remind news media if required.
  - Get to airport early for final briefing.
  - Send ground crew to DZ early to set up target, PA system etc.
  - Have ground crew phone airport shortly before scheduled take off time to confirm weather conditions, etc.
  - Be prompt on take-off and jump times.
  - NEVER jump under adverse conditions.
  - Mix with spectators after jump, if possible, to answer questions, get spectators' opinions of the jump, etc.
  - Clean up the area of target, smoke bombs etc.
  - Thank the sponsor for the opportunity of working for them.

- Post-jump:
  - Ensure that the aircraft bill is paid promptly.
  - Request letter of recommendation from sponsor for club files.
  - If an annual event, try to obtain a booking for next year.
  - Debrief all participants. A thorough debriefing and critique can expose weak points and enable you to improve future exhibitions.

CAUTION: Smoke adds immensely to spectator appeal and should be used on all exhibitions, whether free fall or precision displays. However, smoke can be dangerous if not properly used. All parachutists using smoke should be familiar with the opening characteristics of the type being used.

SECTION 15

EXTRAORDINARY ACTIVITIES

CONTENTS

1 NIGHT JUMPS

Night jumps, properly planned, can be a unique and enjoyable experience in sport parachuting. Any jump that falls within the period 1 (one) hour after sunset or 1 (one) hour before sunrise is considered a night jump.

1.1 GENERAL

- The CI shall appoint an Instructor to ensure that the activities are conducted in accordance with the regulations and doctrine.
- A manifest officer shall be appointed to control the jumping operations and to check that the documentation and licences are in order.
- All participants must adhere strictly to all PASA SOPs pertaining to night jumping.
- Night jumps are defined as:
  - Individual participation.
  - Night formation skydiving.

1.2 REQUIREMENTS

Pre-requisites for participation:

- Individual Night Jumps
  - Holder of a B Licence or higher.

- Night Formation Skydiving
  - Have made a minimum of two previous night jumps, one 10 second delay and one of at least a 30 second duration.
  - Category III formation skydiver; an experienced and accomplished day formation skydiver.

- Wind
  Maximum recommended surface wind for night jumping is 10 knots (19 km/h). Excessive ground drift can make night landings hazardous.

- Training
  No parachutist, regardless of experience, may participate in night jumping prior to receiving an endorsement in that category, as described in this manual.

CAUTION: No parachutist must attempt to participate in night jumping until he is thoroughly competent in the equivalent level of normal, day jumping.

- Practice
  All parachutists, regardless of past experience, should receive refresher training on procedures within a few days of actual participation in night jumping.

- All parachutists engaged in first night jumps shall carry out a delay of 10 seconds from 4500 ft AGL, counting and observing their altimeter, followed by a stable delay in excess of 30 seconds on the following night jump.

- Parachutists engaging in their first night formation shall do a 2-way with a competent formation skydiver appointed by the CI, prior to doing any formation with other jumpers.

1.3 EQUIPMENT

- Instruments

- All instruments must be illuminated in a manner that:
  - They are clearly visible to the parachutist.
  - The light is not mounted in a manner that will interfere with emergency procedures.
  - Prevents glare (light reflection) from the glass face.

NOTE: Always check lighting systems on the ground in a dark area prior to jumping to ensure glare isn't present.

CAUTION: Flashlights must be held with wrist attachments or mounted in such a way that they do not snag the suspension lines of either the main or reserve canopies.

- Personal Lighting
  All participants in night jumps require:
  - A reliable flashlight.
  - An illuminated altimeter.

  Flashlights should be used for:
  - Pre-jump safety check (if a lighted area isn't available).
  - Canopy check if desired (silhouette check is reliable).

It is recommended that all parachutists engaging in FS should wear additional illumination.

- Clothing

  Individual Night Jumps
  - Normal accessories.

  Night Formation Skydiving
  - Light coloured overalls should be worn to aid visibility and perception.

- Parachute Equipment

  On all night jumps, use equipment with which you are completely familiar. NEVER use unfamiliar or new equipment while parachuting in night jumping.

1.4 GROUND EQUIPMENT

- The landing area must be adequately illuminated.
- A method of indicating wind direction must be provided; illuminated ground signals or illuminated windsock.
- At least two torches must be provided at the manifest area in order to locate parachutists who have landed out.
- Additional ground-to-air communication should be available to control the jumping.
- All DZ obstacles, hazards etc., should be illuminated with a steady red light(s) if visibility is restricted (very dark night).

1.5 EMERGENCY PROCEDURES

The emergency procedures are identical to day jumping.

NOTE: The ground, although not as visible, is just as hard and unforgiving at night as it is in daylight.

1.6 SAFETY CHECK

The pre-jump check must include the additional points listed below:

- Lighting

  Check that all lights are:
  - Operational and adequate.
  - Properly mounted (no glare or obstruction).

- Equipment

  If a well-lit area is not available, flashlights must be used for the normal safety checks.

- Clothing

  No restrictive (visually or physically) clothing must be worn by parachutists.

1.7 JUMPING PROCEDURES

- The Instructor on duty shall ensure that all parachutists, pilots and manifest officers are adequately briefed.
- A particularly intense safety check should be carried out as previously described, immediately prior to boarding the aircraft.
- If possible, a parachutist with past experience in night jumping, should be utilised as loadmaster on each load.
- Exercise extreme caution around running aircraft at night. It is recommended that the propeller be stopped prior to loading and/ or unloading at night.

1.8 CLIMB OUT

During the climb to jump altitude:
- Request the pilot to remain over land.
- Exercise additional caution in guarding ripcords etc.

1.9 LIGHTS

Do not activate free fall and/or instrument lights during flights; they will interfere with the pilot's night vision

NOTE: Instrument lights can be turned on briefly to check altimeter accuracy during ascent, providing care is taken to shade the light by using your hand to prevent the glare.

Prior to exit, check with the ground control if the jump is to proceed.

1.10 EXIT

Follow the predetermined exit order. Turn on and check the operation of ALL lights a few seconds prior to exit.

1.11 SPACING

Time interval between exits recommended for safety:
- Individual passes. Allow two minutes between passes.
- Where possible, passes should be kept to a minimum.
- CF stacks. Allow three seconds between parachutists.
- FS/AE. Normal exit procedures, as per daylight.

1.12 FREEFALL

Follow the predetermined delay, opening altitude etc., precisely EXCEPT in the event of an emergency.

1.13 INSTRUMENT FAILURE

If a parachutist is unable to read his instruments due to lighting or mechanical failure, he should PULL IMMEDIATELY.

CAUTION: NEVER continue free falling on night jumps if the altitude is unknown. Visual reference to altitude is not reliable at night due to lack of normal ground reference.

1.14 DISORIENTATION

If a parachutist experiences loss of orientation in regard to altitude and/or body position he should PULL IMMEDIATELY.

1.15 ALTITUDE

The minimum recommended deployment altitude for night jumps is 3500ft, but not higher than 4000ft.

1.16 HIGH OPENING

If for any reason, a parachutist deploys early, above 4000 ft, and there are other parachutists still in the aircraft intending to jump, CLEAR the general opening area as quickly as possible by running or crabbing.

1.17 LANDING

Restricted vision at night reduces normal depth perception. Exercise caution on all landings.

NOTE: Lack of normal ground reference points can reduce spotting accuracy at night. Select the exit point carefully. The normal tendency in night spotting is to exit early, or short.

After landing, all parachutists must report at once to the manifest officer.

The manifest officer is responsible for ensuring all parachutists are located. He must also ensure that any injured parachutists receive immediate attention.

1.18 NIGHT FORMATION SKYDIVING

Introduction
If possible, an experienced night formation skydiver should introduce all newcomers to night FS. Two-man manoeuvres only should be attempted until a parachutist becomes proficient in the art of FS.

Performance
Never attempt any sequence or function at night prior to a successful performance of the same sequence in daylight.

Caution
Minimum guidelines for safe night FS:

- Pre-plan all night FS jumps thoroughly.
- Never use bright or glaring lights during sequences.
- Lack of perception in free fall at night caused by poor visibility and reduced vision due to hypoxia can result in high (dangerous) closing speeds.
- Break off higher than normal to allow adequate time for separation before deployment.
- Maintain a sharp visual lookout for other canopies during descent.
- If a lighting failure occurs under a canopy, verbally warn other parachutists of the situation.

Group Formation Skydiving
All participants in group FS at night must be experienced and competent at day FS.

Mass Formations
If more than four parachutists are participating in night FS, all participants should be extremely competent in and have considerable experience in day and night group FS, and day mass FS. All participants must exercise EXTREME CAUTION throughout the entire jump.

2 WATER JUMPS

Water jumps, properly planned, can be a unique and enjoyable experience in parachuting. Water, normally recognised as a friendly and enjoyable element, can be a serious hazard to the unprepared parachutist.

2.1 GENERAL

- Safety Regulations - all participants must strictly adhere to all PASA SOPs pertaining to water jumping.

- The DZ SO/CI shall appoint an Instructor to ensure that the activities are conducted in accordance with the regulations and doctrine.

- A manifest officer shall be appointed to control the jumping operations and to check that documentation and licences are in order.

- Types of water jumps
  - Unintentional: accidental water landings.
  - Premeditated: planned practice or exhibition water jumps.

- Wind
  The maximum allowable surface wind for water jumps is 17 knots (32 km/h). The maximum recommended by the NSTO is 9 knots (16 km/h). Water landings in higher winds can result in:
  - Heavy impact: resulting in momentary confusion, loss of wind etc. that could prove fatal.
  - High speed dragging: If the parachutist is unable to clear his equipment the canopy could drag the parachutist out of reach of the pickup boat.
  - Reserve Landing. If used, clearing the equipment would be very difficult since there is generally no quick release system on a reserve canopy.

  NOTE: Drowning can result from being dragged through water, even with adequate flotation gear being worn by the parachutist.

  Intentional Water Jump Requirements

  Holder of a B Licence or Higher.

  NOTE: It is recommended that all parachutists participating in demonstration water jumps have previous water jump experience.

- Training
  No parachutist, regardless of experience, may participate in water jumping prior to completion of thorough ground training as required for a water jump endorsement.

  All parachutists participating in water jumping should be competent swimmers. It is recommended that weak swimmers practice clearing the equipment in a swimming pool prior to actual participation.

- Water Depth
  Intentional water landings should be made in a minimum water depth of 8-10 ft to avoid possible injury on landing.

- Para Scuba

  CAUTION: Parachuting after scuba diving can be hazardous. It is recommended to wait at least 24 hours between a dive exceeding 30 ft in depth and jumping over 5000 ft. (Consult dive tables)

Procedures for Unintentional Water Landings

The unintentional water jumping procedures received in first jump training should be reviewed and practised by all parachutists periodically.

- Action includes:
  - The parachute should be landing either facing into the wind or cross wind.
  - The chest strap should be released prior to landing.
  - Inflate flotation gear if worn.
  - Immediately after water entry swim forward and out the harness.
  - Swim away from and remain clear of the equipment.

CAUTION: Do not attempt to loosen leg straps while in the air.

CAUTION: In strong wind conditions the main canopy should be released once contact is made with the water.

CAUTION: It is imperative to release chest strap if gas inflated flotation system is used.

CAUTION: If landing in a rapid current, release the canopy IMMEDIATELY after water entry. The canopy can be pulled under by a strong current within seconds and drown a person, with or without flotation gear being worn.

Procedures for Intentional Water Landings

The procedure is identical to those above, except that it is commenced immediately after the canopy check has been completed, to allow maximum time to prepare for the landing.

NEVER enter the water without flotation gear being inflated.

NEVER intentionally make a water jump into a fast current.

NEVER attempt to entirely clear the harness above water, depth perception is very poor, and you may be:

- Still 50 ft above the water.
- Only ten feet above 6 inches of water.

2.2 EQUIPMENT FOR INTENTIONAL WATER JUMPS

- Clothing

  Minimum clothing is required. It is recommended that footwear be worn.

- Instruments

  Normally, short delays are done on water jumps, since water will damage instruments (altimeter, AAD). For a longer delay, PASA SOPs apply.

- Flotation Equipment

  The flotation gear must be adequate to support a fully equipped parachutist (water-logged) with his head above water. Recommendations are:
  - Personal Flotation Equipment:
  - Never use 'rescue packs' 'Aqua Aids' etc. on an intentional water jump.
  - Wet Suits (full suit or just jacket) are adequate and ideal for use in cold water conditions.
  - CO2 and oral inflation are adequate.
  - Flotation jackets etc. are acceptable if they give adequate support.
  - Testing.

Prior to making an Intentional water jump, always check the following:
- CO2 cartridge intact.
- CO2 activation mechanism operational.
- Oral inflation system (valves) operational.
- No leaks or tears in the flotation gear.

Suspension Test:
- If there are any doubts about flotation capabilities of a set or type of flotation gear, always test it in a swimming pool, PRIOR to actual use.

CAUTION: NEVER, unless time prohibits, inflate by CO2 with the chest strap fastened. Pressure created is often sufficient to:
- Make later release of the chest strap very difficult.
- Cause injury to the parachutist.
- Restrict movement and/or breathing.

Unintentional Water Landing

If no flotation gear is worn, the helmet (if solid shell) and the coveralls can be utilised for support.

NEVER rely on the reserve for support. They only float an average of twenty seconds depending on the type.

2.3 GROUND EQUIPMENT

- At least one boat per jumper on each pass must be provided with an additional boat in reserve.
- Motorboats must be utilised, with a speed capability exceeding maximum allowable wind speed.
- All boats must be capable of carrying at least 3 persons and a set of wet parachute equipment without danger of it capsizing at any time.
- A good swimmer must be in each boat in addition to the boat helmsman.
- Crew members must be wearing flotation gear and each boat should have an extra set available in the boat in case a parachutist experiences flotation gear failure.
- At the landing place, a person fully trained in artificial resuscitation must be available.
- A method of ground to air communication must be provided at the jump site.

2.4 PREPARATION

- Equipment prior to jumping:
  - Remove the reserve packing card.

  CAUTION: Smoke bomb brackets can easily become entangled in suspension lines. Only the ejectable types should be used on water jumps.

- Safety Check

  The pre-jump safety check must cover these additional points.
  - Flotation gear properly worn.
  - CO2 inflation system readily worn.
  - Oral inflation system readily accessible.

2.5 OPERATIONS

- Boat(s) must have the motors running and be in the immediate target area prior to the parachutists exiting.
- All parachutists must be practised in water landing drills on the equipment they will use on the jump.
- All parachutists exiting on a pass must be either, in a boat, or landed, depending on boat capacity, before the next pass is made. Boats, which have unloaded, must be on station before the next pass.
- A ground control officer shall be appointed to be present at the landing area. He shall be responsible for ground to air communication and ensure that any parachutist requiring assistance receives it immediately.
- The ground control officer shall have a copy of the manifest in order to properly co-ordinate and advise boat helmsmen which parachutists to pick up.
- Wind Drift Indicator - ensure that a contrasting colour is used. It may sink on landing, so observe it closely.
- Spotting. Lack of ground reference points makes spotting slightly more difficult than normal.
- Delay. Lack of clothing (air resistance) may cause slight stability problems on exit.
- Opening Altitude. Use a deployment altitude of 3500 ft minimum to allow adequate time for landing preparation.

3 HIGH ALTITUDE DOCTRINE

3.1 INTRODUCTION

Sport parachute jumping from altitudes higher than 15000ft AMSL presents the participants with a new spectrum of physiological problems.

The problems of supplying adequate oxygen to and maintaining sufficient pressure on the body to assure consciousness and control require the use of additional equipment and procedures not required for parachuting from lower altitudes.

There is an additional element of risk due to the changes in the atmospheric environment above 15000ft. This cessation of the atmosphere's life-supporting characteristics makes high altitude skydiving more potentially hazardous than at lower altitudes.

With proper training, adequate equipment, and well-planned procedures, high altitude parachuting can be conducted within acceptable limits of safety. Without such precautions, however, such attempted operations may result in disaster.

It is in the interest of promoting safety in high altitude parachuting operations through knowledge of the associated equipment, environment, and physiology that this section is presented.

3.2 ALTITUDE CLASSIFICATIONS

- Intermediate Altitude:
  From FL150 up to FL200 or if time spent above 10000 ft AMSL is to exceed half an hour.
- High Altitude:
  Above FL200 up to FL400
- Extreme Altitude:
  Above FL400.

3.3 EXPERIENCE RECOMMENDED

- High Altitude Jumps:
  - Holders of D Licence.
  - All participants should have completed a Physiological Flight Training Course within the preceding twelve (12) months.
  - All parachutists should have made at least one jump from 15000 ft or below using a functioning bailout oxygen system.
  - All jumps must be co-ordinated in advance with the appropriate local authority and SACAA.

- Extreme Altitude Jumps:
  - Holders of D Licence.
  - All participants should have completed a Physiological Flight Training Course within the preceding twelve (12) months.
  - All parachutists should have made at least two (2) jumps from below 35000 ft using the same functioning bailout oxygen and pressure system.

All jumps must be co-ordinated in advance with the appropriate local authority and SACAA.

REFER TO NATIONAL SAFETY AND TRAINING OFFICER FOR ALL HIGH OR EXTREME ALTITUDE JUMPS.

SECTION 16

SUGGESTED JUMPMASTER CERTIFICATION COURSE OUTLINE

CONTENTS

This section contains minimum course content for both the Basic and Static Line Jumpmaster Certification Courses. The Chief Instructor conducting the Basic or Static Line Jumpmaster course must prepare and evaluate all candidates to the minimum standard and for responsibilities and duties specific to the particular DZ where the course is being held. Qualified Jumpmasters visiting from other DZs should be checked out by the CI to the minimum plus his DZ standard.

Content in this section to be drawn on, as applicable, relating to knowledge required by Basic and/or Static Line Jumpmasters.

1 LESSON 1: COURSE OPENING

1.1 REGISTRATION

See pre-course requirements included in PASA Form 7.

1.2 INTRODUCTION

1.2.1 Objectives

1.2.2 Course programme

1.2.3 Discipline

2 LESSON 2: GENERAL - THEORY

2.1 WHAT IS A JUMPMASTER?

2.1.1 Description of a Jumpmaster (JM)

The JM, more than any other person, is responsible for the conduct of safe parachute jumping. He creates an environment of safe parachuting by his actions, attitude, expression of leadership and attention to detail. One cannot wish safety into existence; it has to be actively pursued. **Safety is completely gone the moment it is compromised.** The effectiveness of a JM is directly proportional to the degree of assumption of responsibility, attention to detail and to adherence to procedure.

2.1.2 Duties of a JM

- Be familiar with both the PASA SOPs and the individual club rules, and to enforce them.
- Assist in the training of students.
- Be familiar with both student and advanced equipment and be able to effectively inspect the equipment before use.
- Be familiar with all training programmes.
- Control students in the aircraft.
- Safe and competent dispatching.
- Give effective post-jump critique.
- Present an image of professionalism, competence and induce confidence in students.

2.2 PASA STANDARD OPERATING PROCEDURES (PASA SOPs)

The PASA Standard Operating Procedures are the rules laid down by the Parachute Association of South Africa (PASA) and are applicable to all sport parachuting in South Africa. These rules are constantly updated and maintained by the National Safety and Training Officer (NSTO) of PASA. PASA is responsible for the safe conduct of the sport within the areas of jurisdiction of PASA.

2.2.1 Requirements of JM Qualification

See Section 2 (PASA SOPs).

2.2.2 Regulations of special importance to JMs

All PASA SOPs to be discussed, but CI to highlight all PASA SOPs of particular importance to JMs.

2.2.3 Other Regulations

- Safety Structure
  - SACAA
  - PASA
  - NSTO
  - DZ Safety Officers/Chief Instructors
  - Instructors
  - JMs

- Approved DZs

  South African Civil Aviation Regulation of 2011 Part 105 – Operation of Parachutes specify:

  All parachute descents, except emergency and display parachute descents, shall be made within a parachute drop zone approved by the designated body.

  A person may make a parachute descent outside a parachute drop zone, if the descent is authorised by the designated body.

- Demonstration jumps

  See Sections 2 and 14 of the PASA SOPs.

  Altimeters to be correctly "zeroed" for landing area if aircraft takes off at a different site.

- High Altitude Jumps

  See Sections 2 and 15 of the PASA SOPs.

  Hypoxia caused by lack of oxygen slows down the functioning of the human brain without the jumper being aware of the effects.

- Water Jumps

  See Sections 2 and 15 of the PASA SOPs.

- Night Jumps

  See Sections 2 and 15 of the PASA SOPs.

2.2.4 DZ Emergency Procedures

Extract from Section 18 - DZ Operating Procedures:

"Injuries

Establish type and extent to injury. If it is of a serious nature or you are not sure what to do, immobilise patient and wait for qualified help.

Fatalities

Every fatality causes considerable damage to sport parachuting. The long-term effects of fatality however, may be kept to a minimum providing the tragedy is well managed in all respects.

Poor management of a fatality can result in adverse publicity, lengthy civil or statutory proceedings, inability to establish the cause of the accident, closure of the DZ, etc.

It is essential therefore that responsible members of the sport, are aware of the complications which can arise, in order that appropriate steps can be taken to prevent them from occurring.

Procedures to be followed:

- *Equipment*
  - *Keep people away.*
  - *Do not remove the body until the equipment has been inspected by the SO/CI.*
  - *The equipment must be photographed.*
  - *Remove and box the equipment carefully, taking care so as not to disturb any evidence.*
  - *Advise the police that PASA, on behalf of SACAA, will investigate the accident, and as such would require the equipment. Do not allow the police to impound the equipment if possible.*
  - *The equipment along with the photographs should be forwarded to the NSTO when possible.*

- *Notifications*
  The following persons should be notified immediately:
  - *Ambulance*
  - *Police*
  - *SO/CI*
  - *NSTO (who will in turn notify SACAA)*
  - *Air Traffic Control (use the telephone and not the aircraft radio).*
  - *Next of kin, preferable by way of the police unless a close family friend is nearby.*

- *The Press*
  All club members should be prepared for the press converging to the scene for what is to them a natural action/drama story. Reporters should be directed to the senior DZ safety officer (SO/CI) who should advise them that an investigation has been launched by PASA, on behalf of SACAA, to establish the causes of the accident and may share with them the contact details for the PASA office and/or NSTO to obtain further information and/or a press release. No further information should be given to anyone. Avoid using the words "parachute did not open".

- *Administration*
  Sworn statements are to be taken from the pilot of the aircraft, and also from as many responsible eyewitnesses as possible. These statements should accompany the equipment and the photographs, along with any other information (logbooks etc.), to the NSTO."

(end of extract)

- Shock

  Shock is a condition of blood circuitry collapse, caused by fright or loss of blood.

  Symptoms:
  - Cold clammy skin
  - Dizziness
  - Pulse fast but weak
  - Hyper ventilation
  - Paleness
  - Anxiousness

  Treatment:
  - Preserve body temperature (keep constant).
  - Place patient in shock position (lie him down and lift the feet a few inches).

- Spinal injuries

  Never attempt to move a patient with spinal injuries. Immobilise him and wait for qualified help, preferably the paramedic ambulance. Make sure that a "spinal board" is used to move the patient.

- Moving injured people

  - Transport in orderly, planned, unhurried way
  - Immobilise fractures
  - Stabilise patient (shock treatment)
  - Position in vehicle, feet towards the front

- Strains and sprains
  Use the "RICE" - procedure for the most effective recovery:

  - **R** Rest the injured part (immobilise)
  - **I** Apply ice-compression
  - **C** Apply direct compression (light, firm crepe bandage)
  - **E** Elevate the injured part to combat swelling

- Medication and illness

  Persons taking medication should be closely monitored and be cleared to jump by their medical practitioner. Jumpers suffering from colds and flu or sinusitis or ear trouble should not be allowed to jump due to the effects of this illness on balance and the dangers involved with quick changes of pressure. Medication taken for the mentioned illnesses may cause drowsiness and affect co-ordination.

2.3 DZ SAFETY SYSTEM AND RULES

Each DZ may well have its own specific safety system and rules over and above those defined nationwide by PASA. At this point, these specific details should be covered.

2.3.1 DZ Safety Hierarchy

- DZ Chief Instructor OR DZ Safety Officer
- Instructors
- Jumpmasters

2.3.2 DZ Safety Rules

2.3.3 DZ Safety Administration

- Student Progression Records
- Other

2.3.4 Visiting Jumper Check List

When a visiting jumper arrives at your DZ, the following things should be checked before he is allowed to jump:

- PASA Membership Card
  Only members of PASA shall be allowed to jump, in terms of the PASA SOPs. If the jumper is a foreigner, he should be issued a temporary PASA card. If the jumper is a student in his first year of membership, without an A Licence, he should be registered with PASA as a temporary member. Check the expiry date on all cards.

- Licences/Ratings
  All licences and ratings have to be renewed on an annual basis. Check their validity. In the case of a foreigner, the equivalent FAI licences are acceptable. However, only current PASA ratings are valid.

- Logbook
  Check the currency of the jumper (date and location of last jump, etc.). If a student, check the progression chart and whether your type of aircraft has been jumped before. Check for endorsements and/or violations recorded in the logbook.

- Equipment
  Check that all equipment is serviceable, especially the expiry date on the reserve packing card, and who packed it. Unknown foreign gear should be treated with caution. If in doubt, seek advice from qualified personnel.

- Orientation to DZ Procedures
  Explain all special DZ rules and procedures (pilot commands, boarding points, opening altitudes, manifest procedures, exit procedures, etc.). Orientate the new jumper on the DZ, highlighting hazardous areas and prevailing weather conditions, etc.

3 LESSON 3: STUDENT INSTRUCTION AND BRIEFING - THEORY

3.1 METHODS OF INSTRUCTION

Refer to Section 3 of the PASA SOPs.

Learning is an active process of acquiring new knowledge, skills, techniques and appreciations. Learning originates with sensory stimulation. Training aids are essential for the stimulation of the senses. There are six principles of learning that are used to formulate a lesson plan.

3.1.1 Principles of Learning

- Motivation
  The student must know the reason for the actions that he is about to learn/perform. He will be mentally and physically prepared if he knows why he must learn something. Intent to learn must be developed in the student (which leads on to the next principle).

- Objective
  One of the best ways to motivate the student is to explain exactly what is required of them. Present the student with an objective that is to be attained. Learning is more efficient if the student knows the object of the lesson and how it fits into the more global aspect of the programme.

- Doing
  We learn by doing. We learn more by practice than by any other process. Practical training combines all senses and builds confidence in the student and completes the learning process.

- Realism
  The more realistic the learning process, the more efficient it will be. The more realistic the exercise, the easier it is for the student to relate to the exercise and the real thing.

- Background
  A student builds knowledge on what he already knows and therefore relates back to previous lessons and experiences. Do not leave gaps and flit around from concept to concept. Progress in an orderly fashion.

- Appreciation
  Learning has not taken place until the student has appreciated what he has learnt or why he has learnt it. Understanding of the motivation, objective and the lesson itself is crucial.

3.1.2 Lesson Plan

- Motivation and Objective
  Explain to the student what is to be learnt and why.

- Explanation
  Demonstrate and explain the action.

- Practice
  The student practices his new knowledge.

- Review
  Find out what the student has learnt and if he understands it.

3.2 STUDENT PROGRESSION/BRIEFING

Refer to Section 3 of the PASA SOPs.

3.2.1 General pre-jump briefings

- Isolate the student from all other distractions.
- Personalise the instruction/briefing.
- Check that the student has been cleared for that jump, ask when and how the previous jumps were and who his last JM/Instructor was.
- Follow the structure of the above lesson plan.
- Always stick to the standard methods to avoid confusion.
- Only an instructor may progress a student from one test to another.
- All briefings for freefall progression must be done under the auspices of an instructor.

3.2.2 General post-jump debriefings

- Critique must be constructive.
- Point out good as well as bad points of the jump.
- Never bluff to hide lack of knowledge. If you cannot identify a student's problem, ask for advice.
- An easy way to remember what the student did is to memorise the main points after each jump, e.g.
  No. 1 : De-arch with left hand in, turned 180° right.
  No. 2 : Good arch, but looked down.
  No. 3 : Arch too late, went head down, etc.

NB! JMs may recommend progression, but only an INSTRUCTOR may clear freefall students to the next test.

ONLY the Chief Instructor may clear a static line student to go on to freefall.

3.2.3 DRCP briefing (applicable to SL JMs only)

Objective: To teach the student to pull his own ripcord in preparation for free fall.

Always teach the standard method:

Arch Thousand	Good stable arch and look up at aircraft.
Two Thousand	Keep arch, look at aircraft.
Reach Thousand	Symmetrical motion with both arms, left hand to position in front of face where wrist can be seen, right hand on dummy with open palm. Grip dummy firmly.
Pull Thousand	Pull dummy out, back into arch position with both arms symmetrical.
5000 Thousand	
Check	From here check and reserve procedure same as for normal static line.

NB: In case of a malfunction, throw dummy ripcord away immediately.

The training harness can be useful if a student has problems. Stress that the student must not rush the pull. Same speed as on the ground. The static line will open his canopy while he concentrates on the dummy pull.

3.2.4 First freefall briefing (applicable to SL JMs only) (only after progression has been cleared by the Chief Instructor - briefing to be done by, or under direct supervision, of an Instructor.)

- Stress that student must not rush the pull. Same speed as he was trained for the dummy pull. Mention the extra altitude to give more self-confidence.
- Deployment sequence only begins once the handle has been pulled; there is therefore a longer delay to opening shock.
- Reserve procedure is the same as for static line. In case of a malfunction throw main ripcord away immediately.
- Pilot chute hesitation should clear in the "check position" - if not, use reserve.
- Student's Freefall Progression Programme log sheet must be signed by an Instructor, after passing each test, with help from the JM.
- The longer the delay, up to terminal, the more the head drops to a horizontal position. Do not swim when this happens.
- Maintain discipline throughout count.
- Maintain a heading on the horizon to prevent slow turns.
- Maintain a symmetrical body position for stable delays, to prevent spins and unintentional turns.
- When in trouble, arch more.
- If unable to correct a problem, deploy main parachute.
- Explain the importance of altitude awareness and how to develop it.
- Maintain altitude awareness and make only two attempts to solve a problem before deploying main parachute.
- Explain spins and how they are caused.
- Explain how to prevent and correct spins. Arch hard, keep looking in direction of original heading.

3.3 PRACTICAL SESSION

4 LESSON 4: EQUIPMENT - THEORY

4.1 STATIC LINE STUDENT EQUIPMENT / FREEFALL EQUIPMENT

4.1.1 Rigging and Assembly

The JM must examine the design of static line / freefall equipment and understand how it is constructed, and why.

4.1.2 Rigging Checks

What to look for:

- Check for compatible gear.
- Accessibility of all handles.
- Damaged and unsafe gear.
- Canopy size suits the jumper.
- Correct length of static line for aircraft used - bag ± 10cm in front of tail plane.
- Student is familiar with the equipment to be used.

4.1.3 Kitting up and pre-jump check

The JM is responsible for faulty gear, not the student.

COMPULSORY GEAR: Helmets, soft soled shoes, (no hooks on shoes)

CHECK PROCEDURE: Top to bottom, right to left, front to back.

- Front
  - Helmet - fits well, chinstrap tight and not flapping.
  - Spectacles secure - goggles for contact lenses.

- Jewellery off.
- 3-ring release system routed correctly and risers straight into container.
- RSL secure and routed correctly.
- Chest strap secure, loose ends tucked away. (Radio secure and working, if fitted)
- Cutaway puff secure and easily accessible. No cable showing.
- Reserve handle secure, easily accessible and free to move.
- Leg straps tight, not twisted and excess tucked away.
- Shoelaces done up and secure.
- Boots with hooks must be covered with tape.

- Back

  - Check the routing of RSL and ensure that the reserve pin is in correctly.
  - Check that the reserve is in date.
  - Static line correctly routed and first bungie doubled and the pin in correctly.
  - Check the closure loop for fraying.
  - Static line hook functional.
  - Remove and check the packing slip.
  - Check general appearance and all flaps closed properly.

- Freefall Gear

  - Pilot chute must be flat in centre of the container.
  - Free movement of cable.
  - Rip cord stuck to Velcro and easily accessible.

4.1.4 Direct Bag Deployment System

4.2 AIRCRAFT EQUIPMENT

4.2.1 Required equipment

- Knife for pilot.
- Hook-knife for JM.
- Static line attachment point.
- Altimeter and airspeed indicator.

4.2.2 Aircraft pre-jump check

- Approach aircraft from behind or where pilot can see.
- Inspect the entrance to the aircraft (no hooks or similar problem situations).
- Check exit position and launching platform if applicable.
- Door and inside of cabin must be clear of hook-up points.
- Check the static line attachment point.
- Check that hook-knife is in position and also functional.
- Check airspeed indicator and altimeter of aircraft.
- Check seating positions and exit procedures.

4.3 PRACTICAL SESSION

5 LESSON 5: THE JUMP - THEORY

5.1 JUMP PLANNING

5.1.1 General

- Know the students on the load. Ask them how many jumps they have and what they are meant to do on the next jump.

  NB: Must have received correct briefing.

- If a student is from another drop zone, make sure that the following has been done:
  - The Club Chief Instructor inspected his logbook and affiliation card and approved him on merit.
  - Make sure that he understands the exit procedure and is familiar with the gear he is about to use.

- Make sure students do not use freefall gear for a static line jump.

- See that the canopy sizes are compatible with the student's weight.

- Make sure you plan the correct altitudes for the planned delays. (See PASA Freefall Progression Programme – Form 14)

- Ground Crew
  - Appoint responsible ground crew where applicable.
  - Have somebody to keep an eye on the wind speed - agree on signals to abort the jump if so required.

- Batons, arrows or other forms of communication used by club. (Discuss)

5.1.2 Weather

Check meteorological conditions to clear and plan the load:

Note the wind direction and the wind speed.

Maximum Wind speeds:

• Student	15 knots (28 km/h)
• Non-student	CI/SO discretion

Note the effect of top winds from previous jumps or wind drift indicator.

Note and be aware of approaching thunderstorms and fronts. They cause sudden gusts and wind directional changes as well as wind speed changes.

Plan the exit point for the student in correlation with his jump, canopy control and experience.

(Study the section on Spotting Techniques with particular reference to the situation of "cone of possible landings".)

5.1.3 Unfamiliar DZ

- Check DZ for obstacles - open water, power lines, busy roads, etc.
- Large enough outlanding area.
- Familiarise the student with the new DZ.
- Check for top winds using wind drift indicators or GPS data.

5.2 PILOT BRIEFING

Use the logical and sequential method:

- Number of run-ins required.
- The altitude of each run-in.
- The direction of each run-in to be (from .. to .. method).
- Ask for a 1000ft AGL check.
- Ask pilot to indicate when he turns for final run-in.

Summary:

Number of run-ins	**N**
Altitudes	**A**
Directions Seq =	**D**
Alti-check – 1000ft	**A**
Pilot comms	**P**

5.3 AIRCRAFT DRILLS AND DISPATCHING

According to club policies.

- Equipment Check
  Talk to students and make sure they know what they are to do on the jump. Hand all student gear packing cards to the pilot or manifest. (see club regulations). All equipment must be checked by JMs before boarding.

- Aircraft Check
  Inspect the aircraft before each load, hook-up point, knife, etc.

  See "Aircraft pre-jump check" (4.2.2 above).

- Brief the Pilot
  See "Pilot Briefing" (5.2 above).

- Boarding
  Place students in correct position for exit order.

- Take-off Procedures
  Check your own altimeter with aircraft altimeter and correlate. Move students' weight forward for take-off. Do not move back until pilot gives the OK.

  ALL static line students are to be hooked up either on the ground or by 1000ft AGL. Unhooking of any static line before all students have exited is not recommended.

- In-flight Procedures
  Re-check all parachutists' equipment (including your own) at 1000ft AGL. Show the pilot and the student that they are hooked up before they exit. (Check each student's equipment before he jumps.) Clear run-in with pilot.

- Check the following
  - Airspeed - 70 to 80 knots / 120 to 140 km/h / 75 to 90 mph.
  - Altitude - as requested.
  - Wind Sock - for direction.
  - Ground batons/arrow.

- Do the Spot
  Very important part of safety. Give instructions to the pilot clear and loud, or positive signs, or taps on the shoulders as cleared with the pilot PRIOR to take-off. Finally, check airspeed and altitude on run-in.

- Give Exit Commands
  "Stand by!"
  (This command is directed to the pilot.)

"Climb out!" (Procedure depends on aircraft type)
(Point with your finger firstly at the student then to the step outside.)

"Right Foot.. Right Hand..
Left Foot.. Left Hand.. "
(Assist the student while getting out - e.g. push gently or hold on to harness to ease climb-out procedure.)

NOTE: Each drop zone has its own particular method of climb-out depending on aircraft type and configuration. Change the above commands to suit your drop zone.

NB: Be very careful with the static line at this stage. Beware of putting too much tension on static line and check the routing thereof. The static line must run straight from the backpack up to the far upper front section of the door frame, in order to prevent it from looping/snagging around student's arm or equipment. Quick-check spot and see student's affirmation.

"GO!"
(Give this command loud and clear)

Observe student carefully and make a mental note of details for critique.

Retrieve static line and bag and stow it under the pilot seat.

If all students are not hooked up simultaneously (on the ground or at 1000ft) then hook up the next static line and show pilot.

Move next jumper to the door.

Always use the standard method of dispatching. Students get very confused when they get an order that they have not been briefed on, or when they expect a certain order and they do not get it.

- Command for climbing back in:
  If student is still in the door, it is easy to pull him back to his seat. However, if he is ready to jump, it can be difficult to communicate with him. Do not shout or touch him, as he may confuse this with the command to jump. Try to attract his attention and indicate that he must climb back into the plan. Assist him back into the plane by placing your arms around the back of his pack.

  Always ensure that all static lines are unhooked before following out. Ensure the pilot knows that you are following out.

5.4 AIRCRAFT EMERGENCIES

Chain of Command:

The **PILOT** is always in command of the aircraft and all passengers.

The **JM** is in command of all the jumpers.

In an emergency the JM and the pilot must communicate and decide what to do. The general rule is to let the students jump if above 1000ft AGL and if below 1000ft AGL all land with the aircraft.

There are other factors that can influence this decision:

5.4.1 Engine Failure

The rate of descent can be as high as 800ft per minute with a full load. This leaves very little time to jump, even from 2500ft. The pilot may decide to head to a safe landing area rather than spend time gliding over a safe jumping area.

Unhook all static lines and tell students to brace themselves for a hard landing in case of a forced landing.

5.4.2 Fire on Board

In this case the pilot may stop the engine and get down as fast as he can. If the fire is bad, he may decide to bail out. In this case, get the students out as fast as possible, under their reserves if necessary. (Collect the handles in the doorway.) Fire can also cause structural failure.

5.4.3 Structural Failure

Emergency of the worst kind. The aircraft will most likely be out of control. Get as many students out as possible and save yourself before it is too late.

5.4.4 Area where emergency occurs

High ground, densely built-up areas and open bodies of water can also influence the decision to jump. Always keep cool in an emergency, communicate with the pilot, keep the students under control, make the necessary decisions and act fast.

5.4.5 Student in Tow

There are mainly two student hang-up possibilities:

- Student hang-up on static line

  Causes:
  - Improper handling of static line by the JM
  - Unstable exit of student.

  In both cases the static line can wrap around the backpack, arm or leg of the student.

  In this case the static line will be attached to the inside of the plane where the JM can reach it. Students are trained to place their hands on their heads to indicate awareness of the situation - the JM shows them the knife and cuts them free.

  When the student is unconscious or unaware of what has happened, the situation becomes infinitely more dangerous.

  First of all tell the pilot what is happening so that he can try to maintain or gain altitude and circle over the DZ with full power. If the student does not recover consciousness it will be necessary to slide down the static line, cut him free and deploy his reserve. If possible, leave a knife with the pilot.

- Student-in-tow with his canopy hooked up

  Causes:
  - Premature opening of container
  - Too much power applied by pilot
  - Airspeed too high
  - Aircraft in side-slip on exit
  - JM applied too much tension on static line during climb-out procedure

  In this case the student is out of reach and help from the JM. They are trained to cut themselves away and deploy their reserves in the correct sequence.

  Firstly, let the pilot know what is happening. If they do not react to the situation, the JM can try to communicate with the student, or give the pilot instructions to try to shake him off. A canopy wrapped over the tailplane may cause structural damage or pull the tailplane down so far that the aircraft will be out of control.

NB: Never give the pilot turning corrections just before exit of static line students.

- Make sure that the throttle is right back and airspeed is within limits.
- Never "short line" a static line student.
- Be extremely careful with the static line when student climbs out.
- Always carry a hook-knife in the aircraft.

5.4.6 Accidental Premature Deployment of Reserve

- Always watch the reserve handles of the students when they are moving inside the aircraft.
- If you can, trap the fabric before it catches air, do so with great haste.
- If not, push the student out after the inflating fabric as fast as possible.
- Structural failure may result from such an incident.

6 LESSON 6: PRACTICAL TESTS – JM BASIC

Include a Remarks column in each section for each student JM to assist in final assessment.

6.1 STUDENT EQUIPMENT CHECK AND BRIEFING

Mark Schedule:

Bearing and Attitude of JM	3
Check System and Awareness	3
Student Communication	3
Equipment Knowledge and Time	3
Include a remarks section on mark sheet	**12**

6.2 CANOPY DOWNSIZE, DZ ORIENTATION, ADVANCED CANOPY CONTROL OR LANDING PATTERN BRIEFING

Mark Schedule:

Bearing and Attitude of JM	3
Student Communication	3
Teaching Method	3
Subject Knowledge	3
Include a remarks section on mark sheet	**12**

6.3 PILOT BRIEFING AND AIRCRAFT CHECKS

Mark Schedule:

Bearing and Attitude	2
Exit Point	2
Aircraft Instruments	2
Pilot Communication	2
Run-in and Drop Details	2
Include a remarks section on mark sheet	**10**

6.4 AIRCRAFT DRILLS AND DISPATCHING

Mark Schedule:

Bearing and Attitude	4
Aircraft Emergencies	4
1000ft Check	4
Student Equipment Check	4
Pilot Communication	4
Aircraft Awareness and Instruments	4
Spotting, batons and arrow	4
Student Communication	4
The Exit: Student Handling:	
– Post Jump Observation	7
– Landing Pattern Observation	2
Include a remarks section on mark sheet	**41**

6 LESSON 6: PRACTICAL TESTS – JM STATIC LINE

Include a Remarks column in each section for each student JM to assist in final assessment.

6.1 STUDENT EQUIPMENT CHECK AND BRIEFING

Mark Schedule:

Bearing and Attitude of JM	3
Check System and Awareness	3
Student Communication	3
Equipment Knowledge and Time	3
Include a remarks section on mark sheet	**12**

6.2 DRCP, FIRST FREEFALL AND FREEFALL TRAINING BRIEFING

Mark Schedule:

Bearing and Attitude of JM	3
Student Communication	3
Teaching Method	3
Subject Knowledge	3
Include a remarks section on mark sheet	**12**

6.3 PILOT BRIEFING AND AIRCRAFT CHECKS

Mark Schedule:

Bearing and Attitude	2
Exit Point and Static Line Accessories	2
Aircraft Instruments	2
Pilot Communication	2
Run-in and Drop Details	2
Include a remarks section on mark sheet	**10**

6.4 AIRCRAFT DRILLS AND DISPATCHING

Mark Schedule:

Bearing and Attitude	4
Aircraft Emergencies	4
1000ft Check	4
Student Equipment Check	4
Pilot Communication	4
Aircraft Awareness and Instruments	4
Spotting, batons and arrow	4
Student Communication	4
The Exit: Student and Static Line Handling:	
– Post Jump Observation	7
– Static Line Retrieval	2
Include a remarks section on mark sheet	**41**

7 STUDENT PROGRESSION

- See Section 3 of the PASA SOPs.
- The major cause of student problems is too rapid a progression rate combined with an inadequate training programme.
- In progression, a small point overlooked in the early stages can create serious, if not dangerous, problems in later jumps.
- Dropping back one level of progression (i.e. 10 second to 5 second) to correct a fault is often the fastest method of advancement.
- Students must always strive for perfection in their performance. A conscientious JM will demand perfection from his students prior to recommending advancement.
- Prior to advancement, a student must perform all phases of a level to a minimum standard of 80% or higher.
- Emphasis must never be placed on quantity, but quality is essential.
- The maximum number of jumps that the average student can perform in one day and still advance at 100% of his ability is three.
- Students must be trained on an individual basis according to ability and must never be allowed to progress beyond their capabilities. To do so is definitely hazardous.
- The progression chart we follow, is the maximum rate recommended by the NSTO. It is accomplishment to the NATURAL, rewarding to the AVERAGE and demanding of the SLOW LEARNER.
- Individual progression charts should be kept on each student and used in conjunction with the individual's logbook.
- An accurate and detailed briefing, observation and debriefing must be made on every student if they are expected to learn at their maximum rate.
- Any student whose performance creates a hazard to his safety on a continued basis, without any sign of improvement, MUST be told to quit Sport Parachuting immediately. This is a difficult decision to make, especially with an enthusiastic student, but necessary to maintain the safety standards of the sport. Such decisions should be left to the CI of the Drop Zone.

Levels of Knowledge	
1 Student	Eager to learn and improve skills.
2 "B" Licence Holder	Often over-confident
3 "C" Licence Holder	Knows everything in the world about parachuting.
4 "D" Licence Holder	Begins to realise how much more there is to learn about the sport, usually self-confident and competent

The JMs must be capable of:

- Teaching students to pack their main parachutes properly.
- Assisting a student in kitting up correctly.
- Controlling their student load on the ground, e.g. having them ready when it’s their turn to fill the next load.
- Discussing with and briefing students on their relevant tasks.
- Checking out students prior to jump.
- Checking out the aircraft prior to take-off.
- Controlling their student load in the air e.g. discipline during emergencies.
- Spotting safely!
- Dispatching safely!
- Critical observation - both from the plane and when following out.
- Critiquing sensibly and helpfully.
- Generally assisting instructors and DZ management to improve the quantity and quality of parachuting/skydiving, particularly where students are concerned.

SECTION 17

RIGGING REGULATIONS

CONTENTS

1 INTRODUCTION

See also Civil Aviation Regulations, Part 105, subpart 3 (Parachute Maintenance).

1.1 TYPES

There are three distinct levels of Parachute Technician ratings, each with its own regulations, qualifications and restrictions associated with it.

- **RP** (**R**eserve **P**acker)

  The holder of this rating shall be allowed to inspect sport parachuting reserves and harness/containers and pack reserves.

  He should always pack in accordance with the manufacturer's manual for the applicable harness/container, reserve parachute and AAD. Any repair work should be referred to a holder of an RS or RM rating, as appropriate.

  A special endorsement shall be required for round reserves.

- **RS** (**R**igger-**S**enior)

  In addition to RP as above, the holder of this rating shall be allowed to maintain parachute equipment by carrying out Minor repairs. The following repairs shall be classified as Minor:

  – Patching of main canopies
  – Hand tacking
  – Line replacement on main canopies.
  – Patching on main container
  – Installation/replacement of BOC Spandex pouch.
  – Cosmetic repairs.
  – Velcro replacement

- **RM** (**R**igger-**M**aster)

  In addition to RS as above, the holder of this rating shall be allowed to repair parachute equipment by doing Major repairs, as well as to manufacture parachute equipment to TSO specifications or similar. The following work shall be defined as Major:

  – All work on reserves or reserve containers.
  – Harness work.
  – Other work not listed above which may affect the airworthiness of the parachute system.

1.2 RATINGS

All ratings shall be issued by PASA after the requirements for the said ratings have been met. The applicant shall apply on the prescribed online PASA form and pay the prescribed fee to PASA.

2 REQUIREMENTS/QUALIFICATIONS

- **RP**
  – Minimum of 18 years of age.
  – Be a bona fide member of PASA.
  – Have completed all the pre-course qualifications required. (See PASA Form 10)
  – Be nominated to attend a PASA Reserve Packing course by a PASA RP, RS or RM.
  – Have attended and passed the approved PASA Reserve Packing course, which shall include a theory and trade test.

- **RS**
  - Shall have held a current RP rating for at least two years.
  - Shall have completed an apprenticeship under a holder of an RS rating, during which time the apprentice shall have assisted in doing minor repairs. (See PASA Form 11)
  - Shall be nominated to attend a PASA Rigger Senior Certification Course by a PASA RS or RM.
  - Shall have attended and passed the official PASA Senior Rigging Certification Course, which shall include a theory and trade test.

- **RM**
  - Shall have held a valid RS rating for at least two years.
  - Shall have completed an apprenticeship under a holder of a RM rating, for a minimum period of one year, during which time the apprentice shall have demonstrated to his mentor the ability to carry out any major work on parachute equipment. (See PASA Form 12)
  - Shall be nominated to attend the PASA Rigger Master Certification Course by his mentor, in writing after having met the entrance requirements for the course.
  - Shall have attended and passed an approved PASA Master Riggers Certification Course for the RM rating, which shall include a theory and a trade test.

Parachute Technician Evaluators shall be appointed by PASA but should be at least a Rigger-Master or foreign equivalent. All nominations for appointment to be referred to the NSTO for comment.

3 RENEWAL AND REVALIDATION

- All parachute technicians shall renew their ratings on an annual basis, along with their PASA membership renewal at the year-end, using the official PASA General Application Form.

- A PASA Master or Senior Parachute Technician must inspect the applicant's logbook and certify that the renewal requirements have been met. An application for renewal shall be approved by a CI / SO, certifying that the renewal requirements have been met.

- The requirements for renewal shall be:

  All
  - Have attended a Parachute Technician's seminar, run by a Master or Senior Parachute Technician, within the last 12 months.
  - A Parachute Technician rating shall lapse in the event of continued inactivity.

  RP
  - Shall have packed at least 15 reserves in the last 12 months.

  RS
  - Shall have packed at least 10 reserves in the last 12 months.
  - Shall have carried out or supervised at least 12 minor repairs in the preceding 12 months.

  RM
  - Shall have packed at least 5 reserves in the last 12 months.
  - Shall have carried out or supervised at least 12 minor repairs in the preceding 12 months.
  - Shall have carried out or supervised major repair work or have manufactured equipment in the last 6 months.

- If, after an investigation by the NSTO of a written complaint, a Parachute Technician is found guilty of either misconduct of unsatisfactory workmanship, the NSTO may suspend or withdraw such rating. The holder may appeal to the executive of PASA, who may review the specific case.

- To revalidate a suspended/withdrawn or lapsed rating, the applicant may be required to do a trade test as specified by an appointed Parachute Technician Evaluator.

4 METHODS OF OPERATION

- A holder of a Parachute Technician rating shall maintain a Logbook of all work done, in which the following shall be recorded:

  - Date job done.
  - Place.
  - Serial number and description of equipment on which the work was done (manufacturer, model, etc.).
  - The owner of the equipment (name, etc.).
  - A description of the work done on the equipment.
  - Comments on the equipment/job done.

- In addition to the Logbook, a holder of a Parachute Technician rating shall complete the PASA online Inspection Record as a record of work done.

- Parachute Technicians shall seal completed pack-jobs by means of seal thread and lead seal, or similar, bearing their unique seal number/symbol.

- By signing a data card for a reserve parachute system, the Parachute Technician is indicating that the equipment (including the reserve canopy, harness container system and AAD) is airworthy and shall accept the associated responsibility.

- All parachute systems shall carry a data card for the reserve canopy, harness and AAD (where applicable). The following information shall be reflected:

  - The types and serial numbers.
  - The dates of manufacture.
  - The date and place of the last pack.
  - The packer's name.
  - The certifying signature(s) and number(s).
  - The type(s) of repair/modification undertaken (if any) as minor or major.
  - The record of compliance with any service bulletin(s).
  - The record of installation or removal of an AAD

5 FOREIGN OR MILITARY RATING HOLDERS

Holders of current foreign or military Parachute Technician Ratings, in order to obtain PASA ratings shall proceed as follows:

- Meet all the PASA requirements for the applicable rating.

- Produce satisfactory evidence of such currency. (To include paperwork, logbook, etc.)

- Pass the appropriate theory and trade test as administered by a PASA Parachute Technician Evaluator.

- Apply as required above.

SECTION 18

DZ OPERATING PROCEDURES

CONTENTS

1 VISITING PARACHUTISTS' CHECKOUT

Policy requires member clubs to extend all club privileges to visiting FAI affiliated members. The visiting jumper must present documents to the club when requested by club officials.

A normal visiting parachutist checkout should include:

- Current PASA (if a South African) membership, or current FAI affiliated club membership card. Issue foreigners a temporary PASA membership card.
- Properly certified logbook.
- FAI sporting licence if required.
- Equipment: main, reserve, instruments, etc.
- Orientation to DZ procedures.

Membership card

- Check the expiry date.
- ANY signs of alteration render the card invalid.
- Check with PASA if there is any doubt.

Logbook

- Description of logbook owner as to the holder and in comparison to his other documents, i.e. licence, etc.
- Date and location of his last SIGNED jump (currency).
- Type of jumps done in the last six months.
- Endorsements and/or violations recorded in the logbook.
- If a student, check his progression and abilities.
- Has the holder jumped your type of aircraft?
- Do the signatures in the book coincide with licensed jumpers known in his home area?
- Statements like "I don't log jumps anymore" or "I wasn't able to get these jumps signed" are totally unacceptable for non-D Licence holders.

Licence

- Check the class and number of the licence (certificate). If a non-SA licence, determine qualification requirements for class of licence held and the expiry date.
- Check date of issue and personal description and signature of the holder.
- Any signs of alteration on ANY licence renders it invalid.

FAI Sporting Licence

FAI Sporting licences are certified by the FAI stamp that expires on the 31st December of the year issued. It is required whenever the parachutist is to participate in a competition run under the rules issued by the FAI.

Equipment

- The Chief Instructor must check all equipment for serviceability.
- Check reserve packing card.

Orientation to DZ Procedures

- Always explain any special DZ rules and procedures i.e. pilot commands used, flotation gear, opening altitudes etc.
- If novice/student, always check out his previous training and knowledge. If in doubt drop him back to the level of progression that his knowledge dictates.
- Always show visitors the DZ, either actual or by aerial photograph or diagram, pointing out obstacles, prevailing wind, prominent landmarks.
- Always assess the individual through casual conversation and questioning. His first jump at your DZ, regardless of experience, must be an assessment of his ability.

- Never lend or allow a visitor to jump more advanced equipment than he has been accustomed to, as recorded in his logbook.
- Never allow an unknown visitor to jumpmaster students until you have seen him jump and briefed him on your methods.
- Don't ever be impressed by jump totals, smooth talk or attitudes.
- If in doubt of the individual's ability or credentials DO NOT allow him to jump at your DZ until you have checked him out thoroughly.
- A rule of thumb is that those who talk the best on the ground are usually limited to verbal ability.
- Foreign jumpers must abide by and jump under PASA regulations while using a PASA member club DZ.

False Documents

If a visiting parachutist is suspected of having false documents, follow these steps:

- Do not allow him to jump at your DZ until his status has been clarified.
- Contact PASA and his home DZ for confirmation of his experience and qualifications.
- Advise the parachutist involved of the action being taken.

Should the investigation prove the validity of the documents in question, apologise for your mistake and welcome him to your DZ.

In the event the investigation bears out your suspicions, submit a full report of the incident to PASA with a request that the other clubs be notified.

General Notes

Visitors appreciate a thorough check out as it lets them know they are getting involved with a safety conscious club. Any jumper who is on the level will co-operate with you 100% because he realises your position and respects it.

Only someone with something to hide or a very immature attitude towards the sport would ever refuse a safety check.

2 EMERGENCY PROCEDURES

Injuries

Establish type and extent to injury. If it is of a serious nature or you are not sure what to do, immobilise patient and wait for qualified help.

Fatalities

Every fatality causes considerable damage to sport parachuting. The long-term effects of fatality, however, may be kept to a minimum providing the tragedy is well managed in all respects.

Poor management of a fatality can result in adverse publicity, lengthy civil or statutory proceedings, inability to establish the cause of the accident, closure of the DZ, etc.

It is essential therefore that responsible members of the sport, are aware of the complications which can arise, in order that appropriate steps can be taken to prevent them from occurring.

Procedures to be followed:

- Equipment

  - Keep people away.
  - Do not remove the body until the equipment has been inspected by the SO/CI.
  - The equipment must be photographed.
  - Remove and box the equipment carefully, taking care so as not to disturb any evidence.

- Advise the police that PASA, on behalf of SACAA, will investigate the accident, and as such would require the equipment. Do not allow the police to impound the equipment if possible.
- The equipment along with the photographs should be forwarded to the NSTO when possible.

- Notifications

  The following persons should be notified immediately:

  - Ambulance
  - Police
  - SO/CI
  - NSTO (who will in turn notify SACAA)
  - Air Traffic Control (use the telephone and not the aircraft radio)
  - Next of kin, preferably by way of the police unless a close family friend is nearby.

- The Press

  All club members should be prepared for the press converging to the scene for what is to them a natural action/drama story. Reporters should be directed to the senior DZ safety officer (SO/CI) who should advise them that an investigation has been launched by PASA, on behalf of SACAA, to establish the causes of the accident and may share with them the contact details for the PASA office and/or NSTO to obtain further information and/or a press release. No further information should be given to anyone. Avoid using the words "parachute did not open".

- Administration

  Sworn statements are to be taken from the pilot of the aircraft, and also from as many responsible eyewitnesses as possible. These statements should accompany the equipment and the photographs, along with any other information (logbooks etc.), to the NSTO.

SECTION 19

HANDY TIPS FOR NEW JUMP PILOTS

CONTENTS

In accordance with SA-CAR Part 105, jump pilots are required to have received an appropriate briefing on the intended parachute drop operations and have the briefing entered and signed in the pilot's logbook. Alternatively, jump pilots to keep a completed and signed copy of Form 22 with their licence documentation.

This section of the PASA Standard Operating Procedures will serve as GUIDANCE for jump pilots in general; this information does **NOT** supersede the procedures as described in the Pilot's Operating Handbook or the standard operating procedures in force at the individual clubs.

1 GENERAL

The noise of a jump airplane cockpit generally makes normal conversation difficult and communication of complex plans almost impossible. It is therefore very important that the pilot fully understands, and be in a position to anticipate the procedure required by the load/jump master under almost any set of circumstances. The load/jump master must be familiar with the performance limitations of the aircraft.

Communication between the jump pilot and the load/jump master is vital for successful and safe parachuting operations.

A jump pilot must be familiar with the various hand signals used during skydiving operations; this type of communication is only possible after you have solid knowledge of parachuting. Make a point of attending first jump courses as well as jumpmaster/instructor seminars on a regular basis. This will expand your understanding of skydiving activities and allow you to voice your opinion on any issues that you wish to raise.

2 PRE-FLIGHT INSPECTION

The commencement of daily operations is preceded by a pre-flight inspection. Always follow the procedure as prescribed by the Pilot's Operating Handbook.

The following points are generally applicable for any type of aircraft.

3 CABIN INSPECTION

Ensure that all the required paperwork is available.

Remember the letters AROW and you will have no problem recalling what is required.

- **A**irworthiness certificate
- **R**egistration certificate
- **O**perating handbook
- **W**eight and balance data

Remove the control wheel lock.

Check that the ignition switch is off and keys are not in the ignition.

Switch on master switch.

Check fuel quantity, but be aware the gauges are only completely accurate when reading empty. Visually inspect the tanks and calculate fuel requirements.

Lower the flaps.

Switch the master switch off.

Ensure that the fuel valve is on.

4 EXTERIOR INSPECTION

During this part of the pre-flight inspection look for anything that is mechanically unsound. If in doubt do not fly!

i Inspect the empennage.
ii Remove tie downs.
iii Check for free movement and security of the elevator and rudder. Ensure balance weights are secure.
iv Check antennae.
v Inspect right flap. Check sliders and security of flap, there should be only slight movement possible.
vi Inspect the right aileron by checking the hinges and ensuring that there is freedom of movement. The control wheel should move in the correct direction when the aileron is moved.
vii Inspect the leading edge of the wing.
viii Check right main wheel. The tire should be in good condition and adequately inflated. There should be no signs of brake fluid leaks.
ix Drain a small quantity of fuel from the right fuel tank drain valve and check for water, sediments and proper fuel grade.
x Inspect upper surface of wing.
xi Visually check fuel quantity by removing fuel cap and looking in the tank.
xii Secure fuel cap.
xiii Check oil level.
xiv Pull out the fuel strainer drain knob and collect a sample of fuel to check for any sediment and/or water.
xv Look inside cowling for small animals, lost wrenches, oil leaks, etc.
xvi Inspect the nose wheel and fairing. The nose wheel strut and tire should be properly inflated. There should be about two inches of nose wheel strut exposed and no significant leakage of oil from the strut. Check the shimmy damper and the nuts and bolts for security.

While inspecting the nose of the airplane, remain clear of the arc of rotation of the propeller at all times.

xvii Check propeller and spinner for damage such as nicks or cracks and security.
xviii Check alternator belt.
xix Ensure air intake filter is unobstructed.
xx Landing light should be clean and operational.
xxi Inspect static source opening.
xxii Inspect upper surface of left wing.
xxiii Visually check fuel quantity by removing fuel cap and looking in the left tank.
xxiv Inspect the pitot tube.
xxv Inspect the leading edge of the left wing. Check stall warning device and fuel vent.
xxvi Inspect the left aileron by checking the hinges and ensuring that there is freedom of movement. The control wheel should move in the correct direction when the ailerons are moved.
xxvii Inspect left flap. Check sliders and security of flap, there should be only slight movement possible.
xxviii Check left main wheel. The tire should be in good condition and adequately inflated. There should be no signs of brake fluid leaks.
xxix Drain a small quantity of fuel from the left fuel tank drain valve and check for water, sediment and proper fuel grade.

Stand in front of the aircraft and take a minute to consider whether anything has been overlooked.

5 LOADING, START-UP AND TAXI

Always load the aircraft within the weight and balance limitations, pay specific attention to the position of the centre of gravity as this limitation is the one most likely to be exceeded.

The jump pilot is faced with a high risk of someone walking into the propeller. Jumpers and spectators may not be aware of the spinning propeller. Crouching in the propeller arc is a favourite spot for photographers, NEVER start the aircraft until all jumpers are aboard and the spectators are clear.

On busy days it may be necessary to leave the engine/s running while the jumpers are boarding the aircraft. BE EXTREMELY CAUTIOUS.

If record keeping is required, it can be done while the jumpers are boarding or before start-up, this will ensure that the jump pilot can apply his full attention the start-up and taxi.

During the taxi, re-confirm the jump run altitudes. If you know or suspect that the requested altitude may not be practicable discuss the alternatives before take-off.

6 TAKE-OFF AND CLIMB OUT

Perform complete pre-take off procedures as described in the Pilot's Operating Handbook before each flight, this will ensure that nothing is left to chance. The use of a checklist is highly recommended.

Just before take-off the jumpers will make their final adjustment in seating position. Do final cockpit checks prior to take-off. Check the fuel selector/s, trim, flaps, primer, mixture, prop-pitch, carburettor heat, cowl flaps, fuel quantities (pumps) and magnetos as you roll into the take-off position.

The first priority after lift-off is to accelerate to the best rate of climb speed, obstructions permitting. Since the aircraft is near its weight and centre of gravity limitations, the airspeed must be closely monitored. Trim the aircraft so that minimum control forces are necessary during the initial climb out.

Perform the after take-off checks as per Pilot's Operating Handbook and club standard operating procedures.

Ensure that the aircraft is operated within the operating limitations at all times, pay specific attention to engine performance indicators as the nature of the operation can lead to abuse of the engine/s.

7 CLIMBING TECHNIQUE

Efficiency in the climb is achieved not by overworking the engine, but by maintaining coordinated flight at a constant airspeed and by keeping the turns gentle and to a minimum. Be smooth and precise.

Follow the standard operating procedures as set out by the Pilot's Operating Handbook.

Handy tips for piston engine aircraft.

Cylinder head temperature is controlled in the following order:

1 Cowl flaps
2 Richer mixture if smooth engine operation allows
3 Higher airspeed
4 Lower power settings

High oil temperature is quickly corrected by 1, 3 and 4.

Much of the guesswork in proper leaning can be taken care of by the exhaust gas temperature gauge. About 100 degrees to the rich side of peak is recommended.

There have been several publications discussing techniques to utilize thermals and rising air to help gain altitude. In practice, the flat-ground thermals are very difficult to utilise for lift in an aircraft moving at 85 mph or more. Some areas may be blessed with long ridges where flying parallel to the ridge would be very beneficial when the winds are favourable. The most practical techniques are:

- When the aircraft starts to **climb** (before the VSI indicates) **slow down** by about **5 mph**.
- When the aircraft starts to **sink, speed up** by about **10 mph**.
- Ideally climb in areas of high lift activity and descend in high areas of sink.

The jump run should be planned to allow the load/jump master a good view of the exit point and parachute landing area.

The jump pilot and load/jump master are responsible for keeping all the occupants of the aircraft calm. ALWAYS REMAIN CALM - NO MATTER WHAT THE SITUATION.

8 DESCENDING TECHNIQUE

The primary consideration that an engine requires for the decent is temperature, or more specifically, rate of temperature change. To ensure a constant change in temperature without damaging the engine, allow the engine to cool smoothly and slowly. Once again follow the Pilot's Operating Handbook and Standard Operating Procedures to avoid abuse of the engine.

On the descent, keep well clear of the Drop Zone, and follow the applicable descend and approach patterns accurately.

9 LANDINGS

Try to land at the lowest safe airspeed. This will greatly reduce tyre and brake wear. Follow the Pilots Operating Handbook after landing procedures, as you approach the loading area, taxi past the waiting jumpers to position the aircraft so that the jumpers approach it from behind.

10 SPOTTING BASICS

Spotting skydivers is as much intuition as it is manipulation. This means that even though you know where the jumpers need to be dropped, you still need to fly the aircraft over that path. You will need enough situational awareness to time it so they climb out and leave right where you want them to. The following steps will ensure that the jump pilot will dispatch the jumpers exactly overhead the drop zone.

10.1 STEP ONE

Spotting is built from the ground up. Jump pilots need to consider the shape of the landing area, obstacles near the airport, winds aloft and the composition of the load.

10.2 STEP TWO

Ensure that the canopies will be in the best position considering the winds. Look at the surface winds up to three thousand feet. Generally, canopies are capable of forward speeds of 15-30 mph. If the winds are 15-20 knots at three thousand feet the jumper will need to open directly above or just beyond the landing area upwind.

If the winds are forecast at 0-10 knots, you can put them pretty much anywhere within a half-mile of the airfield.

10.3 STEP THREE

Figuring out what influence freefall drift has on the jump run takes some practise and needs a little precision flying to make the first part of your plan work.

Here are some interesting facts:

- When a jumper has about one minute of freefall, and the prevailing winds aloft started out at 60 knots, the jumper will drift about one mile.
- If the winds prevail at 30 knots they will drift half a mile, and if they prevail at 15 knots, they will drift a quarter mile.

Ensure that jumpers are dropped at the correct position taking into account their freefall drift, prevailing winds and the composition of the load.

10.4 STEP FOUR

Fly the plan and be precise. As you descend, watch where the canopies open. This will give you a good idea of how effective your jump run was.

Try to get someone to let you know how the spot worked out. Use someone you trust, and ask where they went out on the exit order if it's a larger aircraft. This will give you a good idea of what to do in future loads.

10.5 CROSSWIND JUMP RUN

Sometimes a crosswind jump run is beneficial if the landing area is a long, narrow rectangle and one side has a hazard.

When you do a crosswind jump run you will also give any gear that is cutaway a chance at landing on the airport. As the winds change through the day or the types of loads you are flying change then adjustments will be needed to the offset. Discuss it with your jumpers beforehand.

10.6 HOOK PATTERN JUMP RUN

The hook pattern run is partly a crosswind jump run, partly into the wind and possibly, a downwind run. Try to plan your hook before you drift too far off.

Let the jumpers know that it is acceptable to exit whilst the aircraft is banked. SOME DROP ZONES TEACH PEOPLE TO STAY IN WHEN THE AIRCRAFT BANKS. Make sure you know what the jumpers expect. If you plan to use this technique then you need to tell the jumpers. Banking while large groups climb out is not very good practise, thus the hook pattern jump run is not appropriate all the time.

11 SPEED AND POWER CONTROL

The airspeed for all jump runs should be 80 – 85 mph. Find the optimum power setting for the type of aircraft you are flying, avoid large changes in the power settings during the jump run.

Terminal velocity for the human body is approximately 125 mph and at speeds below 80 mph the human body is “flying” below minimum control speed. Knowledge and application of this fact to student jumpers is very important. Speeds of 65 – 70 mph will make it slightly easier to get out on the step, but it will make it unnecessarily difficult for the static line or 5 seconds delay student to fall stable.

Set power to maintain altitude on the jump run. During the exit it is helpful to reduce power to a low thrust setting, this makes it easy for the inexperienced to exit on to the step. It is still quite common for jumpers and jumpmasters to call “THROTTLE BACK” as they or their students are preparing to exit. A “throttle back” is never more than a smooth power reduction to low thrust where the airspeed will not to have to be chased and even a slow exit will only have a 50ft loss of altitude.

SECTION 20

PASA FORMS

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SECTION 21

COMMON ABBREVIATIONS USED IN THIS MANUAL

AAD ..... Automatic Activation Device
ADZO ..... Association of Drop Zone Operators
AE ..... Artistic Events
AFF ..... Accelerated Free Fall
AGL ..... Above Ground Level
AMD ..... Automatic Measuring Device
AMSL ..... Above Mean Sea Level
ARO ..... Aviation Recreation Organisation
BDS ..... Back-Down Stable
BOC ..... Bottom of Container
BSP ..... Basic Sit Position
CF ..... Canopy Formation
CI ..... Chief Instructor
CP ..... Canopy Piloting
CPSP ..... Canopy Piloting Skills Programme
DRCP (also DRP) ..... Dummy Rip Cord Pull
DZ ..... Drop Zone
DZO ..... Drop Zone Operator
FAI ..... Fédération Aéronautique Internationale
FF ..... Free Fall
FL ..... Flight Level
FS ..... Formation Skydiving
ISP ..... Intermediate Skills Programme
JM ..... Jumpmaster (also JM B Basic Jumpmaster or JM SL Static Line Jumpmaster)
NSTO ..... National Safety & Training Officer
PASA ..... Parachute Association of South Africa
PLF ..... Parachute Landing Fall
RSL ..... Reserve Static Line
SACAA ..... South African Civil Aviation Authority
S/L ..... Static Line
SAP ..... Freefall Style & Accuracy Landing and Para-Ski
SJO ..... Show Jump Operator
SO ..... Safety Officer
SOPs (also PASA SOPs) .... Standard Operating Procedures
SSA ..... Sport Skydivers Association
TE ..... Tandem Evaluator
TM ..... Tandem Master
TSO ..... Technical Standard Order
VRW ..... Vertical Relative Work
WDI ..... Wind Drift Indicator
WS ..... Wingsuit (also Wingsuit Flying)