



AUSTRALIAN PARACHUTE FEDERATION

Tandem Endorsement Guide

A Handbook for the Tandem Master



VERSION 01-2023

STATUS: EDUCATIONAL/ADVISORY

Warning

Parachuting and flying in parachuting aircraft can be dangerous.

This guide is not a do-it-yourself guide to skydiving instruction and should only be used while under the supervision of a qualified APF instructor.

IMPORTANT: Version Control

It is important that members refer to the current version of this Tandem Endorsement Guide. Current Version number is shown on the front cover and in the below table. As the Tandem Endorsement Guide is administered exclusively by the APF, it will be updated and amended when and as required.

Current versions of the Tandem Endorsement Guide and any associated forms can be found on the [APF website](#). Significant changes made from the previous version are shown in Amendments.

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PART 1 - INTRODUCTION

1.1 Welcome

Congratulations on your decision to begin your Tandem endorsement course.

Tandem skydiving has come a long way since its inception in the late 1970's. What started with a crude experiment by a skydiver who took his wife for a jump by strapping her into the same harness as himself, has now become a widely successful adventure industry. Well over 1 million people across the world make a skydive as a 'tandem student' annually. During 2018 in Australia, over **197,000** adventure seekers were introduced to our sport via Tandem skydiving, and the numbers continue to grow. About half of these were international tourists.

A Tandem Endorsement is a privilege and an extremely large responsibility. It requires the holder to exercise a high degree of professionalism especially in regard for safety. Holding the endorsement requires a commitment to remain up-to-date with relevant technical and safety information. It should also require a desire to represent your sport and industry in a positive manner.

Taking student passengers for the experience of a lifetime makes Tandem Masters the face of skydiving and it is a critical role in more ways than one. It falls under Adventure Tourism and in addition to providing a safe skydive for them and you, your role is also one of customer service and an often forgotten opportunity to help your sport to convert these one-time thrill seekers to take up a first jump course.

Scope of Study Guide

The study guide is intended to be used in addition to an official course of instruction conducted by an APF Tandem Examiner. It aims to provide information and guidance to:

- Prepare you for your initial examination;
- Give you a foundation of knowledge necessary to begin Tandem instructing; and
- Be a useful source for future reference during your career.

It does not contain all of the information required. To use this guide, you will require additional documents which are listed below. It is a mandatory part of your course that these materials be studied.

How the guide works

The guide is divided into lessons. At the beginning of each lesson, the aims of that lesson will be clearly stated. At the end of the lesson, you are provided with a set of review questions to answer. The questions are designed to confirm your learning and to prepare you for your written and oral examination. Some of the lessons will require interaction between you and your Course Instructor/Examiner.

You will also need:

- APF Operational Regulations and Regulatory Schedules
- APF Training Operations Manual
- APF Instructor Guide
- The Manufacturer's manual for the Tandem equipment you are planning to jump
- The Manufacturer's training DVD for the Tandem equipment you are planning to jump
- The manual for the AAD fitted to the Tandem equipment
- The Strong Enterprises 'Side Spin' DVD.

1.2 Prerequisites to the Tandem Endorsement

Firstly, to be an APF Instructor you are required to have an adequate level of English and capability in each of the core skill areas of learning, reading, writing, oral communication and numeracy (RS 53, 4).

If there is any doubt about your ability to both read and write English adequately, the matter should be referred to the STO. You may be required to sit a short test to ascertain your capability level meets a minimum standard.

Secondly, to begin training for your Tandem endorsement, refer to the following checklist:

- You must hold an APF membership
- You must hold a minimum APF Certificate Class E
- You hold either a Packer A rating, so are required to provide a copy of the required evidence (eg- packing log showing the minimum 6 emergency/reserve repacks)
 - **OR**
- You must hold at least a Packer B rating, or no longer valid Packer A so reverting to Packer B
- You must hold a star crest
- You have been deemed medically fit to undertake the role either by:
- Holding a current Private Pilot Medical Certificate (Class 2) (copy provided);
 - **OR**
- APF *may* accept a current CASA Basic Class 2 Medical Certificate (copy provided)
- You must hold an Instructor rating **OR** are being assessed for an Instructor rating concurrently with this Tandem endorsement assessment
- You have a minimum of 3 years active skydiving experience since obtaining your Certificate A (strongly recommended)

To begin, you must complete an APF application, i.e. an R1 Form, have it certified by your Chief Instructor and pay the appropriate fee to the APF.

1.3 Assessment Outline

The assessment process consists of three parts: Written, Oral and Practical.

Written

There is a separate written exam for the Instructor rating and the Tandem Endorsement. If you already hold an Instructor rating, then you will only must sit the relevant written exam for the endorsement(s) you are applying for.

The Instructor exam consists mainly of multiple choice questions which will examine your knowledge on Operational Regulations and Schedules, general knowledge, equipment and instructional technique. An 80% pass mark is required. The Tandem written exam consists of mostly multiple-choice questions designed to evaluate your knowledge of the regulations and procedures relevant to Tandem instruction. An 80% pass mark is required. These exams will have been sent to your Examiner when you have completed your study and set the date for the training and assessment.

Oral

When the Tandem Endorsement is being conducted in conjunction with an initial Instructor rating, the Oral examination is usually a combined Tandem/Instructor. When the Tandem Endorsement is completed alone, the Oral examination will usually focus on Tandem-related content only.

The Oral examination will be held in front of a panel of three Instructors, one of whom is a Tandem Master Examiner and all of whom hold a Tandem endorsement.

The examination panel will ask as many questions as necessary (minimum 10) to test your knowledge of the Tandem Master's job and responsibilities.

Each panel member scores the answer to each question on the collation assessment sheets provided to the Examiner.

The Examiner computes the final percentage by averaging the three Examiners scores. An 80% pass mark is required.

Practical

During the practical assessment you will need to demonstrate competence in all aspects of Tandem Instruction to the satisfaction of a Tandem Master Examiner. The practical assessment will consist of three parts: ground work, briefing, air work including assessment jumps.

(a) Emergency Procedures

Tandem descents require more extensive decision making than sport and recreational skydiving, due to the complexity of the equipment and the duty of care to your student. You will be required to respond correctly to a range of scenarios, which this study guide will prepare you for. The satisfaction of the Tandem Master Examiner during this ground-based assessment is important, but ultimately more important is your ability to respond correctly with a situation involving a student when required.

(b) Packing

You must demonstrate competence in the packing of the main canopy to the satisfaction of the Tandem Master Examiner. As a packing error can have grave consequences, a packing error can be grounds for failing this exam.

(c) Assessment Jumps

Prior to commencing assessment jumps acting as Tandem Master you must have:

- Completed all application requirements
- Obtained an approved Tandem Master medical
- Viewed the Tandem Master Training DVD/ Strong Side Spin DVD
- Completed the Tandem Master's written examination with a pass of 80%
- Completed the Oral examination with a minimum pass of 80%
- Completed and successfully passed the Emergency procedures examination
- Received authorisation from the Tandem-Instructor Examiner to commence the examination jumps

Once you have satisfied the above requirements, you may begin your exam jumps. For full exam jump requirements, see your Examiner.

Assessment Jump One

Acting as passenger, you will make a Tandem Jump (There is no additional requirement for the Tandem Master).

Assessment Jump Two

Acting as Tandem Master, you will make a stable delay on heading, with a stable drogue deployment and comfortable landing (The Examiner is required to be in the Student position for this jump).

Assessment Jump Three

Acting as Tandem Master, you will make a stable exit followed by a stable drogue deployment. Hold a heading for five seconds, then perform one 360 degree turn. Deployment must be stable, the landing comfortable and within 50 metres of the target centre (The Examiner is required to be in the Student position for this jump).

Assessment Jump Four

Acting as Tandem Master, you will make a stable exit followed by a stable drogue deployment. (Stability and heading to be regained within 10 seconds of exit.) Perform two opposite 360 degree turns. Deployment must be stable, the landing comfortable and within 50 metres of the target centre.

Assessment Jump Five

Acting as Tandem Master, the sequence of the jump will be as determined by the Examiner, deployment must be stable and the landing comfortable and within 50 metres of the target centre.

Assessment Jump Guidelines:

- On at least the first two exam jumps where you are acting as the Tandem Master, the passenger is required to be the TI Examiner. On the other exam jumps where you are acting as the Tandem Master, the passenger may be the Examiner or a highly experienced TI nominated and directly supervised by the Examiner.
- For the remaining two assessment jumps any active, current Tandem Master with a minimum of 3 Tandem Jumps within the preceding 90 days and a total of a minimum of 50 Tandem Jumps, may act as Examiner (as passenger) at the Tandem Examiner's discretion.
- Assessment jumps may be repeated until you meet the performance standards determined by the Examiner.
- The jumps should be performed with a variety of passenger sizes and in a variety of wind conditions.
- All assessment jumps are to be completed and signed-off before you take a licensed parachutist for the remaining consolidation jumps.

Additional consolidation jumps

After completing ALL assessment jumps and being signed-off as such by the Tandem Master Examiner, you are required to complete a further five jumps as Tandem Master to the satisfaction of the Tandem-Instructor Examiner. Any current APF Member holding at least a Certificate 'A' may act as passenger, however it is highly recommended that the passengers be highly qualified Tandem Masters with more than 50 jumps in order to gain additional feedback and experience.

PART 2 - EQUIPMENT

2.1 Introduction

At this point, with you already holding a Certificate Class E and a Packer B as a partial requirement of your Instructor rating, you should have an excellent working knowledge of sport parachute systems.

In this Part, we will cover the things that make a Tandem system different. You will be required to read the current owner manual for the rig you will be endorsed on. Having a thorough working knowledge of your Tandem equipment is fundamental to your safety and that of your student.

In this Part:

- Introduction to the Tandem system components
- Maintenance and wear and tear
- Packing your Tandem system
- Your specific Tandem system and how it operates
- How to perform a gear check
- Keeping up to date.

2.2 Tandem System Components

Tandem Harness Container

Like a sports rig, although larger, as it carries a larger main and reserve canopy. The harness is also adjustable to allow for different size Tandem Masters. Some harnesses have step-in leg straps and others have B-12 snaps.



B-12 Snap

Student Harness

Like a parachute harness without the pack trays attached, this harness is highly adjustable to fit a range of people. It has four connectors which attach to the Tandem Master harness. The top shoulder snap hooks can carry up to 2268KG *5000 lbs* and the 'quick ejector' hooks, located on adjustable webbing at the hips carry up to 1134KG *2500 lbs*. Note that the harness does not fit EVERYONE! Not everyone is suited to Tandem skydiving.

Student Attachment Points

There are four located on the Tandem Master harness. Two large "D" rings located under each riser three ring release, and two smaller rings, most commonly threaded through the harness at the hip area. It is to these points that the student harness connects.

Drogue

The drogue is similar in appearance to an oversized throw away pilot chute and is stored at the BOC in a spandex pouch. It consists of the drogue chute and the drogue bridle. The drogue, which is deployed by the Tandem Master shortly after exit, inflates and trails behind the tandem for the duration of freefall. Freefall then becomes "drogue fall".

The drogue has two jobs:

1. Reduce the terminal velocity of the tandem pair to the speed of a solo jumper. This provides a safer deployment speed and a longer freefall time.
2. When released by the Tandem Master, it acts as a pilot chute to assist deployment of the main.

No Drogue = No Main

For this reason, it is impossible to deploy the main without the deployment of the drogue.

After main deployment, the drogue, now deflated via a kill-line system, trails behind the main canopy. Depending on the system, drogue deflation occurs at different stages of main deployment.

Drogue Riser

These exist on all systems except for the Sigma System. The drogue riser is fixed to the container. It consists of the two smaller rings of the 3-ring drogue attachment/release system. The 3rd, larger ring is attached to the drogue bridal. This attaches to the drogue riser in the same manner that your main risers attach to your harness via a locking loop and cable (drogue release cable). On systems with two drogue release cables, a double-ended locking loop is used.

The Sigma system uses a unique Disc mechanism, instrumental in preventing some "Out of sequence" openings.

Drogue Release Handles (Primary, Secondary, Tertiary)

The Primary Drogue Release deploys the main canopy. When pulled, the drogue is released from its duties as a 'terminal velocity reducer' and performs its second role as a pilot-chute to assist main deployment.

The secondary is a back-up main deployment handle and can be used if the Tandem Master experiences a 'Hard pull' on the primary handle or is unable to locate the Primary Handle. It can also be fitted to the student harness (on certain systems) for a student deployment during a TAF stage. It is sometimes found attached to the cutaway pad, thus ensuring that an attempt has been made to release the drogue prior to cutting away. A secondary handle is not mandatory but highly recommended as 'Hard Pulls' and

'floating and/or can't locate handle' scenarios can and have happened to many Tandem Masters in the past.

The tertiary release is an option on some equipment. It is usually attached to the cutaway pad, and releases part of the drogue bridle three-ring system independently of the primary or secondary.

The location of the primary and secondary handles depends on the system and certain systems are flexible as to where they are situated. This can be advantageous for TAF Training and Hand Cam Users.

Main Cutaway and Reserve Deployment Handles

Unlike a sports rig, these are located at shoulder level and outboard of the harness, so that access to them is not obstructed by the student. Depending on the system, they can be pads, Loop handles, stainless steel handles and/or combinations of both.

Secondary Reserve Deployment handles

Certain Tandem Systems have a secondary reserve handle. This handle is usually part of the RSL assembly, and a contingency to be used by the Tandem Master's right hand (cutaway hand) in the event that the Tandem Master's left hand (Reserve hand) becomes incapacitated.

Automatic Activation Device (AAD)

All Tandem systems must be equipped with an AAD and must be active on every jump. AAD's must be approved by the manufacturer of the Tandem system. The makers of electronic AAD currently approved on Tandem equipment are Vigil, CYPRES and M². Each has different functional characteristics and it is imperative that you study the owner's manual for the model that you will be using.

Each AAD references a different arming height; for example, a CYPRES Tandem AAD arms at an altitude of 3,000 feet during the climb to height and activates at 1,900 feet during descent. This contrasts with the lower heights of the CYPRES Expert found in sports equipment.

M.A.R.D. System and Reserve Static Lanyard (RSL)

Main Assisted Reserve Deployment (MARD) system activates via an RSL. This is an option on all systems and has advantages and potential disadvantages. As a result, it is up to your Chief Instructor as to whether they are to be connected, and they will brief you on their rationale. On some systems, a handle is attached to the lanyard which acts as the secondary reserve deployment handle.

The Skyhook is available on the Sigma (UPT), the Air Anchor on the TNT (Strong Ent.); and the Reserve Boost (Plexus).

(Please read Appendix B: RSL's on Tandem Equipment)

Risers

Tandem risers are larger and stronger than that of a sports harness but operate in the exact same way. They are connected/detachable via the same 3-ring system you have on your sports gear.

Main Canopy

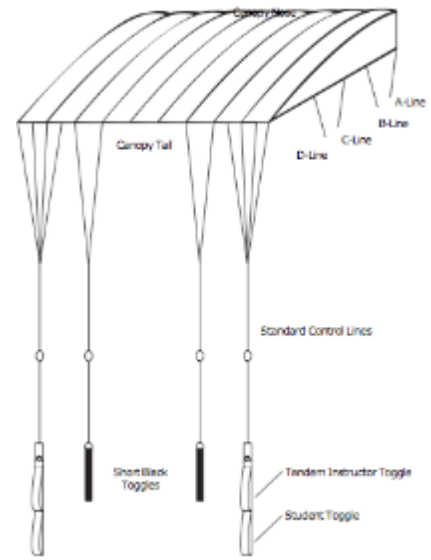
There are different makes of tandem canopies used in Australia, each with different handling characteristics. If changing to a canopy you are unfamiliar with, it is important you educate yourself on its handling characteristics prior to jumping.

Steering Toggles

These are attached to the brake lines of the tandem canopy and are kept on the main risers. The primary toggle has two handle loops. The top loop is used by the Tandem Master for steering or landing. The lower loop can be used by the student as it is more reachable.

Some Tandem canopies have a 'double brake line' configuration, with two brake toggles per side. This means that there are more line attachment points to the tail of the canopy than that of a 'single brake line' configuration. More of the tail will be pulled down when pulling on both lines, resulting in a harder but better flare. It allows for easier steering (less toggle pressure) for you and your student when only the primary steering line is used.

This is usually picked up shortly before landing and used in conjunction with the primary toggle for a more effective flare. If the secondary toggles are not used for flaring, a hard landing will be experienced.



Ancillary Equipment

Student Goggles: make sure these are in good condition. These should be sterilised before each use. Non-tinted goggles are best for DVD/Photos.

Your goggles, a functioning altimeter, Audible Altimeter (Refer Op Regs relevant to Hand Cam descents)

A hook knife should always be carried. Either on your person or on the back of the student harness. Fundamentally, somewhere easily accessible.

2.3 Maintenance and Wear and Tear

Tandem components require a vigilant, systematic inspection and frequent maintenance because of the loads and stresses involved. Combine this with the number of Tandem operations landing on beaches – salt and sand increase wear and tear significantly. At the 2014 APF Symposium, results of failure testing were presented for a 6-8 years old passenger harnesses. Its main lift-web showed 56-74% strength degradation, i.e. $\frac{1}{2}$ to $\frac{3}{4}$ strength reduction.

Another key example: a worn kill-line on a sports parachute will gradually result in less predictable openings and is only a minor annoyance. However, a worn kill-line on a collapsing system (i.e. Sigma) that have shrunk will lead to opening hesitations or bag locks, while broken kill lines on these systems can lead to uncomfortable openings for you and your student. When the kill-line fails on a Drogue system, it will remain inflated for the descent – making a marked difference in the canopy's performance and flare.

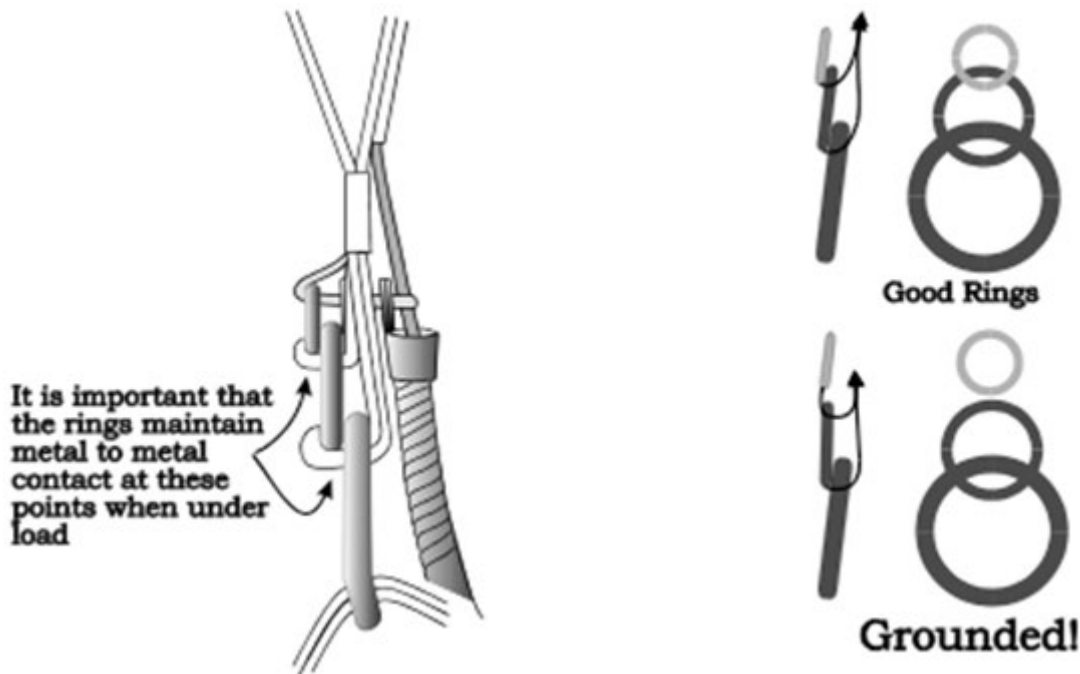
Failure of other components in the Tandem system, such as loss of a riser, has potential for catastrophic results. The drogue, due to the nature of its function, requires constant inspection and maintenance. After every jump, check the point where the drogue attaches to the deployment bag. If this fails, main deployment may or may not be possible. The possibility of two canopies out is also a danger.

Your closing loop is an obvious critical wear point which needs constant inspection. Failure of this can lead to horse shoe malfunctions and other dangerous scenarios.

Wear and failure points for all systems are well known. Best practice DZ's service their Tandem systems monthly or even every 25 jumps, in addition to the six month repack cycle.

Like your sports rig, monthly 3-ring maintenance is imperative to avoiding a hard cutaway scenario.

Hard pulls/impossible cutaways have also been due to incorrect geometry of the main riser 3-ring assembly (the position of the rings in relation to each other and the grommet). This can create load on the loop, rather than the rings, preventing the cutaway cables from being withdrawn.



Examples of an Inspection Checklist can be found in the Strong DHT manual and the Sigma Manual. As part of your learning, it is recommended that you complete a 25 jump inspection with your course trainer.

2.4 Packing

Part of your practical exam will be to demonstrate competence in the packing of the main canopy. Following the manufacturer's instructions and always exercising attention to detail, greatly reduces the risk of malfunction.

Take the time now to read the Packing section in the owner's manual for the Tandem System you will be trained on. Whilst learning this process, you should have an experienced Tandem Master or your course instructor supervising you.

Drogue Connection and Closing the Rig

The nature of the drogue-release system allows for possible miss-rigging (incorrect cable routing and 3-ring assembly). Miss routing of the drogue bridal during the closing sequence is also possible. This can result in the inability of the drogue release to open the container (a drogue in tow). This creates a potentially lethal situation and is easily avoided by attention to detail! Factors which contribute to this are:

- **Lack of Currency:** If it has been a while since you've closed a Tandem container, get a refresher from someone that is current; and
- **Distraction:** Don't get distracted during your closing procedure. If this happens, start again.

Remember: There is only one correct way to close your container!

2.5 Your Specific Tandem System

There are quite a few Tandem Systems on the market. Systems commonly used in Australia are the UPT Sigma/Micro Sigma and Strong Enterprises TNT/Dual Hawk. Other Tandem systems include: Racer, Atom and Vector2.

You are required to research the most current Manufactures Manual for the equipment you are attempting to be endorsed on. It is highly recommended that you have access to the actual rig system whilst consulting the manual. The manuals are available from a link on the APF web site. Your Examiner/Course Instructor should also have a copy. It is preferred though that you download your own

copy from the manufacturer's website. Your course trainer will also cover the functional aspects and the packing of the equipment you are to be endorsed on.

You will need to cover:

- Operation: Drogue Deployment; Drogue Release System; Main Deployment; Cutaway and Reserve Deployment.
- RSL: RSL configurations differ between systems. They are often more complex than a lanyard between one riser and the Reserve pin. It is important you understand how they work.
- AAD: How to turn it on and off; Set for a DZ with a different elevation; change mode if applicable.

System Characteristics

The table below displays the Tandem Systems known to be used in Australia. It provides information on the operational aspects of each rig. Let us now look at some of these operational aspects and the operational characteristics they have.

Load Limit

This refers to the legal total exit weight of tandem including Tandem Master, student, container, harness and ancillaries. This is a manufacturer's stipulation and must be adhered to. Simply weigh yourself with your tandem rig and student harness. Subtract this amount from the Load limit of your system. This will then tell you the maximum weight of student you may legally carry.

Drogue Attachment Point

Where the drogue bridle attaches to the container affects the attitude of the tandem pair in drogue fall.

The position varies between: 'centre' of the rig (between the Main and Reserve); centre of 'main tray'; and 'bottom' of container.

- Centre: This places the tandem in a horizontal attitude. This makes it easier to get good video and photography.
- Main Tray and Bottom: During drogue fall, this lower than centre drogue attachment point, tips the tandem pair into a slightly head down position. This can feel a bit awkward initially as it is different from your normal horizontal flying attitude. It mainly affects the outside camera person's job, requiring them to film from a lower position than the Tandem itself, to get a good face shot.

MANUFACTURER	STRONG	UNITED PARACHUTE TECHNOLOGIES	UNITED PARACHUTE TECHNOLOGIES	RACER	ATOM
Model	Dual Hawk Tandem	Sigma	Vector 2 (<i>no longer in production</i>)	Racer Tandem	Atom Tandem
Load limit	227kg (500lbs)	227kg (500lbs)	227kg (500lbs)	272kg (600lbs)	209kg (460lbs)
Drogue Attachment point	Centre	Main Tray	Bottom	Centre	Bottom
Primary Drogue Release	Right hand lift web/or below cutaway pad	Left Hip	Left Hip	Left Hip	Right hand lift web
Secondary Drogue Release	Below cutaway pad	Right Hip	Right Hip(moveable)	Right Hip	Right side (moveable)
Tertiary Drogue Release	Cutaway pad, when pulled, releases secondary drogue release	N/A	N/A	Cutaway pad, when pulled, releases secondary drogue release	N/A
RSL	Single Riser Lanyard LHS	Single lanyard RHS, Collins lanyard, Skyhook	Single Riser Lanyard RHS	Single Lanyard that connects to both Risers	Dual Lanyard RH & LH Side
Secondary Reserve	N/A	Can use RSL Some have ball	RSL RHS (Ball)	Dual pin, concealed running loop	LHS override handle inboard
Drogue Deflation	Non collapsing	On drogue release	Collapsing		Collapsing

Drogue Deflation

- **A collapsing drogue:** When the drogue is released, the main container opens, the drogue partially deflates, container opens then bag launches. When this occurs, the tandem pair will feel an initial acceleration due to the momentary reduction in drag. This is nicknamed the 'Trap door effect'.
- **A non-collapsing drogue:** As opposed to the above scenario, the drogue is released, container opens, bag launch occurs, canopy comes out of bag and then drogue deflates. The Tandem pair will experience a firmer opening during the initial stages of canopy deployment.

2.5 Performing a gear check

Overview to gear checks

This is a particularly critical area and demands close attention to detail. All skydivers need to develop a standard procedure for checking their own equipment and for instructors, checking other jumper's equipment. Once you have developed a system, use it on every jump and stick to it.

The key to gear checking is **routine**. Check your gear:

1. When you get it out of the loft in preparation for the day's jumping;
2. Pre-flight, before putting it on for each jump (mandatory);
3. In the aircraft prior to exit;
4. During packing (a responsibility of Packers).

Additionally, keep an eye on other jumpers' gear and notify them of any concerns. Many potentially critical incidents have been avoided (or could have been avoided) by someone else noticing a gear issue prior to exit and correcting it.

The pre-flight check

It is mandatory for the Tandem Master to perform a pre-flight check immediately prior to donning the rig. There have been Tandem fatalities which could have been avoided by a routine gear check. Make this part of your system from day 1 and never miss it!

Your Pre Flight must include:

1. AAD turned on and set to Tandem mode if a multi-function AAD
2. Reserve pin/s in place and tight. Closing loop in good condition
3. Main pin in place and tight. Closing loop in good condition
4. Drogue attachment completed correctly. Note the Sigma System has a diagram on the reverse of the main pin protector flap. Check your work against this diagram.
5. Drogue Bridal Routed correctly. This avoids a 'drogue in tow'
6. Drogue release handles are fixed in their keepers properly
7. Drogue Deployment handle accessible. Drogue packed to avoid a 'hard pull'
8. Main Riser 3-ring is correctly rigged
9. Reserve and Cutaway handles are fixed and accessible
10. RSL is rigged properly and will not foul 3-ring release
11. Altimeter, goggles, etc.
12. If you are not aware, check that the Reserve and AAD/batteries are in date.

Your course instructor will guide you to a system that works for you.

REMEMBER: The correct closing sequence of a Tandem system is critical. It is one of the major compounding factors in Tandem Fatalities. So is the lack of a pre-jump check and also is the lack of understanding of equipment function.

Take the time to understand how the equipment operates. Always revise your deployment and emergency procedures and always perform a gear check. Gear checks by another person (buddy checks) after gear-up and before emplaning are mandatory.

This misrouting of the 3-ring is called a Butterfly.

This problem is caused by poor packing and missed through lack of checks. It has caused shearing of the riser with catastrophic results.

Gear checks are imperative. Keep an eye open for these on your rig and other TI's rigs.



2.6 Conversion training

Your initial Tandem Endorsement is valid only for the type of equipment you have been examined on. Your Instructor rating will be upgraded to include the Endorsement for “Tandem”, with a sub-endorsement for that manufacturer’s equipment – and you are only authorised to jump that equipment.

If you wish to perform Tandems using other manufacturer’s equipment, you cannot just pick up the rig and go. There are often substantial differences between equipment and procedures. You must qualify for an additional sub-endorsement for that manufacturer, which requires additional examination, and may take the form of written, oral, practical and/or further examination jumps.

The nature of the conversion process is at the Examiner’s discretion, and subject to your experience and the nature of the sub-endorsement sought. Developing some experience with your primary sub-endorsement is usually a pre-requisite to adding additional sub-endorsements. Discuss any transition with your Chief Instructor.

2.7 Keeping up to date

As an Instructor, it is very important to keep up to date with equipment changes and issues. Even today, nothing is fool proof. You need to keep your finger on the pulse so that you know what’s going on.

To achieve this:

- Regularly check the manufacturer website: Companies like UPT and Strong from time to time, post information on their website concerning equipment issues, such as recommendations and mandatory advisories;
- Check the RAC’s and Service Bulletins on the APF website under ‘Rigging Equipment’;
- Ensure you are receiving and reading APF Broadcasts and other emails and the Instructor News Sheet from the APF Office. Always update your email and postal addresses with the APF; and
- Ensure you attend DZ instructor meetings. If possible, you should also attend the APF’s annual Conference, Symposium or Regional Forums.

2.8 Review Questions

1. Explain how a Skyhook and Collins Lanyard Works (Sigma Users):

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2. Will the equipment you will be using have an RSL available? Does your CI insist on or against its use? What is your opinion?

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3. Where and how do you set an AAD (the one you will be using) for a DZ of a different elevation to the airfield you are taking off from?

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4. Does the canopy you will be jumping have a double break line configuration? What will happen if you do not use both toggles when flaring?

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5. What are the common and critical wear points on a tandem system?

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6. Why is the closing of the container so critical? What can happen if this is done incorrectly?

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7. On your Tandem system, where is the drogue attached to the container? How will this affect your freefall?

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8. Does your Tandem system have a secondary reserve handle? When may this come in handy?

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9. Who is responsible for checking the Tandem rig before jumping? When must this be done?

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10. On your Tandem System, at what stage of deployment does your drogue deflate? How will this affect your deployment?

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11. Where would you find the most up-to-date RACs?

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PART 3 - STUDENT PREPARATION

Effective student pre-jump preparation is a key element for a safe and enjoyable experience for both the student passenger and the Tandem Master.

In this Part:

- Student prerequisites
- How to brief your student
- How to fit the student harness
- Instructional technique for different people
- Confirming your training with your student

3.1 Student Prerequisites

Legal Requirements

- Tandem passengers are not fare-paying passengers in the usual sense; they are students learning one method of skydiving. Each student must become at least an APF Student License holder by purchasing and completing an APF "Parachuting Contract" that incorporates the warnings and waiver. This is the same Parachuting Contract (Group Member Waiver) that all Sporting Licence holders accept annually, for every Group Member they wish to jump at.

It is not usually the Tandem Master's job on the DZ to process this, however you should be satisfied that this is completed prior to beginning training. There are personal legal ramifications of taking a non-members skydiving.

- Students must be of the minimum age defined in the Operational Regulations. This regulation can be waived on a specific jump basis only by application on the correct form to the Safety and Training Manager.
- Any students who are under the age of 18 years must have their parent or guardian's written consent. Consent must also be given on the appropriate section of the Group Member Waiver.
- Some States legally require Instructors to acquire a 'Working with Children' police check and Blue Card. DZ owners face heavy fines for non-compliance. See the APF's National Member Protection Policy for guidance.
- Students must not be under the influence of drugs or alcohol.
- Tandem descents are classed as 'Training Descents' and therefore must be made under the auspices of an APF approved Training Organisation supervised by an approved Chief Instructor. They must be made under direct supervision of an approved DZSO. Refer to Operational Regulations as the DZSO requirements differ depending on the experience of the Tandem Master.

Physical Requirements

Whilst Tandem jumping provides the opportunity for a wider variety of physiques to experience skydiving, unfortunately not all applicants who turn up at the DZ will have the suitable physical attributes to participate.

Good fitness screening during the booking process avoids this scenario, however it will only be a matter of time before you are presented with someone who does not fit the bill. If you think they lack the physical capabilities, then you should not proceed with the jump.

Things to consider:

Weight issues

- Will they be able to lift their legs for landing, especially after being in the harness for 5 minutes? Failure to do so can injure the Tandem Master as well as the student.

- Will you be able to negotiate them out of the designated aircraft?
- Will the combined weight of you, your equipment and your passenger exceed the manufacturer's specified limits? Whilst a good Tandem Main parachute may give you a good flare with a heavy load, consider how well your reserve will perform with the same load in a non-ideal off-DZ landing area.
- Do you have the experience or physical capability to control your student during the entire Jump process? Larger students require the Tandem Master to engage more physical strength in certain areas of the jump, especially for the landing flare. They also require a higher degree of management which comes with experience.
- Is the weather suitable? Nil wind conditions may be unsuitable for heavier passengers due to an increased landing speed. In some cases, windier conditions can make a jump safer.
- Light weight passengers (approx. 60kg and less) have their own issues also. Whilst they may be much easier to negotiate out of the aircraft and make flaring easier, the reduced wing loading may make a jump unsafe on a windy day. The legal maximum wind limit for a Tandem Descent is 25 knots. Sometimes it may be necessary for the DZSO to reduce this for lighter passengers.

Age Issues

- Will they be able to perform the landing position?
- Do they have any health issues such as heart conditions or other debilitating illnesses? A letter from a doctor approving the person's suitability is important for risk minimisation. Some conditions are acceptable provided they are taking prescribed medication.
- Are the weather conditions appropriate? Landing conditions can be more critical for elderly people. Remember that older people do not recover well from serious fracture injuries.

Mental Issues

- Will the student be able to follow your commands?
- Will the student be able to behave in a safe and mature manner in a high pressure situation such as a skydive?

Disabilities

With careful planning and specific modification, people with disabilities such as blindness, deafness or paralysis can successfully perform a tandem descent.

As a new Tandem Master, it is important to ease yourself into the role. As you gain more experience, you will be able to take more challenging students. Never feel obliged to take someone that you are not comfortable with. Follow these simple rules:

- Know your limitations and always operate within them; and
- If there is any doubt regarding safety, then there is no doubt that you should decline the jump.

Further reading on disabilities appears in a later Part.

3.2 Student Briefing

A Tandem jump is not an amusement park ride. The student must perform certain tasks and behave appropriately in order for the jump to meet both safety and customer expectations. A good briefing is therefore important and should not be skimmed over (never be in a hurry). 'Poor preparation equals a poor performance'. Also, in the event of an injury, an insufficient brief can open doors for litigation.

A Tandem jump is classed as a training descent, and therefore there are requirements set out in your Group Member's Training Operations Manual (TOM) as to what is to be covered in the briefing. In some

cases, the Chief Instructor of a Group Member may have applied to modify some or all parts of their Group Member TOM. You are required to follow the TOM of the Group Member you are instructing at.

See Part 12 on Risk Management for the TOM Tandem Brief Requirements.

Here is an example of a lesson plan that provides a sufficient briefing and also covers the requirements of the TOM.

LESSON PLAN: Tandem Student briefing

Aim: To equip the student with the knowledge and skills to perform a successful Tandem jump.

Training Aids: Pictures/Video of correct freefall position/landing position; Tandem Rig/Student Harness; suspension device for landing practice; surface suitable for comfortable kneeling.

Introduction and Welcome

1. Introduce yourself and welcome the student to your organisation. Ensure Waiver/Pink card has been explained and completed.
2. Ask how they are feeling about their jump.
3. Explain that it is very normal to experience fear/nervousness prior to the jump, and that this emotion will change to exhilaration after the exit and that they will have fun.
4. If you suspect the possibility of or notice a disability, ask them if they have any condition that you should know about which may be relevant to the jump.

You will develop your own repertoire for your introduction. Your aim should be to begin to relax your student, and get a feel for how they need to be treated to bring out a good performance.

The Briefing

1. General Safety:

Begin your brief by laying down some basic safety rules.

Rule 1: "For your safety, you must follow all of your instructor's commands".

Rule 2: "Do not touch anything unless asked to".

In a friendly way, you can let them know that you are boss, that there is a serious side to what they are doing and that they need to be proactive to ensure their safety and that of others.

2. Equipment:

With a rig/student harness, briefly explain the important components of a Tandem system. This is a great opportunity to install confidence in your student. Mention the presence of an AAD, the reserve canopy, the 6-monthly reserve inspection, the load capacity of the student harness connectors.

3. Aircraft procedures:

- (a) Approach aircraft from behind. Stay with your instructor at all times.
- (b) Outline seating arrangement, importance of minimal movement and how to use Single Point Restraints.
- (c) Emergencies: Brace position relevant to your aircraft, follow Instructor's commands promptly, possibility of a lower exit.
- (d) Gearing-up (student connection).

4. Exit:

- (a) How to climb out (remind Student on things not to touch).
- (b) Exit Position (arms crossed, head back etc)
- (c) Freefall position (use pictures or demonstrate, allow them to demonstrate and practice this skill whilst kneeling or lying down)

5. Freefall procedures:

- (a) Explain what to expect (feeling, duration)
- (b) Maintain Arch position (Build in a reminder signal for students who forget to arch. A tap on student's leg by Tandem Master or a visual signal of two fingers (legs) works well.
- (c) Don't grab Tandem Master's hands etc.
- (d) If getting photography, keep head back for best results.
- (e) Explain feeling of deployment

6. Emergency Procedures:

- (a) Follow commands from instructor immediately
- (b) Body position: arms crossed, head back, arch.
- (c) What to expect

7. Under Canopy:

- (a) Removal of goggles unless unsuitable.
- (b) Advise that hip connectors will be loosened
- (c) Ask student to make you aware if they experience discomfort as it can be fixed with some adjustment.

8. Landing Position:

It is a requirement of the TOM that a student pass a practical assessment of their ability to perform the correct landing position. If necessary, this can include suspending them whilst they are wearing their student harness.

Whilst suspended:

- (a) Explain the possible harness adjustments that can be made to make them more comfortable (see Student Harnessing).
- (b) Check that the harness is fitted correctly and is not loosening by itself. This can happen when the harness gets older and thus will need to be grounded until fixed.
- (c) Get student to demonstrate landing position.
- (d) Explain and emphasise the consequences of lowering legs on landing (broken leg, etc.)
- (e) This is also a good time to confirm the freefall arch position.

Confirmation

It is important to confirm that your student has understood your instruction, especially the 'fundamental' must-knows. Ask your student:

1. To demonstrate freefall position (you can do this in suspended harness)
2. To demonstrate landing position (you can do this under canopy just after opening)
3. What is meant by your signals (tap on arms/tap on leg)?
4. In an emergency, who do you take instruction from and what must you do?
5. What must you not do at any stage of the jump? (touch anything)
6. Do they have any questions?

Your briefing will develop over time in terms of efficiency and effectiveness. It is important not to skip any of the 'must knows', no matter how busy your operation. However, it is important not to over-train people by covering the 'could knows'. The aim of your briefing should always be to:

- Provide the necessary information and skills so the student can perform a safe and enjoyable skydive.
- Install confidence in the student
- Tick the boxes that the TOM requires you to.

3.3 Student Harnessing

To state the obvious, good harnessing technique aims to ensure the security and comfort of the passenger. The Strong and Vector/Sigma student harness fitting guides appear as appendices to this manual (Appendix C). These are an excellent guide. Harnessing techniques tend to vary slightly between instructors. It is imperative though that you work within the manufacturer's guidelines. There is no guide available for Racer and the Atom guide can be found in the Owner's Manual.

Some things to be mindful of when harnessing your student

1. For student comfort and gear preservation, it is best to perform harnessing in a shaded area.
2. Show respect for the equipment in front of your student. Do not throw/drop the harness, rather place it on the ground ready for the passenger to step into. For gear preservation, avoid letting the hardware come into contact with concrete, etc.
3. For ease and comfort, loosen all adjustments prior to putting on.
4. Always explain to your student what you are doing and why.
5. Do not linger when doing up harness around sensitive body parts. Make eye contact as often as possible to make student feel comfortable. Allow passenger to make adjustments if possible.
6. Be appropriate and professional when touching the student during this process.
7. Mention the high load bearing capacity of the harness connectors to make the passenger feel at more ease.
8. Student fatalities have occurred due to poor harnessing. A student of large body size fell out of a harness on opening, due to improper harnessing. Always follow manufacturer's guidelines and double check your work!

Comfort Adjustments

Explain to your student that the harness is supposed be comfortable, however during the jump, it can move into a position that is not. Ask your passenger to let you know if they experience any discomfort under canopy as there are adjustments that you can make to alleviate this.

Whilst lifting legs into a sitting position, the Leg straps (from the back of the leg) can be pulled down slightly towards the knee so that the passenger is sitting in the harness, rather than hanging.

In the case of plump students, this should be done regardless as it can prevent the loss of blood flow through the femoral artery which causes faintness, loss of consciousness and sickness. It also makes it easier for the student to assume the correct landing position.

For females, the chest strap can be lifted (by the passenger) over the top of the chest so it is not cutting into the chest.

Now take the time to read the Manufacturers Student harness guide for the System you are using. Your Tandem Course Instructor will go through harnessing with you also. The UPT and Strong harnessing guides are provided (see Appendix D)

Practice harnessing a range of body shapes and sizes until you are comfortable with the process.

3.4 Instructional Technique

One of the challenges of being a Tandem Master is the need to identify and manage different personalities. Your job as a Tandem Master is to provide ALL of your students with a safe and enjoyable

skydive. To do this it is often required that you vary your instructional approach so as to get the best result.

Nervous students

Most students are nervous. Some though are extremely nervous and will require a greater amount of coaching to get out of the plane. You can establish whether they fit into this category by:

- watching for potential indicators on the ground: undue stress, nervousness, uncertainty, a significant change in mannerisms; and
- asking them how they are feeling at the start of your brief and during the ride to height.

Not everyone will confess to this though, so it is important to monitor your student's body language from when you meet them up until preparing for exit.

Good instructional technique in this situation can mean the difference between a very nervous student achieving exit and a very nervous student refusing to jump, only to land in the aircraft disappointed and embarrassed. Here are some tips:

- Provide positive opportunities for the student to express anxiety and receive a sympathetic response. Provide honest replies to student's concerns;
- Explain that it is normal to be nervous prior to jump, but they will really enjoy it once they have exited. Talk about how rewarding it will be once they land. 'Big steps = Big rewards!'
- Inform them of your expertise and explain the safety features of the equipment.
- Put the nervous passenger in first exit position, as watching others exit before them can often be enough to push them to 'refusal'. The trade-off though is that with some aircraft, if the first tandem does not exit, it can be difficult to get the others out of the plane.
- In the plane, right up until exit, keep talking your passenger through the process. You need to keep their mind focused on the positives. Ignoring them for too long will allow them to slip into a negative zone. Keep your conversation friendly and avoid inappropriate conversation or crude humour.
- Be wary of teasing a nervous student with jokes regarding safety. That's not what they are paying for. Do whatever you can to install confidence.

Young students

What to watch out for with younger students:

- A lack of appreciation for the dangers of what they are doing. Remind them they will be required to follow your instruction to avoid injury.
- Adolescent's communication skills and confidence are still developing. They can be more likely to pretend they have understood something when they haven't. Place greater emphasis on confirmation during your brief on the 'must knows'.

Elderly Passengers

- In some cases, older people's ability to learn has diminished. Without being patronizing, you may need to take things a little slower.
- Older people tend to be the ones who ask lots of questions and over complicate matters. Try and keep them focused on the 'must knows'.
- Take into account their lack of flexibility and overall physical condition during the whole process.
- Good Instructional technique will help the elderly to perform a tandem skydive suitably. It is advisable to gain some experience before taking elderly people.

3.5 Review Questions

1. What paperwork must all students complete prior to their first jump?

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2. What is the minimum age requirement for a Tandem student?

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(a) How can this requirement be waived?

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(b) What is required when a Tandem student is under the age of 18 years?

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(c) What class/type of descent is a Tandem descent? What requirements does this entail?

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(d) What ratings/experience must the DZSO have, to supervise your first 50 Tandem descents?

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3. What is your opinion on size limitations regarding passengers and what are the potential problems?

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4. Why is the back horizontal strap, when fitted on the student harness so important? How should it be fitted?

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5. What are the key points which must be legally covered in a Tandem student briefing, as per the TOM and Op Regs?

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6. During ground preparation, what can you do to ensure a safe landing?

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PART 4 - AIRCRAFT AND EXITS

In this Part:

- Safety aspects
- Aircraft emergencies
- Use of Single Point Restraints
- Connecting student
- Pre-exit Brief
- Spotting
- Exits
- Emergencies and Unusual Situations.

4.1 Aircraft Safety and Working with the Jump Pilot

Prior to approaching aircraft

- Ensure you have completed your 'Pre Jump Gear Inspection'. Refer to the Op Regs regarding pre-jump inspection.
- Check again that the student harness is fitted properly. (They can loosen over time and your student may have made an adjustment.)
- Ensure you have all of your ancillary equipment.

Approaching aircraft

- Always approach from the rear or the side of the aircraft.
- Keep your student 'on a short leash' and out of harm's way. Brief them to stay next to you at all times. Never assume they have 'aircraft sense'.
- Remind them of the dangers of the propeller. Warn them to mind their head on wings etc.
- Do not enter an aircraft whilst refuelling is in progress. It's against the law.

Aircraft Loading and Mixed Loads

Key points:

- The aircraft must be loaded within its weight and balance limits. The pilot can assist with this.
- You must use restraints.
- Your student should be in a position to be connected-up to you rapidly in case of an emergency.

Briefing the Pilot:

For most Tandem operations, the Pilot will have been briefed for the day's operations and prior to each load by manifest or the DZSO. In this situation, an experienced Jump Pilot will not normally require a specific briefing from you. However, where the Pilot is new to your operations, or you have particular requirements for your passenger or descent, be sure to communicate your needs so he/she can take these into account.

Use of Single Point Restraints (SPR):

- Please refer to Operational Regulations regarding the use of restraints in aircraft.
- Failure to use these in large aircraft has resulted in multiple fatalities in forced landing situations when those at the back of the aircraft are slammed into those at the front, crushing them. Restraints can also prevent the occupants sliding towards the rear and causing the aircraft to stall and crash.
- Buckle up for take-off, landing and flight below 1,000 feet.

- Develop a routine, possibly involving signals, for disconnecting SPRs once you've reached minimum height for their release. There have been serious incidents (and injuries) where Tandem Masters have been hung-up in the door at exit for failing to disconnect their SPR. One suggestion is for a procedure where the Loadmaster or Pilot calls "SPR's off!"

Mixed Loads:

Consideration should be made as to what types of different jumpers should be allowed on the same loads. Have some discussion with your CI taking in regards the type of aircraft at your DZ and the equipment being used. Consider if you would have Static-line students on the same load as Tandems and what some of the issues that could occur might be.

Take-off and Climb

- Check that you or your equipment is not in a position to interfere with the aircraft controls.
- Observe that your student does not interfere with any equipment.

Jump Run or Preparing for Exit

- Your Tandem system is bigger than your sports gear. Be aware of your new extremities to ensure good handle and pin protection whilst moving in aircraft.
- Observe that your student does not interfere with any equipment.
- Ensure that you and your passenger are no longer connected to a single point restraint.

Climb-out

- Prior to opening the in-flight door, ensure the pilot, you and other Tandem Masters on the load are ready.
- Be vigilant of pin and handle protection.
- Watch your passenger's hands: This is one time in particular when they feel the need to grab onto things!

4.2 Aircraft Emergencies

Action Planning

Aircraft Emergencies, can, do and have happened. You need to be ready with a quick response to any given situation. Do not wait until there is trouble to devise a plan.

Some things to keep in mind when considering your action plan:

- A Tandem canopy (main or reserve) can take up to 1,000 feet to open; exiting below 1,500 feet is extremely dangerous.
- The AAD is set to fire the reserve at around 2,000 feet. Thus, for an exit below 4,000 feet, activating the reserve immediately will avoid a main/reserve entanglement. Be aware the AAD will not be active unless it has reached its minimum altitude arming height. This height varies depending on the make and type of AAD used. Consult the manufacturers manual for the correct arming height.
- In a catastrophic aircraft failure (e.g. aircraft on fire, in an uncontrollable spin or any situation where landing in the aircraft is not survivable), no matter what height you are at, an emergency exit will more than likely be your only chance of survival.
- Most planes can glide and land successfully without engine power. Sitting still and maintaining the current weight/balance of the aircraft assists the pilot greatly with the controllability of the aircraft. Obey pilot direction.
- In some situations, you may not have time to fully connect and/or tighten the student harness. It is acceptable to use just the top two clips if time is not on your side. In this

emergency situation, it is critical that you wrap your legs around the front of the passenger's legs. This will stop the top clips acting as a hinge for the passenger to rotate around, creating problems for your necks and stability.

- If you are nearest to the door, your efficiency will give others a better chance of survival.

With these considerations, here is a suggested action plan for aircraft emergencies. Discuss the action plan for your DZ with your DZSO and CI.

Catastrophic failure

Above 4,000 feet:

- Connect passenger, exit quickly, deploy drogue, pull drogue release after it inflates.

Below 4,000 feet:

- Connect passenger, exit quickly and deploy the reserve immediately.

Loss of power (Aircraft controllable)

Above 4,000 feet:

- Wait for instruction from the Pilot in command;
- Connect passenger, discuss options with Pilot. If exiting, exit quickly, deploy Drogue, pull drogue release to deploy main canopy.

Below 4,000 feet:

- Check with the pilot in command for instructions;
- Reconnect Single Point Restraints, minimize movement and assume the brace position. Re-brief your student on disconnecting the Single Point Restraint.
- The "brace" position when facing the rear of the aircraft is different to a forward facing situation. Slide towards the front of the plane as far as you can, and have your student lean back, placing their head back as far as possible. Attempt to minimise the flailing of arms and legs – a common cause of injury – upon touchdown. Ensure all loose items in cabin are secured.
- Once safely on the ground, exit aircraft promptly and move your passenger safely away from the aircraft.

4.3 Connecting your Student

Naturally the process of connection has to be performed perfectly without fail for every tandem jump you make. To ensure this, **YOU HAVE TO HAVE A SYSTEM** which is followed religiously for each and every tandem!

As you gain experience, the time it takes you to connect will become shorter. So in the beginning, allow yourself a bit more time so you are not rushed. As a rough guide, you should begin your connection process 2,000 feet prior to exit height in a Cessna 182, and 4,000 feet in a quicker turbine aircraft.

Pre-connection Position

Prior to assuming the connection position, check that your leg straps are firm and even, snap locks are fastened properly, all handles are in place and your chest strap is correctly routed. Get a pin check from another instructor if you feel you need one. Check that the horizontal back strap on the student harness has not slipped down below the buttocks.

There are different ways of positioning yourself and your student to begin connecting your student, commonly sitting, kneeling or standing. These depend on the aircraft type, your position in the plane and personal preference. Your course instructor will provide you with the best options for your circumstance.

The key here is to have your students harness hip junction close to your hip connection rings. This allows you to comfortably tighten the side webbing connectors. This reduces any movement the passenger can make independently of you once in freefall.

Connecting-up

1. Explain to your passenger what you are about to do.
2. Connect side adjuster clips to your harness connection rings. Ensure that release levers are fully depressed and in the latched position.
3. Tighten the side adjuster webbing to a firm but comfortable length. Both sides should be even lengths. Stow excess webbing using the elastics provided.
4. Connect top snaps.
5. If necessary, further tighten the vertical shoulder webbing. This will help avoid the student hanging lower than you under canopy which is undesirable for landing. Ensure the excess webbing is secured.
6. Confirm with your student that you have them connected.

After starting your system, continue until it is finished.

Pre-exit Check

Part of your training will be to develop a Pre Exit Check System. You will use this system for the rest of your career. Your course instructor will help you with this.

Some instructors like to assign a number to each thing they check. They end up having an 11 to 13 point verbal check. Some instructors check each part and verbalize the name. Whatever your system is:

- Stick to it
- Never miss it
- Start again if you get distracted.

There have been incidences in Australia of Tandem Masters failing to connect the tops snaps prior to exiting. Such an incident should result in the instant and permanent loss of your Instructor Rating.

Check:

1. Side clips are connected and closed properly
2. Top clips are connected properly.
3. Leg strap snaps if present on student harness.
4. Check all handles are housed properly and accessible. Do this in the same order you would use them in freefall.
5. Check your altimeter is functioning.
6. Check your passenger goggles are fitted correctly.

Pre-exit Brief

Now that you are connected and ready to go it is a good idea to reconfirm with your student, a few of the basics before the jump:

- Talk your student through the climb out procedure and the safety aspects.
- Remind the student of the importance of the arch for exit and freefall.
- Ask your student how they are feeling. Provide some support if necessary. Most people are extremely nervous at this stage!

4.4 Spotting

Landing back at the designated landing area is even more important for a Tandem. 'Landing Off' exposes a Tandem to more risk due to lack of catchers, uneven landing surfaces, turbulence and other landing hazards.

Your spot is your responsibility. Never assume the pilot has got it right, nor the person getting out before you.

Considerations for spotting Tandems:

- You will be under canopy by 4,000 feet. Wind directions and strength can often vary at different levels throughout your descent. The conditions at 4,000 feet, can be completely the opposite at 2,000 feet. You need be aware of the wind conditions at all levels when determining your spot. You need to be on wind line.
- You may have wind strengths higher than your canopy's natural airspeed at opening height, resulting in backward canopy flight (especially with light passengers). You need to lengthen the spot so that you are still upwind by the time the wind has dropped off.
- During 'drogue fall', Tandems are quite susceptible to 'freefall drift' when there are strong upper winds.
- Look after your cameraperson. He/she can't open as high as you nor glide as far as you.

4.5 Exits

Minimum Exit Height

The minimum exit altitude is to be no lower than 7,500 feet. This is also the minimum exit altitude recommended by United Parachute Technologies.

Use a Dive Exit

The United Parachute Technology's Tandem Manual instructs two exits, the dive exit and the poised exit. Racer suggests crouching, sitting, standing and even back-out for specific aircraft.

Note on Poised Exits:

A poised exit is where the student assumes the correct freefall position prior to exit, creating the benefit of a perfect entry into freefall. It admits though that the poised exit exposes a Tandem to risk of premature deployment and has caused fatalities in the past.

This would definitely be prevalent for a Cessna 182 exit. A poised exit from a tail gate however would not pose any more risk than a dive exit from the same aircraft. However, it has been demonstrated that suitable alternatives for the poised exit do exist and involve less risk and complication.

POISED EXITS ARE NOT RECOMMENDED BY THE APF!

This Guide recommends the dive exit as the modern and safest way of exiting Tandem from most aircraft. Thorough training in body position for exit will assist in achieving a successful exit.

Aircraft Door Configurations

Skydiving aircraft used in Australia can be categorised under three types of door/exit configuration:

1. Side Door: Cessna Caravan, Cresco XL 750 and 500, Cessna 206 Rear door, Navajo, Air Van, Beaver, Islander
2. Under-wing Wheel Strut: Cessna 182, 185, 206 front door
3. Tail Gate: Sky Van

Exit Safety

1. Double check that you are both disconnected from your Single Point Restraints.
2. Whilst moving toward and setting up in the door, watch your student's hands: they will be in 'overload mode' and keen to occupy their hands.
3. Protect your handles whilst moving towards the door, climbing out and exit launch.
4. Always monitor and stay in control of your student.
5. Check your drogue handle immediately prior to launch.

Side Door Exits

1. Set up towards the front of the door, not the side closest to the aircraft tail. It is easy to hit the back end of the door on exit. Ensure you have a clean launch for you and your student.
2. Some instructors like their student to place feet under the fuselage as it creates a body position closest to the desired exit arch position. Others are happy with their feet on the step if one is present. You can kneel, sit or crouch. Whichever works best for you? Maintain handle awareness.

Wheel Strut Exits

1. Be careful of aircraft instruments and controls on climb out.
2. Ensure the student's feet are not hanging on nose-side of wheel strut. They should be placed on the step.
3. Hold your drogue handle as you begin your launch for the part where it passes the door's edge, to prevent premature deployment.
4. This climb-out requires more from your student than any other. Instruct them and maintain control so they do not touch things they shouldn't.

Tail Gate Exits

This is possibly the easiest and most rewarding exit.

Facing out of the plane, place your student in an arch. Step forward into freefall, keeping your legs straight out and below you, remaining in a standing position. Airflow will rotate the Tandem pair backwards; as you see the ground, perform a hard arch to stabilise the pair prior to deploying the drogue.



Dive exit: Note that the Tandem Master's good position will overcome the student's poor position.



Dive exit with uphill turn for presentation.

Exit Procedure

1. Set-up in door, following the safety guidelines mentioned above.
2. Instruct student to cross arms or grasp harness (each side of chest strap) depending on your preference.
3. Instruct student to place head back. If they do not respond to the verbal cue, perhaps they cannot hear you: a gentle touch on the forehead with the verbal command “Head Back” usually works. Be aware that some people, especially the elderly, have minimal range of neck movement. Never apply force to someone.
4. Launch from the plane. Like any exit, the key to success is good presentation to the relative air and a good arch. Don’t get lazy or complacent; no manufacturer recommends using the drogue as your primary stability tool. Poor presentation and poor student body position can lead to dangerous situations like ‘side spins’ (covered later).

4.6 Exit Emergencies and Unusual Situations

Safety and Unusual Situations

Situations in which the student's actions are not appropriate to their training or in which the necessary technical or environmental requirements are not suitable for skydiving are termed Unusual Situations.

An unusual situation can occur during any of the five phases of the jump, which are:

- Unusual Preparation Situations;
- Unusual In-flight Situations (including climb-out);
- Unusual Freefall Situations;
- Unusual Canopy Control Situations; and
- Unusual Equipment Situations.

Not all the unusual situations listed below fit neatly under this Part 4’s heading of Aircraft and Exits; however as they can occur during any phase of the jump, some non-aircraft/exit topics have been included here.

Adverse Weather

When adverse weather threatens, it is recommended that Tandem operations go on hold or allow an experienced load to go ahead, while watching the rate of change of conditions. If a large airport is nearby, you can check with aviation weather for an accurate forecast and ask the pilot for an opinion. Remember that poor weather conditions can have a negative effect on your student’s experience and have a significant detrimental effect on their capacity to perform as required.

Don’t push the weather and don’t feel pressured by your organisation to jump when you don’t feel it will be safe.

In 2015, a load of seven Tandem Masters were warned by their pilot of an approaching storm front, but they took the risk of continuing with the sortie. On jump run, they (and their students) were confronted with hail bouncing in the open door and a major destructive storm only minutes away; yet they still chose to exit into these unfavourable conditions, including rain, hail, cloud and winds up to 53 knots. Three Tandems landed in the water (chest deep) and two in the suburbs; and injuries included bruising, bleeding and breaks and one was serious.

Whilst incidents like this may involve many parties, the bottom line for you must be your safety and that of your passenger.

If there are storms on their way, stop jumping with students. If it is getting dark, stop. In skydiving as in other sports, it always takes longer than you think and by the time you are dispatching, it will be either dark and/or very windy. Both are bad situations for students.

Each training organisation should have a set of standard procedures for each DZ which form part of the Group Member’s SMS. These may include guidelines on weather, maintained for local conditions and

discussed with all staff. Your DZ should develop a chart like this example:

Problem	Solution
High wind	Check the forecast, wait call aviation weather,
Low cloud	Ceiling check, experienced load
Refusal on jump run	Discuss, try again seat in rear of aircraft, bring down

Equipment

If a reserve is out of date, return it to the equipment room and tell the person in charge of gear; if another type of deficiency is suspected, check with a rigger or the DZSO.

Serious Doubt at Aircraft

If at the aircraft, the student expresses the feeling that they are not ready, you may try to positively reassure them, highlighting your assessment that they will perform satisfactorily. However, it is recommended that you allow them to wait for a later load, rather than talk them onto an aircraft ride and then experience a refusal at altitude or worse a sick student.

Negative Response to Another Skydiver's Accident

If an accident occurs, it is best to allow the experienced jumpers and those among the students who display more confidence to proceed with their jumps, rather than trying to convince a doubtful student that nothing else will go wrong. Watching subsequent successful jumps is stronger encouragement.

Aircraft Breakdown

If there is any doubt about the serviceability or reliability of the aircraft, it should be sent for a test flight first, then possibly with a load of experienced jumpers, rather than with a group of student parachutists aboard (see Aircraft Emergencies).

Unusual In-Flight and Climb-out Situations

Student Sick

If your student experiences dizziness or light headedness, they should close their eyes, put their head down and/or breathe deeply and deliberately. If the aircraft is performing steep turns, have the pilot fly wings level for a while.

There is the chance that your student may want to or must vomit. If this happens, you could have your hands full! It is best to recognize when this is going to happen and take action. Have an airsick bag (or glad kitchen catcher bag) on board your aircraft and use it. If not, zip down the student's jumpsuit and pull up their shirt like a bowl. Once they are finished, have them hold up their shirt and zip up the jumpsuit.

Student Legs Asleep

If your student's legs go to sleep, have them try to sit up on their knees or in a position to facilitate the best circulation of blood to that area. Also check to see if the leg straps are tightened excessively and loosen if necessary.

Dealing with a Refusals

It is your responsibility to be prepared, if a student refuses to leave the aircraft. If you do enough Tandem Jumps, you will eventually experience a situation which has potential to become a refusal. In every case, how you manage the situation will determine the outcome.

Refer back to 3.4 Instructional Technique, Nervous passengers.

If your student, prior to exit says "I don't think I can do this", then there is opportunity for you to talk them around. You may even take plane around (depending on the operation) to give yourself a bit more time.

If however your student uses any terms that can be interpreted as: “I don’t want to do this” or “Don’t make me do this”, then you must abort the jump and if necessary, take the plane down. If you force someone out of the plane and into freefall and a subsequent injury occurs, there is greater recourse for litigation!

If the shuffle is not possible or necessary, then landing with the load may be the only option. Put restraints back on and reassure them for the flight back down. The pilot should not bring the aircraft down as fast with people on board. Once landed, make sure that they get off the aircraft by you physically escorting them off the aircraft and to the hangar safely, and see that the gear is returned.

If you are outside the aircraft and then you experience a refusal, then you must make the decision as to whether it is safe or not to climb back in. This is a very unlikely situation. Almost all refusals occur prior to climb-out.

A Tandem Master that is proactive in dealing with passenger nervousness, apprehension and fear, will experience very few refusals in their career.

Harness Webbing (or other) Snagged on Aircraft during Exit

Avoidance is the obvious remedy to this extremely dangerous situation. Make sure:

- you disconnect your Single Point Restraint;
- you make sure you and your student are clear of any possible snag points in the door area prior to exit; and
- you get a strong positive launch to avoid coming in contact with any part of the aircraft.

Carrying a hook knife is not a mandatory requirement and are not provided by all DZs. However, in the situation of being hung up under a plane, it may be your only chance of survival. It is highly recommended that you always carry a knife capable of cutting harness webbing such as a hook knife. The knife should be kept in an accessible location. On the back of the student harness or in a purpose built leg pocket of your jump suit are popular options for Tandem Masters.

Premature Bag Deployment

There have been several reported cases of Premature Main Bag Deployments during climb out. If you notice your main bag fall out of the plane during climb out: Exit immediately, deploy drogue. You may or may not achieve main deployment. If not, Cutaway main, deploy your Reserve.

Remember that the correct handle sequence procedure is critical. The Drogue must be pulled first. This situation would undoubtedly be one of high stress. Regular mental rehearsal of your response to situations like this will greatly improve your performance.

Good pin and handle protection during climb-out will help avoid such a problem.

4.7 Review Questions

1. Describe the manner in which a student must be secured in the aircraft.

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2. What should you ensure before opening the aircraft door in-flight?

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3. Discuss with your CI the DZ accepted Aircraft Emergency Procedure for: Catastrophic failure above 4,000 feet and below 4,000 feet; Loss of power above 4,000 feet and below 4,000 feet.

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4. Discuss with your course trainer your pre-exit check. Describe this:

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5. Who is ultimately responsible for your spot? What are the special considerations that Tandems present in relation to spotting?

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6. Name 3 safety considerations whilst your student moves towards the door and climbing out:

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7. The drogue should not be relied upon to achieve stability. What can you do to achieve a stable exit?

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8. Describe your reaction to a premature bag deployment on climb out, where the bag has fallen out of the aircraft:

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9. What can you do to avoid refusals? At what point do you accept the refusal?

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10. Discuss with your course trainer how you would deal with adverse weather conditions.
Describe how you would deal with pressure from your CI/DZSO to go up regardless:

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PART 5 - FREEFALL AND DROGUE FALL

We commonly use the term “Freefall” to describe skydiving. A freefalling Tandem pair will accelerate to a higher velocity (potentially between 280 and 400kmh) than a freefalling individual (180 to 220kmh). The higher speed is known as “Tandem Terminal”, and the drogue is used to reduce the speed back to that with which we are more accustomed. Tandem freefall with a drogue deployed is thus referred to as “Drogue Fall”.

In this Part:

- Safety aspects
- Drogue deployment
- Freefall sequence
- Deployment
- ‘What could possibly go wrong?!’

5.1 Safety Aspects

Drogue deployment

If the drogue cannot be deployed, then the Main cannot be deployed (see Part 8 Emergency procedures for scenarios and responses). A good positive Drogue throw into the clear air is required to ensure inflation.

Handle checks – the “Circle of Awareness”

These should be performed shortly after drogue deployment and are mandatory for every Tandem jump. It ensures your handles will be available when it comes time to use them. It is obviously better to find out earlier than later that a handle is floating or concealed. You then have time to find it.

Your Handle Checks, like your pre-exit checks, should be carried out in order of deployment to reaffirm your deployment drills.

Height Awareness

There are lots of things that can distract you during tandem freefall: Interacting with a camera flier, Hand Cam, Your passenger, etc. As you would be aware, it generally takes the compounding of 2-3 mistakes/problems to create a serious accident. Loss of height awareness is commonly the first mistake that contributes to a fatality. If for some reason you have lost height awareness (perhaps your altimeter appears to be faulty) then deploy immediately.

Employ other methods to remain height aware. Take note of cloud base heights on the ride to altitude. Study and learn what the earth looks like in freefall at main deployment height. You can also use an audible altimeter in addition to a visual altimeter.

ALWAYS REMAIN HEIGHT AWARE!

Be aware of the difference between Drogue fall and Tandem Terminal (no drogue) Speeds

A stable tandem pair without drogue deployment will take approximately 18 seconds to reach Terminal Velocity (180 MPH/280KMH approx.) During Drogue Fall, a tandem pair will fall at approx. 120 MPH/185 KMH. There is a big difference here. You need to be aware that in high speed emergency situations such as ‘No Drogue’, ‘Deflated drogue in tow’, or any cutaway, you have significantly less time to perform procedures than on a solo jump at the same height. The AAD opens at a higher altitude as well. Additionally, more wear and stress is placed on the drogue if deployed at Tandem Terminal speed; and whilst your Tandem reserve is designed to cope with opening at that speed, your main is not.

Monitor your students arm and hand placement

Always keep your arms and hands clear of your students. Students like to grasp things for security purposes. A possible scenario is an ‘arm lock’. Here the student places their arms over the Tandem Master’s arms in a way that can make it very difficult for the Tandem Master to release his/her arms.

This has happened to many Tandem Masters and it must be noted that smaller passengers are just as capable of a disabling 'arm lock'. The best cure for this is prevention. Immediately pull away as soon as your passenger's hands or arms begin to engage yours. If a lock occurs, use whatever means necessary to gain use of your hands, so that you can deploy your main.

Check your spot in Drogue Fall

Observe any freefall drift. Open high if necessary. Scan for other aircraft/canopies that may be underneath you.

Drogue Release/Main Deployment

Refer to Operational Regulations (Part 11). The minimum open height for a Tandem Main is 4,000 feet AGL. A minimum drogue release pull height of 5,000 feet is generally required to achieve this. Some canopies take longer than others to open and will require a higher pull height. You should locate your handle before you get to your pull height. For novice Tandem Masters, it is recommended that you aim to be open 500 to 1,000 feet higher than the minimum. This will allow more time to deal with emergencies and your procedures under canopy.

5.2 Drogue Deployment

When to deploy

The drogue may be deployed at any point during freefall; from shortly after exit to after Tandem terminal is reached. Considering the quick acceleration to tandem terminal, it is recommended that stability is achieved, and the drogue is deployed in the first five seconds of freefall.

Your priority is to deploy the drogue when in a stable, belly to earth position. As a Tandem Master, your freefall skills should be at a level which allows you to achieve this easily. When deploying the drogue from any other position, you risk an entanglement with the drogue. Deploying the drogue to gain stability is not acceptable. If you routinely require the drogue to gain stability, then you should simply not be doing Tandems.

Tip: Don't rush!

Novice Tandem Masters have a natural keenness to get the drogue out as soon as possible. In doing so, they bring their right arm in for the pull almost immediately after exit. Resist this temptation as this creates instability. Use both your arms to control your entry into the relative air. Build up some speed and when you feel like your stability is 'solid', then deploy.

How to deploy

1. Locate. Grip. Locate drogue handle and grasp firmly using proper technique.
2. Throw. Pull drogue from pouch and throw aggressively to your side at full arm extension.
3. Release immediately once forward of the line of your shoulders.
4. Check. Watch drogue inflate over your right shoulder.

Like a pilot chute throw, your focus here is to avoid the drogue being caught in your burble or entangling with you or your student.

5.3 Drogue release and Main deployment

Activate the drogue release to deploy main as per the manufacturer's procedure set out in the user manual.

If for some reason you are falling at tandem terminal when the drogue is thrown, where possible ensure your speed is decreased before deploying the Main Canopy.

It is recommended to use the secondary drogue release from time to time as you may find yourself in a situation where you need to use it.

(Refer to Equipment Part 2)

Depending on your equipment, you will experience either the trap door effect (collapsing drogue) or normal opening shock (non-collapsing drogue). If you pull the release handle completely and do not feel any sensation, then your drogue has failed to release. Pull the secondary drogue release immediately.

This is a critical time for awareness. If an emergency occurs, such as a bag lock or a streamer, your speed will increase rapidly. Maintain altitude awareness and exercise emergency procedures promptly.

Emergencies during this part of the jump will be covered in more detail in the Emergency Part.

Control of the Canopy opening will be covered in the Canopy Control section.

5.4 Freefall Sequence

Here is the basic freefall sequence that you should follow:

1. Exit and Gain stability
2. Deploy drogue
3. Check that drogue is inflated
4. Signal Student to bring arms out into box position (normally a tap on the arms)
5. Complete Handle Check (as per safety brief above)
6. Check spot and for traffic
7. Monitor Student and height awareness throughout descent.
8. Release drogue (as per safety brief above).

5.5 'What could possibly go wrong?'

Unstable exit

Even when you arch and do your best to present, instability can occur if your passenger is very de-arched. This is particularly the case with taller 'lanky' people. They have more control surface area (arms and legs) and therefore have a greater influence on stability. Brief these people accordingly by highlighting the need for them to perform well on exit.

In many cases, a de-arched student will assume the correct position shortly of their own accord, assisting with stability and in turn presenting you with a 'window' of opportunity to deploy the drogue. In some cases, they may not. In most of these cases, it is still possible to use your skydiving skill to control the exit, but in others, you may find yourself either on your back, on your side, or tumbling.

Every situation is different. Here are some tips to gain stability:

- Yell in the student's ear: 'Arch'
- "Leg Lock": Wrap your legs around theirs and pull their legs back with your legs.
- Tap them on the legs to signal 'legs back'. Note that this can only work if it has been previously briefed.
- If in a back to earth position, relax, try the above, and assertively attempt to roll over.
- Wearing a jumpsuit with a bit more drag will give you more control. This is recommended for novice Tandem Masters.
- A little patience can sometimes go a long way. Students will often remember their job once the initial shock of exit passes. You cannot wait forever, of course.

Only throw the drogue for stability as a last resort.

If you have tried everything possible to get yourself belly to earth and are still unstable then you may have to deploy the drogue:

- Where possible deploy when drogue handle side facing up

- If drogue handle is facing down, then throw drogue behind container to reduce risk of drogue contacting body parts.
- Be aggressive with your throw to avoid a Tandem Master/passenger entanglement with drogue.

Side Spin

Please now watch the video 'Tandem Side Spin Phenomenon'. This educational video was produced by Strong Enterprises, makers of Strong Dual Hawk Tandem System. Its information is relevant to all Tandem Masters using any type of equipment. Its viewing is a mandatory requirement of your Tandem Endorsement Course.

Once you have viewed the video, review these key points below:

Side spins can be attributed to:

- A lazy exit and/or poor presentation (side-on to relative air);
- The bringing in of the Tandem Master's right arm to deploy the drogue before stability, with the left arm still out, which tips the tandem side on to relative air;
- The negative arch of the student, the hard arch of the Tandem Master creating a propeller configuration.

Side Spins are worsened by:

- The Tandem Master arching hard to recover stability.
- The Tandem Master not recognising the situation early, thus delaying their response.
- Poor harness fitting, e.g. very long lateral connectors/side attachments.

Side Spin Recovery options

Whilst grasping the student's forearms, bring your arms down to the hip region. Wrap your legs around the student's legs. This will cancel the propeller configuration, and with both Tandem Master and student now in a similar position, the pair should fall back to earth.

After the Instructor has the leg lock and arms pulled down to side or students chest, it is very important for the Instructor to relax... (Maintaining grips of students arms and legs). You can feel the side spin slowing down! As it stops, "you must arch HARD"! A quarter turn to drogue side up will do. Failing this, deploy the drogue as described in 'unstable exit' above. "Check Altitude" and deploy the drogue followed by pulling the drogue release! OR if height determines, deploy RESERVE.

You will be physically drained, loss of height is incredible, and the correct procedure is vital.

It is likely that for the above method to be successful, the Tandem Master would need to employ this procedure immediately on the onset of a side spin, before the speed of the spin increases.

Failing the above, your next option is to deploy the drogue. With the drogue handle pointing skywards, throw the drogue.

If you are not able to reach the drogue, or feel you cannot cleanly deploy it, then you must deploy your reserve. The drogue should be your first option, as it will at least slow you down.

If the drogue side is down, you are in a difficult place. Throwing the drogue may result in an entanglement. If a drogue/tandem pair entanglement occurs, do not pull a drogue release. It will make the situation worse. Pull your reserve, which has a good chance of deploying cleanly in spite of the trailing drogue.

Other notable aspects

- Small light passengers have a greater potential for instability and side spin.
- Side Spins have been fatal.
- Early detection and action is imperative!

Best to avoid/prevent side spins

The best way to deal with side spins is to avoid/prevent them. The likelihood of side spins can be reduced by:

- (a) good preparation: a good briefing and checking if the student understands improves your chances of a better body position, as well as proper harness fitting; and
- (b) a good exit: presenting to the relative wind, which will reduce the likelihood of the relative wind hitting the tandem pair side on.

Hand/Arm lock by Students

Hand/Arm locks usually occur when a student places his arms over the top and around the Tandem Master's arms.

If a student gets one or both arms, a quick, rearward extraction movement of both hands can generally free you at once. If unsuccessful, you still have your voice, your head, your teeth and your knees to work with.

Prevention is the best cure here. Include in your brief the importance of not touching your arms/hands. Do not place your hands or arms in reach of your student's hands or arms. Monitor your student's hands and arms at all times. If they get too close, pull away immediately before they get a chance to create a lock.

5.6 Review Questions

1. How can you ensure a successful drogue deployment?

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2. Why are handle checks in freefall so important?

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3. What would you do if you noticed or suspected your altimeter was not reading correctly?

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4. What other forms of height awareness may lead you to this conclusion?

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5. How long does it take to reach tandem terminal? What are the dangers of this occurring?

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6. Name 3 things that you should be monitoring during drogue fall:

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7. What is the minimum opening height for a tandem main? What is the minimum height you will need to pull the drogue release to achieve this?

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8. What sport would you be more suited to if you are constantly relying on the drogue for stability?

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9. You have exited and your student is badly de-arched. You are on you back. What would you do?

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10. Describe your reaction to a side spin:

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11. How can you avoid a side spin?

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PART 6 - RELATIVE DESCENTS

In this Part:

- Considerations with RW
- Briefing other jumpers
- Working with a cameraperson

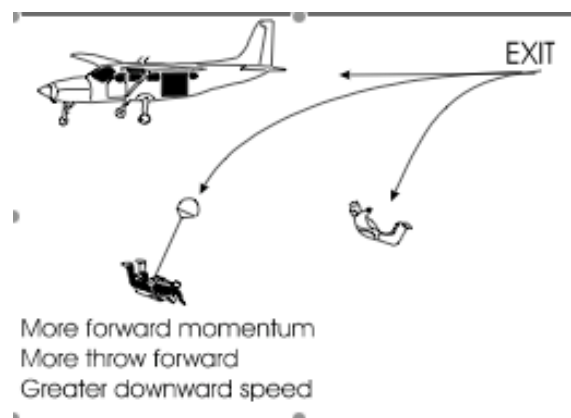
6.1 Considerations with RW

- All relevant Operational Regulations are to be followed. Know and understand them before proceeding.
- The skill level of the jumper/s. You are completely responsible for the safety of yourself and passenger. You must therefore be completely comfortable that the accompanying jumper/s have the skills to act safely on the jump. The jumpers must have a good level of freefall control, as the Tandem pair has minimal manoeuvrability to avoid a collision.
- Check that the air is clear above you before you deploy the drogue.
- A tandem relative jump is different from a normal relative dive. A good briefing for all participants must be given. See below.
- All RW and camera approaches should be made from the front and grips on the student ONLY.

6.2 Safety Brief

Exit

Explain that Tandems are affected more by 'throw forward' than solo jumpers and that the tandem will accelerate faster on exit. As a result, the solo jumper can expect to end up in a position relative to the tandem as the picture below demonstrates, if exiting at the same time.



For this reason, it is better for the jumper/s to float rather than dive out after the Tandem Master, as they can end up directly above the Tandem Master and in the way of your drogue throw. The response to jumper/cameraperson becoming entangled with the drogue is discussed in Part 8 'Malfunctions'. A jumper with more experience/skill can leave closer to a tandem. But for newer jumpers/camera person, it is better for you to allow more time between their exit and yours.

Approach

When diving down to a tandem, the jumper should not aim directly at the tandem. All approaches should be done with control. Newer jumpers/camerapersons should aim to be on level with the tandem with a safety buffer of say 5-10 metres horizontal separation. They can then close the gap in a controlled manner, whilst staying on level.

During Freefall

The jumper/s should never pass directly over the top or underneath the tandem. Bumble related collisions can occur.

If docking on the passenger, the passenger needs to be briefed to allow the jumper to take the grip, so that they can release when they need to. If someone attempts to dock on you the Tandem Master, apart from avoiding this, you the Tandem Master should take the grip, so you can release when you need to.

Where possible, keep other jumpers within your field of vision at all times.

Remain Height Aware! RW jumps are distracting.

Deployment

Any grips should be broken 1000 feet above deployment height. Jumpers should back away (many a camera person/jumper has copped a kick in the head from being too close on deployment) and track away. Even though opening heights are staggered, this horizontal separation is important, due to the possibility of a malfunction of the Tandem Main and re-entry into freefall of the tandem pair. A jumper directly underneath you at deployment may result in a collision due to the trap door effect with certain rigs.

RW with Freeflyers

Freeflyers in a head-down position can generate dangerous horizontal and vertical speed. Only allow this approach if you know the jumper is a highly experienced flyer.

Drogue fall speeds are usually unsuitable for head-up and head-down orientation, so back flying is usually a common position free flyers will adopt to fly with you. Again, the flyer must be known to you (and the DZSO) as a highly proficient flyer. It also normally involves the flyer to be on a lower level to you. A jumper should never pass directly underneath you as there is the issue of a premature opening of the freeflyer's container and a possible burble related collision. Be satisfied the jumper has well maintained 'freely friendly' equipment.

It has also been noted that drogue-less tandems have been performed so Freeflyers can practice their head-down flying. For reasons that you have already learnt in this Guide, this is not a good idea. Delaying the deployment of the drogue is not the safest practice!

Contact with the drogue and/or bridle

Freefallers should never attempt contact with the drogue or drogue bridle.

Student Priority

At the end of the day, it is your students skydive. Your number one priority is to provide them with a safe environment and an enjoyable jump. This cannot play second fiddle to you or your jump mate's entertainment. However, done safely, and within the regulations, a RW jump can be great fun for all.

6.3 Working with a Cameraperson

Requirements

A cameraperson on a Tandem jump must hold at least a Certificate Class C and have DZSO and Tandem Master approval.

When jumping with a cameraperson, you are part of a team. Obviously, your responsibilities in relation to safety are your first priority, however there are a few extra things you can do to ensure that your student's DVD/photo product is a good one.

In the plane

Have your passenger look at the cameraperson when he/she is trying to film them.

Exit

Prior to exit, remind them to keep their head back for the exit to gain a good face shot on exit. For the exit, give a nice clear count (pre-brief this if necessary) for the cameraperson. This often means the difference between a nice face shot with the plane in the background, or a poor exit shot of perhaps just your arm. Remember the last thing you tell your tandem passenger is the first thing they will remember on exit.

Drogue Throw

Ensure your cameraperson is not above you. This is more common with new camera flyers. If you have a heavy passenger, deploy the drogue as soon as it is safe to do so. With an extremely light passenger (less than 55kg) a small delay to build up speed can help avoid your camera flyer going low on you.

In Freefall

Unless doing intentional turns, keep facing into the sun for best lighting. Ensure your passenger has their head up looking at the horizon for a larger part of the jump, for the best shot. Monitor your cameraperson's body position. Assist with fall rate if he is struggling. This can be the required with larger and lighter passengers. Remember, manoeuvres such as 360 turns may alter your fall rate and are not helpful if the camera flyer is struggling to stay up or down.

Deployment

Signal to the camera flyer that you are going to deploy to allow him enough time to move away. It is important for the camera person to track to allow separation in case you have a malfunction and open lower than planned. A cameraperson, who is proficient with 'back tracking', can keep you in shot, whilst creating safe horizontal separation.

Safety

- Utilise the points covered in the 'Relative Descents' topic.
- It is normally better for the Tandems with camera flyers to exit first. If you notice a long spot, then deploy higher so your cameraperson can make it back to the DZ. Signal to him/her) that the spot is long. Using both index fingers to form a cross is reasonably universal.
- Don't allow the presence of the camera flyer distract you from your primary responsibilities!
- Your height awareness is essential for camera safety.
- Ensure your cameraperson is briefed appropriately. Follow the Safety Brief in 'Relative Descents'.

The response to jumper/cameraperson becoming entangled with the drogue is discussed in Part 8 'Malfunctions'.

6.4 Review Questions

1. What are the current requirements to perform video on a Tandem?

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2. What are the current requirements to dock on a Tandem?

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3. What are the requirements of the Tandem Master for RW with other jumpers?

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4. You are jumping with a Certificate Class C camera flyer that has not jumped with a Tandem before. Write down in dot-points, the things you will cover in your brief to the camera flyer.

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PART 7 - CANOPY CONTROL AND LANDINGS

In this Part:

- During opening
- Post-opening procedures
- Student considerations
- Canopy flight
- Landings
- Other landing types and issues.

7.1 During Opening

Ensure passengers hands do not interfere with your arms/hands or your handles. Take note on your tandem training jumps how easy it is for the passenger to access the emergency handles! Assertively ask them to place their 'hands down' or push them down with your hands.

Take immediate control of the opening with risers to avoid line twists. Applying outward pressure to keep them apart can help. You can lean (harness turns) in the harness to move with a turning canopy to avoid line twists also. Ensure line twists are fully resolved before the toggles are released.

Maintain height awareness. Some canopies, especially older ones, can take over 1,000 feet to open, sometimes 2,000 feet. Adjust your opening height to match your canopies opening characteristics.

Check that your slider has come all the way down and end cells open. Tandem canopies sometime require toggle input to achieve this.

7.2 Post-opening Procedures

1. Ask your passenger to keep their hands lower than shoulder height. It is possible for them to reach your emergency handles. Monitor your passenger's hands throughout flight.
2. Confirm toggle type (one handle or two handle). You will need to use the top handle if there are two for the most effective flare on landing.
2. Steer canopy towards Dropzone to ascertain whether you are on wind line or not. This is your first priority as you may need all the height you have to make it back onto the wind line and the DZ.
3. Stow away your drogue release handle if required. The most common place to keep your handle is to thread it through the small space left in the webbing that loops and holds the top clips. Most rigs have bungee retractable handle systems now so that this step is not necessary.
4. Loosen side adjusters, lengthen, and **then re-attach**: this assists with passenger comfort and gives you more mobility for landings. Prior to doing this:
 - (a) Check to make sure your top clips are secure!
 - (b) Inform the passenger that harness adjustments are being performed and not to panic (they will feel a loosening around the hip area).

From the UPT Sigma Manual: Release the lower attachment quick ejectors, loosen the lateral webbing. Having the student stand up on the instructor's feet will assist in this procedure. Do not tell the student the lower attachments are being released; simply inform them that harness adjustments are being performed. **It is important to re-attach the quick ejectors immediately.**

Note: With heavier passengers especially, a lot of load can be placed on the side adjustment webbing and quick release clips. This makes it harder and sometimes impossible to release them. To alleviate the load, you need to ask the passenger to place their feet on your feet and stand up, keeping their hips close to you.

5. **Goggles Off:** Ask your passenger to pull them down around their neck. Also twisting them around so the goggles are behind the neck is more comfortable and better for Hand Cam footage. Passengers who have contacts may wish to leave their goggles on. Give them the choice. Those that wear prescription glasses should keep their goggles on to avoid losing them.
6. **Check Chest Strap:** Check that it is not too tight and loosen if necessary. This is important as it may be positioned over the neck (normally caused by incorrect harnessing). For women with large chests, it will be more comfortable for the chest strap to sit above the chest. Get them to adjust themselves. The appropriate wording for this: 'For your comfort, place your thumb under your chest strap and lift it over and above your chest'. This should be practiced on the ground in the suspended harness if necessary.
7. **Have your passenger practice the landing position.** This will also adjust the leg position in the harness and create more comfort (see 'Student considerations' below). If doing Hand Cam, it is a good idea to film this for risk minimisation.

7.3 Student Considerations

Comfort

Whilst with the benefit of your experience, being harnessed into a parachuting system is a comfortable and pleasant experience; it is rarely the same for the first-time jumper. Careful harnessing is the key, as the range of options once the parachute is open is limited.

Asking the student, "Are you comfortable?" will rarely lead to an accurate answer. The student will often simply answer; "Fine", to please the Instructor.

The number one cause of discomfort is in the legs. After a period of being stationary in the aircraft, followed by a unique experience and the multiple G-shock of a parachute opening, their legs will be uncomfortable. Anticipate this and take steps to fix:

Tandem Master: "We're going to make your legs more comfortable. Can you give me a hand?"

Tandem Student: "Sure!"

Tandem Master: "We'll practice the landing. This will adjust the harness so it is more comfortable. Hands under your knees... now lift up your legs..."

With a properly harnessed student, the harness will rotate slightly, taking up any slack in the back strap, and allowing their knees to sit a little higher. If nothing else, this will move the pressure point to slightly lower on the back of their thigh. It will make it easier for them to lift their legs for landing.

Pressure Equalisation

Many students experience high pressure in their inner ear whilst skydiving, having descended from a pressure of around half an atmosphere to something closer to sea level. You probably don't experience this much anymore; with regular skydiving, you have become accustomed to subconsciously making miniature equalisations on a regular basis.

A student wishing to equalise can do so quickly and effectively by pinching their nostrils closed and gently – stress the "gently" part – attempting to "push a little breath out of your ears".

Nausea

One theory suggests that the reason some Tandem students get sick or pass out under canopy is that blood circulation is cut off at the inner thighs and the shoulders by the harness. It is believed to be caused by the release of poorly oxygenated blood from the legs, coupled with the mental release from the stressful freefall.

Other observations suggest that a lack of proper nutrition – some students will avoid breakfast "in case I feel sick" – is counter-productive and the empty stomach causes nausea.

Motion sickness is rarely a factor, unless you aggravate the situation with rapid turns.

Tips to avoid vomiting:

- Keep turns to a minimum, and docile.
- Make sure harness is still comfortable and make necessary adjustments.
- Ask them to keep breathing in a slow relaxed fashion, deeply through the nose.
- Ask them to look out at a single point on the horizon.
- Keep talking them through the landing, letting them know the duration of flight to go. The simple fib of “sixty seconds to go” may convince them that they can hold on.
- Consider requesting that they steer the parachute; the distraction can be enough to overcome their feelings.

If vomiting is imminent:

- An airline sick bag can be used. Some DZs supply these; some don't. It is in your interest to carry these.
- Some Tandem Masters use a technique where they do a slow turn to one side, and get the passenger to vomit with their head facing underneath the opposing shoulder.
- If the student is sick, then they will more than likely experience embarrassment. Try to be sympathetic so as not to further detract from the experience. A landing a little further away from the spectators may give them the opportunity to recover their composure.

Fainting

Since the inception of student harnesses with more modern designs, fainting has become a less frequent occurrence. However, it can still occur, and you need to be prepared for it.

When you stand up suddenly, your nervous system reflexively increases heart rate and blood pressure, ensuring that enough blood is reaching your brain. Faints at ground level are often caused by a delay in this response, and some fainting under canopy can be attributed to a similar delay. Other causative factors include heavy sweating – the loss of sodium in the body compromises the blood pressure mechanisms – or simply stress, where once again the blood pressure is not what the brain is expecting.

Other contributors to faints can be dehydration, low blood sugar and/substance abuse. A faint can also be indicative of a heart disorder, which requires careful attention from the moment it becomes apparent.

Faints usually only last one or two minutes, but this may not occur until after the landing. You are also unlikely to be able to improve their circulation significantly prior to touchdown.

Responding to a fainting student:

1. Ensure that you are going to land at the target, where ground crew can assist with the situation.
2. Attempt to rouse the student, vocally and with firm taps to their arms. If this does not rouse them, slapping or hitting them harder will probably not either.
3. Assess their breathing. If their breathing is compromised, check for an obstruction (tongue, vomit) and clear it.
4. Loosen anything you can with safety. Student Chest strap and shirt collar may be all you can manage.
5. Avoid radical turns, which exacerbate the problem by pooling blood in the legs.
6. Use a hand to bring their head back, whilst continuing to manage your approach towards the target.
7. On final approach, place your shins behind their calves, effectively hooking their legs from behind.

8. Lean back in the harness, bring your legs as far forward as possible and perform your best sliding flare.
9. Call for first aid.
10. Consider calling an Ambulance. Even if the student has no history of fainting, it is worth getting a professional diagnosis.

7.4 Canopy Flight

Must-do, Should-do, Could-do

- Always work towards and stay on wind line, remain height aware and target aware. Don't get distracted by interaction with your passenger or Handcam and fall short of your target. In windy conditions, injury is possible if you are not caught by catchers.
- Establish sufficient vertical separation with other Tandems to give catchers time between landings. Watch out for student jumpers who are often on the same level and wing loading as you.
- Ask your passenger how they are feeling and whether they want to do 'radical turns'. This is in your interest, as you may induce passenger sickness!
- Consider your student's potential as an AFF/SFF student: Make a quick assessment and if they might be a candidate for taking up the sport, ask them if they'd consider doing a course.

Student Steering

This is great way to add some 'hands on' experience for the student and should be part of your procedure once you have a few tandems under your belt. It also helps you conserve your energy for landing as tandem toggle pressure is much heavier than your sport canopy.

Some students will be hesitant towards this. Some positive encouragement will get them to step outside their comfort zone, and hence enhance the experience. Those passengers, who are adamant, should not be harassed into doing so.

Here are some safety tips:

- Only do this in good conditions with minimal traffic.
- Stay aware of all aspects of your flight.
- Steering from the student position, can require a lot of energy. Less physically capable passengers should conserve their energy for the landing position.
- When instructing their toggle inputs, there will most always be a delay in their reaction to your commands. Allow for this.
- Takeover by 2000 feet, to allow yourself time for your set up.
- When taking toggles back, before asking them to take their hands out, flare slightly so that the student's hands are lower than shoulder height. You don't want their hands anywhere near your emergency handles.

Wing loading

As students vary in weight, so will your wing loading. You will need to take this into consideration when determining: Exit order, Landing order, spotting, opening height, equipment selection, approach and flare.

Traffic

Be vigilant of traffic at all times. Create horizontal separation with other canopies by 2,000 feet. Take into consideration your wing loading and that of others whilst establishing the landing order. Your main traffic will be other Tandem canopies. Individual landings are important where there are only one set of catchers and where the landing area is small. You may also be sharing the sky with students with similar

wing loadings to you. Be aware of them, as they may not be aware of you. Follow the preferred landing pattern direction if one exists at your dropzone.

7.5 Landings

Approach

As with any landing, your approach should begin with enough height to ensure you are turning into wind at safe height, without entering the 'corner'. Take yourself back to student status and make a 'Square Approach'. Your approach should be on the high side. This is important as you will be new to the concept of varying wing loadings. If you have secondary toggles, you should pick them up before you start your approach at around 1,000 feet.

Hook-turn approaches can easily result in serious injuries, as evidenced by some very serious injuries to Tandem students and instructors. Performance turns of more than 180 degrees just prior to landing are **not permitted** by APF. *[Note: USPA imposed similar restrictions in 2016.]*

The use of brakes during any leg of your approach can assist with an accurate landing. This form of approach ('half break accuracy approach') may be foreign to you if you have been mainly practicing high performance landings for the majority of your jumps. Learn and practice this style of approach, as it is undoubtedly the most accurate.

This part of your flight requires a lot of attention. Politely remind your student of this if they begin to communicate unnecessarily. Some students get excited and like to wave to spectators on the ground. This can be distracting and create unnecessary movement in the harness.

Tell your student that you will be landing shortly and ask them to have their hands on their knees, ready to assume the landing position on your command. This gives them something to do with their hands, keeping them out of harm's way.

On your final approach, try to keep toggle input to a minimum as you need to keep your airspeed up to give you the best flare possible.

At approximately 15 seconds prior to landing, ask your passenger to lift their legs into the landing position and remind them to keep them up the entire time. Don't ask them to assume the position too early so as to conserve their energy. It is important to visually confirm that they are in the correct position. Keep monitoring their leg position during the entire landing. It is common for a student to reach for the ground with their feet during the final stage of your landing. If you see this, you will need to assertively correct them. It is best practice to continuously remind the student of their job. "Legs up, legs up, legs up!"

Note: Consider the fitment of grip-handles to the knee/thigh area on your Tandem student jumpsuits. These give the student something to grab and assist with keeping their legs up during landing. They are a particularly useful aid for students who lack the strength to hold their legs up through leg/hip strength alone.

Landing with Forward Speed

When landing with any amount of forward speed, the best technique is a sliding landing. This involves the student having their legs straight and out in front, 90 degrees to their torso. Time your flare so that the canopy planes out at a height that allows you to slide on your feet. During the plane-out, lean back in the harness with your legs pointing in the direction of the landing for balance. As your canopy begins to run out of lift, complete the flare fully and assume a seated position so that the student is in your lap. Remain in this position until stopped.

With a minimal forward speed, you may be able to step or run out your landing. This is only possible with very light students, as you will be supporting their weight once your canopy stops flying. With heavier students it is far better for yourself and student to perform the sliding landing. Trying to run out a landing can often result in falling forwards and on top of your student.

A student must never assist in the running out of a landing. This practice creates a higher risk of injury.

Landing without Forward Speed

In stronger winds, it is possible to stand up your landing. This normally requires a later onset of the flare. Once you have completely landed you may ask your student to stand up, or you can lower yourself to a crouching position so your student is sitting on the ground.



Flaring Technique

A Tandem canopy has a greater toggle pressure than that of your sports canopy. Also, as the weight under the canopy increases, so does the toggle pressure. To help with this increase, different technique is required. Many Tandem Masters use a 'Two Stage flare' to achieve a complete flare:

- Stage one of the flare: pull down the toggles to shoulder level.
- Stage two of the flare: Rotate the arms so that the elbows are higher than the hands, then push down as far as can. This final part of the flare engages the assistance of the chest muscle, giving you more power to achieve a flare.

It will take you quite a few jumps to become accustomed to the timing of the flare. The important thing to remember is that you must always finish the flare. Failing to do this can result in injury.

If you find the flaring challenging conserve your energy by minimising turning at height or by letting your student steer. You may need to perform strength building exercise to help you perform your job.

7.6 Catchers

Catchers are necessary to help deflate your canopy in moderate to strong winds. Failing to do so can result in the Tandem pair falling over, being dragged or even getting lift off again and falling very heavily. Injury can occur if you are not caught properly.

Catchers must be briefed to:

- Stay in one spot so the Tandem Master has a stationary target.
- Once the tandem is on finals, move to tandem to adjust for inaccuracy.
- Be close enough to take toggle/s as soon as the Tandem has landed.
- Do not take toggle until Tandem has completely touched down.
- Run backwards on an angle from the Tandem Master. Careful not to line burn student's face.
- Hold toggle to maintain deflation until Tandem Master has disconnected student.

What you can do:

- Land as accurately as possible.
- Yell to the catcher to come closer if you feel they are not judging your landing position accurately. This is often the case with new catchers.

- Pass the toggles to the catcher.
- Hold your arms in a position that protects the student face from the steering lines.
- In windy conditions, dig your feet in so you don't fall backwards.
- In very windy conditions, you may like to sit down and slide back to help the deflation as the catchers may not be able to run backwards.

It is better for a catcher to grab both toggles as this gives an even deflation. If only one is pulled, the canopy turns and dives into the ground, placing stress on the Tandem Master and Student. Stand steadily if this happens. (Refer to Appendix E Tandem Incidents with Injury.)

When winds are near the limits, two catchers are preferable. A third person can assist from behind to stop the Tandem pair from falling backwards. This third person needs to be mindful of deployment hardware, most notably with the Sigma Disc.

If for some reason there are no catchers, you may need to cutaway the main to avoid being dragged. This depends on the wind strength. Disconnect the RSL first. This is best done under canopy to save time.

7.7 Post Landing

The Mechanics

Unclip the student attachments. Help your student up and assist them loosening their leg straps. Congratulate them and be positive, even if they performed poorly. It's their first jump and only received minimal training. Maintain control of your student whilst walking back from landing area.

Market our Sport

You are in a great position to help sell our sport as a lifestyle to likely candidates. This is not about pressure selling technique or selling more Tandems; only that you take the opportunity to suggest to them – in cases where you believe the student has some potential as an AFF/SFF student.

Talk to your CI about how to market skydiving on your DZ and whether manifest has a special package to add to the usual takeaways after a Tandem jump. This is not about non-English speaking foreign tourists in Australia on a brief holiday; but is about making a little effort to target those that clearly have some potential to help grow our sport.

7.8 Off-Dropzone Landings

Prevention is the best cure here, but it does happen. If you're not 100% sure if you'll make it back to the landing area with sufficient height, then take the out. Select your new landing area with consideration for obstacle hazards, turbulence and accessibility for ground crew.

Remember that you are responsible for your passenger until they are back at the dropzone. Be careful climbing fences, walking on roads and snakes in long grass.

7.9 Turbulence

Although turbulence is difficult to see, it is not hard to predict. From our basic training, we know that mechanical turbulence is found downwind of obstacles, to a distance of ten times the object height or more. Turbulence is also found above the object – twice as high as the object – and in front of the object, perhaps twice the object's height.

Avoiding turbulence – via careful flight planning - is clearly the best option.

It is recommended that if you encounter turbulence, you continue flying on full drive. In this configuration, the canopy is flying at its best: it will penetrate the conditions more easily and be less affected by it. Keep toggle movements to a minimum, avoid corrections if not absolutely required, and be as smooth as you can if you require a turn.

Historically, many have been told to fly in half brakes in turbulence. Whilst this may have created an appearance of stability in older ram-air canopy designs, it is definitely not the best technique for modern

canopies. Manufacturers advise against this for contemporary canopies; holding in brakes makes the canopy more susceptible to turbulence, not less.

“Pumping” the brakes is another myth; whilst this may be effective in a car, it will usually make things worse for a parachute, which is performing at its best on full drive. Holding both toggles down for a moment can help end cells re-inflate, if height allows.

Of course, if the canopy turns and dives towards the ground or a hazard in turbulence, you must take steps to bring the parachute back parallel to the ground. Most canopies will quickly re-inflate given opportunity. At a low altitude, keeping the parachute flying straight and flaring as best you can becomes the priority.

Naturally, if you encounter turbulence on landing, find another spot to land on the next load. Learn from the experience.

Refer to Appendix E, Tandem incidences and injuries. A lot of the worse injuries, Coccyx and Back injuries are turbulence/sink related. The question needs to be asked: Why were they jumping in those conditions in the first place? Is it an acceptable excuse to say, “We experienced turbulence, dropped 10 feet and that’s why the Student has a broken coccyx” or would it be more truthful to say, in many of these cases, “It was a hot day, the wind was coming from a known turbulent direction. We knew there was potential for hard landings, but we chose to push on and keep making money”?

Choose your conditions conservatively. The student can come back another day. Injuries are not good for business.

7.10 Beach Landings

Quite a number of Tandem operations in Australia land on or near beaches.

Considerations for beach operations:

- Spotting is critical.
- Equipment wear is greatly increased. Gear should be inspected and replaced more frequently (refer 2.3).
- Op Reg 7.1.4: *A personal flotation device that complies with APF Equipment Standards must be worn by each and every parachutist in the following situations:*
 - (a) *All parachutists if the target is within 300 metres of a water hazard; and*
 - (b) *A student parachutist if the target is within 500 meters of a water hazard.*

This means both the Tandem Master and Tandem Student must wear a floatation device which meets APF Standards.

- The Tandem Student must be briefed on the use of the floatation device.
- Know the Water Recovery Plan for the operation you are jumping at.

7.11 Water Landings

Landing a tandem pair in water is quite survivable and has been done on numerous occasions. It is important that regulations are adhered to and that a pre-planned procedure is put in place.

If you plan to jump near water, it is recommended that you undergo a course of instruction in Water Landings. This course needs to be conducted by an Instructor with at least a Course Trainer endorsement.

Following this, special attention should be given to the following:

- Student briefing for floatation devices.
- Post-touchdown procedure for separating the student harness from the Tandem container
- Possibility of panic from student, and consequences

- A student harness weighs some kilograms and will rapidly diminish the student's swimming ability. Even if they claim to be a confident swimmer, using their floatation is imperative.

Recommended Tandem Water Landing Procedure

If a water landing seems imminent, remain calm, inform your passenger and follow these steps; (listed in order of priority)

- Fit and inflate passenger's life vest. Ask your passenger to fully inflate the life vest by pulling the tab firmly downwards. If the life vest does not inflate, ask the passenger to fully inflate the life vest manually with the mouth tube.
- Brief your passenger for water landing. This should include:
 - Legs up in front, feet together.
 - Holding the lifejacket with both hands and pulling downwards to prevent the jacket popping off their head upon entry into the water.
 - A countdown to landing including taking a deep breath and holding it just before entering the water.
- Disconnect side adjusters and stow hooks to prevent entanglement with lines etc. once in the water
- Disconnect RSL
- Undo Tandem Masters chest strap. Leave passengers harness as is.
- Ensure helmet visor is open
- Face into wind for landing
- Aim to land as close as safely possible to boats
- Land well away from breaking waves
- Remind passenger to lift legs, hold vest and countdown to entry, hold breath.
- Flare as for a normal landing, aiming to enter the water vertically and with minimal forward speed.
- Once in the water;
 - Cutaway main canopy.
 - If covered by the canopy, remain calm, stay connected and follow the seams on the canopy for the quickest route to freedom. Ask the passenger to assist.
 - Disconnect the passenger once clear of the equipment.
 - Fit and inflate your life vest.
- Remain with your passenger and if possible stay close to the equipment as a floating canopy is a great signal for rescuers.
- Conserve energy and stay warm until help arrives.

7.12 Review Questions

1. Why is it important to monitor your student's hands during opening, and canopy flight?

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2. Line twists are as common with Tandem openings as they are with a sports rig. What can you do to avoid line twists?

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3. After your canopy is successfully open, what is your next priority?

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4. How can you make your student more comfortable under canopy? Why is this important?

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5. Your student has fainted under canopy. What should you check for and monitor during the remainder of your flight?

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6. What are the safety aspects to be mindful of when allowing your student to steer?

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7. How will differing wing loadings affect different aspects of your flight? (Spotting, Exit order, Traffic, Landings)?

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8. What is the safest and most accurate landing approach for Tandems?

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9. Study Appendix E: Tandem Incidents with injury. What is the most common Tandem student injury? What is the most common cause of this? What can YOU do to avoid this from happening?

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PART 8 - MALFUNCTIONS AND EMERGENCY PROCEDURES

You must refer to the Manufacturers Manual for education on Emergency Procedures. The following is a guide only.

In this Part:

- Controlling and Landing a Tandem Reserve
- Emergency procedure fundamentals
- Student management
- Malfunction types and responses.

8.1 Controlling and Landing a Tandem Reserve

Releasing Reserve Toggles

Some equipment manufacturers use snap fasteners and Velcro to secure the reserve brake toggles to the reserve risers. When releasing the reserve toggles, it is important to peel the toggle 'backwards and up' off the Velcro and snap fastener (rather than simply pulling the toggle down, like you do on most sport and tandem main toggles).

Opening and flight characteristics of a Tandem Reserve

Opening characteristics of a reserve include:

- Reserves have a deep brake setting and may open in a stall depending on your wing loading,
- It is important to keep tension on the brake lines as you release the brakes to avoid tension knots (brake lines cascade all the way to the lower steering line attachment)

Flying and landing a tandem reserve is noticeably different to flying a tandem main canopy. During tandem reserve flight, attempt at least one practice flare before landing to feel the difference in performance. Ensure you are aware as to the type of reserve you are jumping as all reserve canopies have different opening and flight characteristics.

Differing flight characteristics of a tandem reserve canopy include:

- Control inputs take longer to react – anticipate a slower turn rate,
- Flight performance feels 'sluggish',
- Airspeed will be less than main canopy,
- Glide ratio may be less than main canopy.

Considerations for flying a reserve:

- Because of the slow flight characteristics, anticipate turning earlier during your circuit and start the flare slightly early to allow for the control 'lag'.
- A reserve opening may be at a lower altitude, therefore:
 - Less time to practice maneuvering the canopy
 - Less time to make it back to the landing area (see 7.8 Off DZ Landings)
- Landing pattern – a tandem pair under a reserve should always be allowed ample airspace and allowed the “right of way” when flying in canopy traffic.

Landing a reserve in water:

- Follow the *Recommended Tandem Water Landing Procedure* where applicable.
- There is no longer the buoyancy of the container and reserve to keep you afloat.
- Collapse reserve canopy by hauling in one brake line.
- Consider the option of climbing out of harness once free of passenger and canopy.

8.2 Emergency Procedure Fundamentals

Tandem emergencies require immediate action. To avoid second guessing and wasting valuable time, it is of the utmost importance that you have a well-practiced plan to deal with the variety of malfunctions that can occur. A Tandem system, with its extra functions and components, provides a set of malfunctions that do not exist with your sports gear. It is important to understand the nature of all malfunction possibilities and to continually revise these and the necessary response.

Out of sequence handle pulling is the main cause of Tandem fatalities. Ensure you know and are current with your procedures by regular rehearsal!

Main Cutaway and Reserve Deployment Procedures

The same procedure as your sports rig, is applied here. The differences are:

- The location of the handles. Practice finding them on every jump, in freefall and under canopy
- Use of double Velcro pouches, can make the handles harder to release. Thus, it is always necessary to 'Peel' your handles
- Be aware that on some rigs with lanyards, the Reserve Ripcord will only pull approximately 15 to 20 cm and then stop
- Your student will require instruction and consideration

Procedure:

1. Instruct student (see student management below)
2. Look, Locate and grasp cutaway and reserve handles
3. Peel, then pull cutaway to full arm extension. Ensure riser release. Arch hard
4. Peel, then pull reserve handle to full arm extension
5. Arch as hard as you can

When an RSL is attached, the reserve will deploy immediately; and even quicker if a MARD is fitted (e.g. a 'Skyhook'). Do not rely on this however and not pull the Reserve handle. It is important to keep your emergency procedure flow the same.

Hard Pull on Cutaway

Instances of hard pulls on the cutaway handle have occurred due to poor 3-ring maintenance. Good regular maintenance on the cutaway system will help avoid this. If you experience a hard pull, ensure you have peeled the handle. Use both hands on the one handle. Breathe in first, then exhale for maximum force exertion during pull attempt. Failing this, getting your student to help would be your next choice of action.

Hard Pull on Reserve

Use both hands if necessary. Breathe in first and exhale for maximum force exertion during pull attempt. If unsuccessful, use Secondary Reserve deployment handle if available.

8.3 Student Management

In high speed malfunction situations, it is not really possible, nor do you have the time to communicate the situation to your student. Get on with the job.

In low speed malfunction situations, the cooperation of the student will greatly help the outcome.

Before cutting away

Explain (briefly) that you are not happy with the main chute and need to go back into freefall to activate the reserve. Ask your student to assume the arch position with arms crossed. Reiterate: Head back, legs back, hips forward. You can hook their legs with yours to ensure their correct leg position. Communicate with your student assertively and calmly.

Line Twists

Highly experienced Tandem Masters in recent years have noted that one way to help remedy line twists is to get the student to arch, whilst you are trying to kick out. This has been found to be more useful than getting them to assist with the kicking, as this can be counterproductive. Height awareness is paramount as line twists may require cutaway and reserve deployment.

After the landing

Congratulate your student. Take the time to explain what happened and the relative rarity and normality of the situation. A bit of education on your part, will stop the student from going home with the belief that he is lucky to be alive.

8.4 Malfunction Types and Responses

Before you can begin your training jumps, you must satisfactorily complete the emergency procedure part of the practical exam.

8.3.1 Drogue or Drogue-Release Malfunctions

Impossible Pull Drogue Handle - No Drogue out.

Response: Activate the Reserve only.

In any situation where you do not have an inflated drogue, you will be accelerating to tandem drogue less terminal. This is a dangerous speed for reserve activation. It is not necessary to waste time cutting away as you do not have a main out. Remember: No Drogue, Activate Reserve.

Avoid by: correct packing of drogue in BOC pouch. Bulk of drogue distributed evenly in pouch. Dig elbow into container to allow more leverage if you have a hard pull. Don't jump when fatigued or injured.

Tandem Master or Student Entanglement with Drogue or Bridal

Response: Activate Reserve only.

This situation falls under the 'No Drogue' category. The response to all 'No Drogue' malfunctions is 'Activate Reserve Only'.

Note: Systems with a 3rd drogue release activated by the main cutaway handle (Strong/Racer): Cutting away prior to reserve activation in this situation is extremely dangerous. If the drogue is released in this situation, the main may deploy. Due to the drogue entanglement, separation between you and the main may be impossible. This could therefore lead to a main/reserve entanglement.

Do not spend more than 5 seconds trying to clear the entanglement. Do not waste time with a hook knife.

Avoid by: A good throw. Correct packing of the drogue bridal within the drogue.

Cameraperson/Relative Worker entangled with Drogue or bridal.

Response: Disconnect RSL, cutaway main, drogue release, gain separation, activate reserve.

Note the 'out of sequence' nature of the response. In this rarely reported situation, it is recommended to cutaway, before releasing the drogue. This is to give the other jumper a greater chance of survival by reducing the likelihood of main inflation after drogue release.

Pull Drogue Release Handle, Drogue does not release (Drogue in Tow)

Response: Pull Secondary Drogue Release Handle if present. If unsuccessful: Cutaway, Reserve.

Note to examiners and candidates: See the UPT Sigma Manual and Vector Manual for the recommended responses to this malfunction. The flowcharts from these Manuals are reproduced as Appendix F. Note however that the minimum opening height in the USA is 3,000 feet, which is a reason for not taking the time to cutaway. The Strong Enterprise's Tandem Master Certification Course Syllabus states: Cutaway, Reserve. Australia's minimum Tandem opening height is 1,000 feet higher than the USA, which allows enough time to cutaway.

It is commonly accepted in Australia as the safer practice as it simplifies emergency procedures and considers the risk of main deployment, post reserve deployment. Talk to your Course Trainer/Examiner about this issue.

Avoid by: Correct closing procedure.

Can't locate/Hard Pull Drogue Release handle (Drogue in Tow)

Response: Pull secondary drogue Release. If unsuccessful, Cutaway, activate Reserve.

Note for Sigma Users: A hard pull on the drogue release is usually caused by the misalignment of the main closing pin. The user manual recommends that pulling both handles at the same time will be more effective than pulling one at time. This problem can be avoided by checking the pin configuration against the diagram on the main pin cover.

Avoid by: handle checks in freefall on every jump. Good equipment checks.

Drogue Deployed, but Uninflated

Response: If the drogue does not inflate within six to eight seconds, pull either one of the drogue release handles to initiate main canopy deployment.

An uninflated drogue has enough drag to deploy the main canopy, although it will take longer than normal to do so. If you wait longer, your velocity will increase. Higher velocities may produce a higher opening shock.

Avoid by: Correct packing, gear maintenance (replace old drogues).

Premature Bag Deployment (during Freefall/Drogue Fall)

Premature Bag deployment during climb out/exit is discussed in Part 4.6 Exit Emergency.

Response: Throw Drogue first if it has not been deployed. Pull Drogue Release for full main deployment. If unsuccessful: pull Secondary Drogue Release. If unsuccessful: Cutaway and deploy Reserve.

Avoid by: Good pin protection and checking/replacement of worn closing loops.

8.3.2 Main Deployment Malfunctions (High Speed)**Drogue Bridal detaches from Main Bag. Main does not deploy**

Response: Cutaway, Reserve. (There may be insufficient drag to cause the risers to separate. Ensure full release of main risers. You may need to physically clear the main risers.)

Avoid by: the connection point between the drogue and main deployment bag is a common frequent wear point. It should be checked regularly.

Horse Shoe Malfunction

In Freefall – No Drogue

Response: Deploy the drogue, Pull Drogue release/s

Bag Lock

Response: Cutaway, Reserve. (There may be insufficient drag to cause the risers to separate. Ensure full release of main risers. You may need to physically clear the main risers.)

In Drogue Fall – Main Deployed without drogue release being pulled

Response: Pull the drogue release/s

This is one of the worst scenarios facing a Tandem Master and incorrect reaction has led to several fatalities. You must pull the handles in the correct order! In this situation (with the main container open), the drogue and release handles should be in or near their usual locations. They may feel different due to the loss of rigidity in the main container. The main canopy may or may not malfunction due to the out of sequence deployment. Deploying the reserve into a horseshoe is a bad option due to the probability of the main risers and lines fouling the reserve pilot chute.

If you are unable to deploy the drogue and the main container opens into a horseshoe malfunction, UPT recommends you should release the RSL before pulling the cutaway pad and make sure the main risers have cleared before pulling the reserve.

The Dual Hawk and Racer systems incorporate a combined cutaway pad / drogue release which reduces the risk of drogue and reserve entanglement in the event that the cutaway is pulled with the drogue still attached.

To Avoid: These malfunctions were more prevalent when gear was less developed. Strong Enterprises introduced a double closing loop with long pin modification to counter this. UPT introduced the disk drogue release with safety pin system to counter this also. In this day and age, a Horseshoe mal will be caused by either the dislodgement of the main pin, or the breaking of the closing loop. Check the condition of the closing loop on every jump. Be pin- and handle-aware at all times.

Out of Sequence Handle pull (Drogue release pulled before Drogue deployment)

Response: Throw drogue immediately for main deployment.

Avoid by: Always deploy handles in correct order. Always rehearse your procedures. Be vigilant with handle protection so not to dislodge.

Main Canopy Malfunctions

A Tandem canopy, apart from its size, is in theory the same as a sport canopy. It is therefore susceptible to the same types of canopy malfunctions:

- Line twists
- Streamer
- Tension knots
- Line over
- Two canopies out
- Damage of lines and material
- Pilot-chute (in this case the Drogue) entanglement with main
- Slider hang up.

Deal with these as you would your sport canopy, applying the student considerations mentioned earlier. Ask yourself: Can I land this canopy safely? If not, Cutaway, Deploy Reserve.

Always remain Height aware. It is accepted that your minimum decision height to cutaway be 3,000 feet.

Avoid these types of malfunctions by: Taking control of canopy whilst it is opening (this can avoid line twists); correct and careful packing; good gear maintenance. Tandem canopies will generally start to

play up (turning during opening, snivelling) when they are out of trim. This occurs around the 500 to 700 jump mark.

An educational, true story from a highly experienced Tandem Master:

“I had made 5,000 tandem jumps over ten years prior to making this particular tandem jump. The freefall went without incident. I deployed my main which opened with a tension knot, resulting in the two left-side end cells of the canopy not opening. I tried to flare to fix the problem. The canopy started to rotate and wound-up to a fast rotation quite quickly. I knew I had to cutaway. My heart started beating faster and I could feel an increase in pressure.

I came in for my handles. Once I had both of them, I tried to pull the cutaway. It wouldn't budge. I tried again, but no luck. I brought my other arm over to try with two hands. This still didn't work. The blood was rushing to my feet and I now could feel myself getting weaker. I remember saying to myself, “If I don't get off this, we are both dead”.

I then, without really thinking about it, went back to basics and tried again and stated the words I'd learnt in my first jump course. ‘PEEL, Pull Cutaway’. Success! But... I hadn't peeled my handle in the first few attempts. After the jump, I debriefed myself and realised I couldn't remember the last time I went through my drills.

I'm sharing this story because it goes to show that even with a tonne of experience, you still need to stay on top of your game and revise your procedures.”

Most CIs require a formal check of Emergency Procedures, wearing a rig, on a 6-monthly basis.
It is in your interest to

REGULARLY REVISE YOUR EMERGENCY PROCEDURES

See Appendix F for Sigma/Vector Deployment/Emergency Flow Chart, taken from User Manuals

8.5 Review Questions

1. (a) What is the most common cause of Tandem fatalities?

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(b) What can you do to avoid this happening to you?

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2. Describe your response to the following emergencies:

(a) Impossible pull on drogue handle- No Drogue?

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(b) Tandem Master or Student entanglement with Drogue or bridle - No Drogue?

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(c) Pull Drogue Release Handle, Drogue does not release (Drogue in Tow)?

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(d) Can't locate/Hard Pull Drogue Release handle (Drogue in Tow)?

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(e) Drogue Deployed, but Uninflated?

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(f) Drogue Bridal detaches from Main Bag. Main does not deploy?

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(g) Horseshoe Malfunction: In Freefall – No Drogue?

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(h) Horseshoe Malfunction: In Drogue Fall – Drogue Deployed?

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(i) Out of Sequence Handle pull (Drogue release pulled before Drogue deployment)?

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(j) Main Canopy Malfunctions (listed above)?

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PART 9 - HAND CAM

Hand Cam has become an integral part of the Tandem skydiving industry in Australia, and a must-have in the Adventure Tourism industry. It increases revenue for the operator and the Tandem Master. From a student perspective, they are now able to capture their post-opening reaction and canopy flight.

Hand Cam obviously compromises the Tandem Master's ability to use their left hand. Technique and practice is required to overcome this.

Requirements

The Operational Regulations Part 11.2.12 states the requirements for taking camera on a Tandem jump:

(a) A Tandem Master must not use a handcam while carrying a student parachutist unless the CI has approved the camera and mount and the Tandem Master has:

- (i) completed at least 100 tandem descents since gaining the tandem endorsement;
- (ii) completed a course of instruction approved by the CI;
- (iii) the CI's written and signed approval documented in their logbook; and
- (iv) made one handcam jump with a parachutist who holds a parachutist certificate before using it with a student parachutist.

(b) A Tandem Master must wear a functional audible altimeter for at least the first 50 handcam descents and thereafter at the discretion of the CI.

Priorities

You are a Tandem Master first, and a videographer second. Video should be the last priority on the skydive and fit in around your primary duties of conducting a safe jump.

From the Jump Shack (Racer) advice on Hand Cam:

"A bad video of a good skydive is preferable to a good video of a bad skydive."

Process

The APF Camera Flying Guide Part 8 refers to the use of handcam on a Tandem jump. It is recommended to read and understand the entire Camera Flying guide before considering any camera on a tandem jump.

Stephan Kleinlein submitted the following work as the Thesis component for gaining his Instructor A rating in March 2009. It is worth viewing this in its entirety prior to attempting any Hand Cam descent, which is available on the APF website or can be found [here](#).



*Handcam by Archie Jamieson with Layne Beachley over Kirra Beach, 17 May 2016.
Layne was Keynote Speaker at the 2016 APF Conference.*

PART 10 - TANDEM-ASSISTED FREEFALL (TAF)

10.1 Why a TAF jump?

A TAF descent differs from a first-time tandem descent. A TAF descent involves supplementary training to perform additional manoeuvres defined in the TOM's Training Table. A TAF is considered a training jump on the AFF training table and requires the Tandem Master to hold an AFF rating.

Some Australian Drop Zones conducting AFF training, offer and encourage their students to do a TAF jump first up. The AFF Student Training Table provides for the option of TAF Stage 1, where the student can perform the aims of this stage under the close supervision of the Instructor.

In addition to assisting with overcoming sensory overload, participating DZ's suggest the following benefits of using TAF as Stage 1:

- Canopy control instructions can be given by the TAF jumpmaster directly. A reasonably accurate landing can be expected as a result.
- The flare for landing is primarily in the hands of an experienced Tandem Master. Talk the student through each stage on the landing.
- Locating the Drop Zone can be performed in a timely fashion.
- The jumpmaster can assess and debrief the student's ability to perform their post-opening procedures.

10.2 TAF Requirements and Manoeuvres

Procedures and Under Canopy Lesson

Your Group Member's TOM will establish the requirements and minimum manoeuvres required. The CI will have established a Dive Plan, and you should draw up a lesson plan to go with your Tandem Lesson Plans to cater for this type of jump. The manoeuvres covered by TAF Stage 1 include practice pulls, height awareness, deployment, canopy piloting and following target assistance.

Some manoeuvres which can be taught under canopy include:

- Stall point and stall recovery.
- Flaring.
- Turning. Have your student appreciate the increased descent rate.
- Landing circuit/approach.

Considerations

- Jumping in strong winds (close to or on Tandem limits) is not a realistic training scenario for the student and may not be beneficial. It is impossible to conduct an effective canopy control lesson when you are busy dealing with the challenging conditions.
- Allowing your student to flare can result in injury to both of you. Check with your CI before trying this.
- It is best to get the student to begin their deployment procedures at 6,000 feet. This allows for a slow response.

PART 11 - UNUSUAL DESCENTS

In this Part:

- Students with disabilities
- Operating on Restricted Drop Zones
- Display jumps
- Night jumps.

11.1 Students with Disabilities

Disabilities are not necessarily a barrier to Tandem descents. There are excellent resources available for Wheelchair Dependent Persons¹, and probably a range of experience at your DZ. As a novice Tandem Master, you should observe and note unusual situations of this nature at your DZ until you feel comfortable performing them yourself.

Visualisation

The first step in considering a descent with a disabled person is to envisage yourself as the student. Could you perform a descent as a student if you:

- Were blind?
- Were deaf? Deaf people need a thorough ground briefing with touch/hand signals.
- Had the amputation of a limb to contend with?
- Had a nervous system that made your movements unpredictable?
- Had an incurable disease?

Briefing

The second step is to brief the Student. Disabled people should be treated as regular students until, and unless, their disability manifests.

For example, a student with a prosthetic leg should be asked to demonstrate lifting their legs for landing; it is highly likely they can already perform this task without the need for you to make suggestions.

With a deaf person: we rely so heavily on voice commands, so briefing a deaf person and ensuring they can respond appropriately in a stressful situation requires careful planning.

Risk Analysis

As an example, amputees can and do regularly skydive. However, fitting of a harness to a high-leg amputee without an adequate base to fix the harness may be disastrous. A case which received much publicity involved the second skydive of a person with poor motor skills, who was not capable of reaching the aircraft door unassisted; he moved sufficiently in the harness during the climb out and exit process to slip through the harness on parachute opening.

Whilst your human nature may encourage you to share skydiving with any and all students, there are many situations, some of which can be performed safely and some of which cannot. If you have any doubts as to the ability of yourself and your student to perform the required tasks, the jump should not proceed.

Each case should be reviewed on its merits, and your DZSO and Chief Instructor need to be involved. They may additionally have a network of contacts that can provide experience for the situation.

Do not be afraid to say yes; but do not be afraid to say no.

¹ Paul Murphy, "Tandem Skydiving with Wheelchair Dependant Persons", available on the APF website or can be found [here](#).

11.2 Restricted Operations

These are permanent operations that have a landing zone that would otherwise qualify as a display jump (within 600 metres of a populated area). They therefore operate under the same conditions as a display and require all the same considerations as a display jump (see Display Jumps below). They are supervised by the CI, not the Display Organiser. They are approved by the STO.

11.3 Display jumps

Professionally conducted display jumps are an excellent showcase for our sport and when including tandems illustrates to the public just how safe it is for anyone to make a first jump.

The main consideration when taking Tandems on displays is the increased risk involved in the event of an off-DZ landing. As with any display, you should ensure there are suitable out landing areas available and that you have an experienced spotter on the load. Knowledge of winds at all levels is imperative. Additionally, look for the DZ in freefall and be prepared to open high if necessary.

If conditions are marginal, be cautious when making your decision to jump – remember, your student is relying on you to do the right thing.

APF Operational Regulations require the approval of both a Display Organiser and a Chief Instructor to allow a student on a display. The Operational Regulations outline minimum experience requirements of the Tandem Master.

11.4 Night Jumps

A Tandem night descent must follow all the operational and regulatory requirements for a night descent. Please refer to appropriate Operational Regulation for the current requirements.

11.5 Review Questions

1. What considerations would you need to make for a deaf and blind person? How would you brief them, and what resources may be available to help you?

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2. Research and list the Op Regs that are relevant to Tandem Displays:

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3. Research and list the Op Regs that are relevant to Tandem night jumps:

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Display onto Surfers Paradise beach for the 2015 Castrol 600 Supercars. Celebrity Tandem students into high traffic public areas and with mainstream media coverage increase exposure but must be very well managed. For the event, Gold Coast Skydive took Dani Byrnes, model and ambassador, and retired AFL footballer Peter 'Spider' Everett for a Tandem.

PART 12 - RISK MANAGEMENT

Let's be realistic: we are in a risky business. As a Tandem Master, you have a duty of care to manage the associated risks. The aim of risk management is to:

1. Protect your student and yourself from injury; and
2. Protect you and your Dropzone from litigation.

Your Group Member has a mandatory Safety Management System (SMS) and you must become familiar with its contents and participate in its implementation. It is a living document that is regularly updated. See your Chief Instructor (or Group Member Safety Manager) for a copy before attempting the review questions at the end of this chapter and prior to your ID written assessment.

12.1 Compliance

The rules are there for a reason. Firstly, when adhered to, they provide the best safest practice known to us at the current moment. They have evolved over time and continue to do so, to avoid history repeating itself. Compliance equals safety.

Secondly, if we follow the rules to the letter, we greatly reduce the risk of legal liability. If we do neglect a rule and an injury occurs, then we will easily be proven negligent in a court of law. In addition to the Op Regs, the Training Operations Manual also must be followed. It is relevant to Tandems as it contains the requirements for briefing of a Tandem Student.

Manufacturers of tandem equipment also have requirements which must be adhered to. These include, but are not limited to: Load Limits (see equipment Part) and the approval of AAD types.

Your Instructor and tandem written exams will test your knowledge of Rules and Regulations relevant to tandem skydiving. Please take the time to study them, the Training Operations Manual (TOM), the Instructor Guide and all the other material included with your study package.

12.2 Other things you can do to manage risk

In addition to compliance and participation in your Group Member's SMS, there are some other tricks of the trade which assist with Risk Management:

- Filming the landing practice. The most common tandem student injury is a broken leg on landing, caused by the student reaching for the ground. By filming the landing position practice on the ground, we have evidence to confirm that adequate training was provided. Film this under canopy also, if you have 'Hand Cam'.
- Never give a verbal guarantee of safety to a student.
- When coming into land on finals, repeatedly say the words: "Legs up, legs up, legs up". Do this so others on the ground can hear you.
- Never apologise for anything. You are admitting fault when you do this and it may come back to bite you.
- Explain the waiver to the Student/Guardian.

12.3 Response plan

A good response plan to an injury or suspected injury is key to risk minimisation. Your Group Member's SMS covers the DZ's emergency response plan. In the event of an injury:

1. Assist student comfort to the best of your ability. Never move a student who you suspect may have back injuries. Never give water to a student who may have internal injuries.
2. Call for Ambulance.
3. Never say sorry or admit fault.
4. Gather written witness statements. Things such as the student admitting fault are very important things to have witness to.

5. Fill out an Incident Notification (Form IN1) and Supplementary Incident Notification (Form IN2). Take care to use appropriate wording – seek assistance if in doubt.
6. Show concern by following up with the student’s recovery progress.

12.4 Fatigue

Fatigue and other non-physical aspects of fitness for parachuting (e.g. stress) have the potential to impair the ability of individuals to perform parachuting activities in a safe and efficient manner and as such are a risk factor that we have a duty to manage.

Fatigue is a physiological state of reduced alertness or capability to perform mental or physical tasks, which:

- (a) may impair your ability to jump safely;
- (b) is caused by one or more of the following:
 - (i) lack of sleep;
 - (ii) extended wakefulness;
 - (iii) circadian phase at any relevant time;
 - (iv) workload of mental activities, or physical activities at any relevant time;
 - (v) parachuting-specific contributing factors, such as self-packing and use of non-turbine aircraft.

Fatigue has been shown to have similar negative affect on performance to alcohol.

Experienced fit Tandem Masters have reported feeling fatigued by the end of a long weekend having performed 12 to 15 Tandem jumps per day.

You must ensure you are not impaired by fatigue or any of the other debilitating factors. This should include liaising with your CI and DZSO to ensure your rostering and workload don’t compromise health and safety. Check your Group Member’s SMS (component 5) for coverage of “Human Factors” regarding fatigue and Stress.

12.5 Review Questions

1. What does risk management mean to you?

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2. Who or what is at risk if you do not abide by the rules or fail to adhere to your training?

- (a)
- (b)
- (c)
- (d)

3. If you are unsure about the student or the conditions what would be your course of action?

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4. In which section/s of the APF Rules and Regulations would you find the procedures dealing with incidents?

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5. Which organisations, either directly or indirectly, require APF training organisations to comply with written Safety Management Systems?

- (a) International Civil Aviation Organisation
- (b) Civil Aviation Safety Authority (CASA)
- (c) Australian Parachute Federation (APF)
- (d) All the above.

6. Who has primary responsibility to ensure the Safety Management System is incorporated in the Group Member's activities?

- (a) DZSO
- (b) Group Member Safety Manager
- (c) CI
- (d) Senior Pilot
- (e) The Group Member's Nominated Person.

7. Does the Group Member Emergency Response Plan form part of the written Safety Management System?

- (a) Yes
- (b) No
- (c) Don't know

8. To what amount have human factors contributed to aviation accidents and incidents?

- (a) 25 to 35%
- (b) 45 to 55%
- (c) 55 to 65%
- (d) 75 to 85%

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9. You are aware that another Tandem Master at your Group Member is suffering obvious signs of fatigue in the middle of the day with about 4 to 5 hours of operations left to conduct. What action would you take?
- (a) Report by phone immediately to the STO (Safety and Training Officer).
 - (b) Report the situation to the DZSO or Chief Instructor for them to take action.
 - (c) Speak to the Tandem Master yourself and tell him/her it is obvious that he/she is not fit for operations and counsel him/her to talk to the Chief Instructor.
 - (d) Take no action; it's none of my business.
10. What non-work-related causes could result in fatigue leading to bad decisions and lack of awareness in the air?
- (a) Having a second job.
 - (b) Long commutes to and from work.
 - (c) Changes in domestic arrangements (new baby, loss of a partner)
 - (d) All the above.

PART 13 - WORKING IN THE INDUSTRY

13.1 Customer Service

It's part of the job

Today's Skydiving industry is a far cry from the small club style environment that it used to be. It is a fiercely competitive and professional business. To be competitive, excellent customer service practices play a big part of a business's success. Some Tandem Masters have had prior training or background in these skills from past work experience. For those who have not, we will provide you with some exposure to 'Customer Service'.

What is excellent customer service and why provide it?

For a customer to feel that they have received excellent service, they must feel that they have had all their expectations either met or exceeded. The benefit of providing this feeling of total satisfaction, is that the customer will go away with such a positive feeling, that they will look forward to coming back themselves and enthusiastically promote your business to other potential customers.

Customer expectations and your role

Because of competition, customers have choice. Because of choice, they have grown to expect good service. Customers expect service providers to show respect for the fact that they have chosen to spend their hard earned money with your business and not someone else.

So how do you, the Tandem Master, demonstrate respect and provide good service to your student the customer?

Presentation

Always be dressed well. Most DZs have a uniform. Make sure it is clean. If you wear a jumpsuit, keep it presentable. Always be shaven (males) and smelling good. It is a good idea to keep underarm deodorant and breathe fresheners at work. You come in very close contact with your client. Be aware that your presentation and personality will be on your student's video for life. Make sure it is how you would like it to be seen by others.

Demeanour

Be friendly and show interest in your student. They are spending a lot of money. Make them feel special.

'Bad Tandem safety jokes', whilst may seem funny to you and your colleagues, often are not appreciated by your student. It is their first jump and more than likely are very nervous. Don't take advantage of this. They look up to you and are relying on you to install confidence in them. Don't treat them like an idiot. You wouldn't do it to an AFF student, don't do it to a Tandem student.

Equipment

Demonstrate respect and care for your equipment in front of your student.

Student goggles should be in excellent condition. They should also be cleaned and sterilised before each use. Ensure they are tightened properly before exit. Goggles coming off in freefall is poor form and should be cause for a re jump at your expense.

Gloves should definitely be offered in cold conditions.

Pre Jump

Try not to rush through your brief. Give them value for money.

If there are time delays, keep your student informed as to what is happening and why.

Offer your passenger a drink of water prior to jump. Adrenaline creates the 'dry horrors' and subsequent discomfort. You need your passenger to be not dehydrated also to help with their performance.

In the plane

Show care, by asking "Are you comfortable?"

Introduce your student to others on the plane. Make them feel important.

Choose your words carefully. Ask them to “put their feet apart”, so someone can sit in front of them. Don’t say “Spread Your Legs!”

Connecting-up

Choose your words carefully here to. A better wording for “Sit on my lap” could be “Sit on my knees please”.

There have been plenty of complaints over the years from Tandem Students, who have felt the genitals of male Tandem Masters whilst connecting-up. This is absolutely inappropriate, unacceptable and completely avoidable by correct positioning of the student and yourself.

Prior to exit, check how your student is feeling. After connecting-up allowing your Tandem student to check they are connected by trying to move forward away from you. Putting tension on the straps and going nowhere is a great confidence booster.

Talk them through the next step and give some words of encouragement.

Under Canopy

Congratulate your student, even if they performed incorrectly. It’s their first jump.

Ask your passenger if they want to do spiral turns. Don’t assume.

The average Tandem costs around \$75 per minute, or \$1.20 per second. By turning and descending quickly to speed up your day, you are ripping off your student. Give them value for money.

Landing

A safe landing is paramount. Not being able to walk away with a smile on their face = not good service.

After the jump

Although you only see a small portion of the money the student has paid for the service, you are responsible for providing the student with all the value for that money. In doing so, you will ensure that more and more people keep coming back to your DZ.

Recall the great opportunity you have as the Instructor to market our sport to potential first jump course candidates (see section 7.7).

13.2 Female Tandem Masters

The following was offered by female Tandem Master, Isobelle Dore. Issy is one of Australia’s most experienced female Skydivers. She recently (at time of writing) surveyed all of the female Tandem Masters in Australia.

As, at the time of writing, only 3% of Australian Tandem Masters are female, we thought it valuable to include these words of encouragement and advice.



“I have been a Tandem Master since 2005 and have completed over 2000 tandems for various operations. I have really enjoyed the path it put me on, learnt a lot and think it’s well within the reach of most females and a great thing to do.

I believe the two biggest challenges for female Tandem Masters are canopy landings and confidence.

Canopy landings

More than half the women said this was the hardest part and had some issues with fear of injury or bad landings. It really is a confidence thing. Women need to be more aggressive with their canopy piloting. Generally, most modern tandem canopies need a bit of speed to get good landings. Knowing how to get

that speed through a range of techniques is essential. Examiners take note. Most tandem courses don't include any canopy training at all. It is presumed that the candidate already knows how to fly their parachutes. The best thing you can do for the ladies is to go over different techniques of flying, of flaring, and encourage them to be more proactive in achieving a good landing.



Confidence

With confidence anything can be achieved. Whatever it takes to have that confidence, go and do it.

If you need to go to the gym to work out and build upper body strength, then go do it. If you need to ask questions of every single Tandem Master you respect, then do it. If you feel like you need extra training jumps, then do it.

If you are short and small, go find a short small Tandem Master to talk to. If you're tall and skinny, go find someone the same and ask their advice. In my experience, other Tandem Masters and work mates are more than happy to help you out. Spend as much time as you need to feel like you have the essential information.

One of the biggest problems I encountered was the lack of confidence in my abilities by male passengers. I talked to my CI about it and we worked out it had a lot to do with my handshake and meet and greet of my customers. Most females don't get into handshakes and I was giving the guys this 'limp wristed' handshake when I met them. Little did I know just how important this is to the fellas and how it struck fear and horror into their hearts! This is not news to any woman in business, but I was astounded the difference it made when I looked the passengers straight in the eye and gave them a solid handshake. The men were instantly more relaxed and had way more confidence in my ability to save their lives!!

Other issues for females include large heavy rigs and finding CI's and examiners that would believe in them and take them on. Some smaller girls set lower weight limits and this can be an issue at some Drop Zones. I think Jules McConnell summed it up well when she said,

"Tandem Skydiving is male dominated. Don't put more pressure on yourself just because you're surrounded by males. Be true to yourself, your experience and your abilities"

Know that any skydiver, male or female, can overcome any strength issues when shown the right technique.

One CI gave me this hint, "In many activities individuals who can't rely on brute strength to achieve an outcome develop better technique- this is commonly seen in activities like rock climbing where the difference between power and technique and easily observed."

Mostly, women are generally pretty resourceful and are capable of finding the information they need. It's a great job and an awesome and fun way of earning money. Well-presented girls with a good manner with the customers are always a winner. One CI confided to me that he liked female Tandem Masters because they smelt a lot better!!! All CI's, I interviewed loved having female Tandem Masters working for them.

So get in there and do it. If you're up for a bit of fun, a challenge, an awesome working atmosphere in some of the most beautiful places in Australia and around the world, doing tandems is for you."

13.3 Burnout Management

What is 'Burnout'?

'Burnout' is a psychological term for the experience of long-term exhaustion and diminished interest. It is a common issue in most work places, including the skydiving industry. (Note: Fatigue is a separate issue discussed in Part 14.) For those that experience burnout, the result is a level of reduced performance in some or all aspects of their job role.

Signs of 'Burnout'

To prevent or manage burnout, it is important to know the signs that indicate you are experiencing burnout:

- Feeling run down and drained of physical or emotional energy.
- Finding that you are prone to negative thinking about your job
- That passionate feeling you once had towards your jumping is disappearing.
- You are harder towards your students and less sympathetic of their needs.
- You are getting involved in negative politics at work.
- You were attracted to the steep learning curve that Skydiving gave you, but now you feel you are not achieving.

Prevention

When you think about it, to generalise, Skydivers all have something in common, which is what got us into the sport in the first place. We share the need for a higher level of stimulation than most the population. We love to learn progress and be challenged. We don't mind working hard, but everything we do needs to be fun. Considering this, it is easy to see why we are prone to burnout.

Understanding our individual needs, can help us identify ways toward preventing or recovering from burnout. Here are some ideas you may like to consider:

- Have other interests outside of your work jumping. Don't see your job as a means to an end, rather a means to achieving other things, either in the sport, or other areas.
- Don't get stuck at ID level. You can have a progressive career in Skydiving. Keep upgrading your ratings.
- Keep on moving companies. A change is as good as a holiday. This is a great way of avoiding involving yourself in negative politics, which can occur if you've been somewhere too long. Our industry provides good opportunity for transience. If you always leave on a positive note, then you'll always be welcome back.
- Keep fit and healthy. A fit body, promotes a fit and positive mind (see also Part 14 on Fit for Parachuting Activities).
- Talk to experienced 'long term' career skydivers. Ask them how they have stood the test of time.
- If you are having a problem at work, then talk to your employer before it escalates. Don't stew on things.
- Having a 'Blue patch'? Consider the alternatives! Sometimes you just need to remember how good you've actually got it.

The skydiving industry can provide for a unique, diverse and rewarding career. But like all careers, it has its ups and downs (excuse the pun). One thing to be aware of is that we are a relatively new industry. Other more established industries and work places include 'burnout' management as part of their Work Health and Safety programs.

PART 14 - WORK HEALTH AND SAFETY

Whilst employers and workers (employees, contractors, etc.) have specific Work Health Safety (WHS) obligations under WHS legislation, APF Members also have safety obligations under APF Rules and Regulations and in some cases, to CASA and other statutory bodies under legislation and subordinate instruments.

In this Part:

- Fit for parachuting: Meeting your obligations, physical fitness and flexibility
- Technique versus strength and correct lifting
- Physical and mental preparation
- Communicable diseases
- Fatigue

14.1 Fit for Parachuting Activities

Your obligation to be unimpaired

As with any physical activity, the fitter you are, the better you will perform. It is also an important element of maintaining work health and safety that you are fit for parachuting activities. A Private Pilot Medical Certificate or CASA Basic Class 2 Medical Certificate assesses your fitness to act as a Tandem Master for a set period (e.g. 2 to 4 years).

The APF recognises that a parachutist's fitness for parachuting activities may be affected by a variety of factors including the adverse effects of sickness, fatigue, stress, alcohol or drugs. These factors can lead to impairment of a parachutist's fitness for parachuting activities and can be a contributing factor in incidents and fatalities.

"Fit for parachuting activities" means that you are in an unimpaired state (physical, mental and emotional) enabling you to perform parachuting activities competently and in a manner which does not compromise or threaten your health or safety or that of others.

Tandem skydiving won't make you fit, but you will perform your job with greater ease if you keep up some form of fitness program. You must also seek expert (medical) advice if you develop any form of condition that may affect your ability to safely act as a Tandem Master.

Aerobic Fitness

Medium to longer distance running, swimming and cycling for example, benefit your aerobic fitness. This form of fitness improves your ability to transport oxygen around the body. It also gives you greater energy to get through your day, not to mention more mental alertness.

Being aerobically fit:

- Allows you to perform more effectively in situations where there is less oxygen available
- Gives you greater energy to get you through your day
- Increases mental alertness

Anaerobic Fitness

Weight training etc. will develop your anaerobic (strength) fitness. This relates to your ability to exert quick bursts of energy. If you are not interested in joining a gym, even some 'push ups' and 'sit ups' a few times a week will give you results.

Being strong:

- Makes it easier to steer and flare Tandem canopies
- Makes it easier to control your student in various parts of the Tandem Process

Flexibility

Yoga, Pilates and basic stretching routines, are great for flexibility. As a Tandem Master, you will benefit greatly from this form of fitness.

Being flexible:

- Improves blood flow around the body
- Improves muscle strength
- Reduces the chance of injury
- Makes it easier moving around in small spaced aircraft

14.2 Technique versus Strength and Correct Lifting

There are various physical tasks in the Tandem jumping process that will initially seem to require a great deal of strength. However, with the refinement of your technique, the need for strength is reduced.

Some examples:

- Connecting-up Student: have the student assist you with the tightening of side adjusters
- Under canopy: Have student stand on your feet to take weight from the harness, so you can more easily undo the side clips
- Under canopy: Have your student steer for you to conserve your energy
- If you find something difficult or straining, talk to an experienced Tandem Master about it. Sometimes the smallest things can make a big difference

Correct lifting is important

Tandem equipment weighs around 20kg. It requires the incorrect lifting of much less to injure your back. Be mindful of this when donning your Tandem rig. Always squat down and never bend your back to reach for the rig. Keeping a straight back and let your legs do the work involved in lifting the rig. Never use your lower back muscles to lift something.

Placing the rig on a higher surface like a chair or bench can make it easier to don. Conserve your energy wherever you can!

14.3 Physical and Mental Preparation

Hydration

The human body requires the consumption of approximately 2 to 3 litres of water today, to maintain its normal level of hydration. This varies depending on the environment and physical activity. The dryer or hotter the environment and the more physical activity, the more water is required.

Dehydration causes symptoms such as: Light headedness, decreased alertness and muscle fatigue. Dehydration is therefore detrimental to your ability to carry out your job as a Tandem Master safely.

Take steps to make sure you are regularly topping up on fluids. Water and sport hydration drinks are good. Soft drinks are not good. They are high in sugar and increase dehydration.

A good test as to whether you are drinking enough fluid is to check your urine colour. A clear colour suggests that you are sufficiently hydrated. A darker colour indicates that you are not.

Diet

The right selection of food intake will greatly assist your mental and physical energy. This is an important consideration for a Tandem Master, especially if you have a lot of jumps to do. It is not uncommon for you to be required to do 8 to 12 jumps per day. You want to be as focussed on the last jump of the day, as you were on the first.

Beneficial:

- Eat a good breakfast: Look for foods that are high in Complex Carbohydrates but low in sugar. (Cereals such as 'wheat-bix', brown bread). These will give you lasting energy for your day.
- Fruit

Detrimental:

- Foods high in sugar: Chocolate and other high sugar foods will give you a quick but temporary energy boost but will then leave you feeling flat shortly after.
- Energy Drinks: Tests have shown that these drinks can improve concentration and physical endurance. Moderation is the key. One a day is ok. They are often high in caffeine. Amounts greater than 400mg per day can cause dehydration, anxiousness, irritability, insomnia, abnormal heart rhythms.

Sun Protection

Long periods of exposure to the sun is a major contributor towards Skin Cancer. It also increases dehydration.

As a Tandem Master, opportunities to be exposed to the sun are many.

- Wear Sun Screen with a high UV protection rating.
- Wear protective clothing: long sleeves, hat.
- Avoid packing in the sun and any other unnecessary exposure.

Hearing Protection

If you don't already, now would be a good time to start wearing hearing protection. Over time, aircraft noise, freefall noise and rapid changes in air pressure will damage and reduce your hearing. Take note when you next have a conversation with the older jumpers in our sport at the hearing difficulties they have. Once you've lost it, you cannot get it back.

Mental Preparation

- Get plenty of sleep before work jumping.
- Don't jump if you are mentally distracted by other issues.
- Always rehearse your emergency procedures at the start of the days jumping.

14.4 Communicable Diseases

There have been no official reported incidences of a Tandem Master contracting a disease whilst carrying out their duties as a Tandem Master. But when you think about what the job entails: Shaking peoples hands, being in very close proximity in confined spaces to others, in the firing line of nasal and oral secretions, the risk is there.

Some of the common transmissible diseases that exist are the common cold, influenza and Hepatitis A/B/C.

Transmission of an infectious disease may occur through one or more pathways including physical contact with infected individuals, through liquids, food, body fluids, contaminated objects and airborne inhalation.

Prevention is in most cases the only cure:

- Wash your hands regularly
- Avoid touching your mouth, nose and eyes
- Do not share goggles. Sterilise passenger goggles after each use. 'Best Practicing' DZ's will have sterilising wipes available. Bring your own if not.

- Refuse to jump with someone that is clearly displaying signs of illness.
- Keeping fit and healthy increases your resilience.
- Ensure you have a sick bag for your student.
- Vaccinations are available for Influenza, Hepatitis A and B. It is recommended you get them.

You should also review your Group Member SMS on fatigue and stress.

PART 15 - ACTING AS GROUND CONTROL ASSISTANT

As an Instructor, the Op Regs allow you to act as a Ground Control Assistant (and Target Assistant). Whether you are a candidate for an AFF, SSF or Tandem endorsement, the study guides for each endorsement is the only place this learning material appears. See the TOM for sample written assessments for each role.

15.2 Acting as Ground Control Assistant (GCA)

What you must be able to do

Acting as a GCA involves five key practical elements:

1. Preparation: Access the information, identify hazards, seek advice, inform pilots and loadmasters, confirm details of each load and appropriate conditions.
2. Aeronautical radio: Set-up, select correct frequency, operate using the appropriate basic radio procedure, shut down.
3. Radio language: Use appropriate phraseology and phonetic alphabet.
4. Communication using an alternative ground-to-air communication strategy (without radio), e.g. using target panels.
5. Monitor the weather, aerial activity of participants and ground conditions.

Contact your course convener for appropriate study materials and guidance. Prior to being permitted to act as a GCA, you will need to pass the GCA assessment and be authorised by your CI as such.

15.3 Review Questions

See the TOM, Appendices Q for questions on Ground Control Assistance.

APPENDICES

Appendix A: Resources

Links shown are for convenience and correct at time of writing. Manufacturers often update documentation as well as websites, and other material such as rigging advisories are often available at their site. Find the appropriate section for your sub-endorsement and research further.

United Parachute Technologies <https://uptvector.com/>

Strong Enterprises Dual Hawk Tandem <http://www.strongparachutes.com>

Parachute Labs Racer Tandem (ex JumpShack) <http://plabsinc.com/>

Icarus Tandem Canopies <http://www.nzaerosports.com/canopies/icarus-tandem/>

“Tandem Skydiving with Wheelchair Dependant Persons” by Paul Murphy
<https://www.apf.com.au/Docs-Forms/Prescribed-Training/Tandem-Master-s-Handbook/Tandem-Skydiving-with-Wheelchair-Dependent-Persons/default.aspx>

“Instructional Tandem Handycam”, a thesis by Stephan Kleinlein
[https://www.apf.com.au/ArticleDocuments/65/APF%20Handycam%20Jumping%20DVD%20Tool%20Thesis%20Final%202nd%20Edition\[1\]%20reduced%20size.pdf.aspx](https://www.apf.com.au/ArticleDocuments/65/APF%20Handycam%20Jumping%20DVD%20Tool%20Thesis%20Final%202nd%20Edition[1]%20reduced%20size.pdf.aspx)

Recommended Water Landing Procedure video
<https://www.apf.com.au/apf-members/safety-training/safety-training#TandemWaterLanding>

Appendix B: Jumping Tandem Equipment with RSL's

By Scott Grist, IA

By the time the candidate reaches the necessary skill and experience level required to undertake Tandem Master training, they will have no doubt made up their own mind as to the pros and cons of jumping with a Reserve Static Line (RSL) attached. However, for a number of reasons, undertaking this training and jumping as a Tandem Master may require that these ideas be reviewed in light of the important differences that will be encountered.

Jumping with a passenger changes the reserve deployment dynamic considerably; meaning that there are additional pros and cons for RSL's to be considered in addition to those already understood by most experienced sport jumpers. Additionally, UPT Sigma tandem rigs now come equipped as standard with the Skyhook reserve deployment system, the benefits of which may be sufficient cause to re-consider the use of an RSL.

It should also be noted that Operational Regulation 11.2.6 states, "A Tandem Master must use a connected RSL on a tandem descent unless the CI under whose authority the descent is conducted, has approved otherwise." For the new Tandem Master, this may mean that they may be required by the CI of the DZ to either connect or disconnect their RSL, in conflict with their own usual practices – possibly for the first time in many hundreds of jumps. This being the case, it is important to understand all of the implications of that change and be ready to adjust their procedures and thinking accordingly.

To use or not use an RSL in general is often a hotly debated topic and most reasons for choosing to use, or not use, an RSL on tandem jumps are similar to those frequently debated for standard two action sports systems. There are however some important differences with tandem jumps that can influence our thinking:

- Standard tandem deployment height is much higher than typical sport jumps, so the majority (though not all) malfunctions will occur high, under a large and relatively slow descending canopy, therefore giving much more time to respond.
- Offsetting this is that equipment and emergency procedures are more complicated than other types of jump. Student interference and/or trouble regaining stability after cutaway can also use this time up fast, and loss of height awareness while trying to regain stability is a potential problem.
- Standard tandem AAD fire occurs at ~2,000 feet. This means that the reserve will be deployed sooner and at a safer height in the event of loss of height awareness. It also means that any cutaway near or below this height is likely to result in an almost immediate AAD fire and reserve deployment with or without activation by an RSL.

The difference between conventional RSLs and Skyhook

It is important to note the main difference between the Skyhook system and a standard RSL because it will affect some of the arguments stated here: Although both systems use the cutaway main to activate the reserve, the RSL only pulls the pin, whereas the Skyhook uses the whole cutaway main as an anchor to pull the reserve to line stretch. This means:

- A conventional RSL does not actually deploy the reserve any faster; it just makes sure the pin is pulled in the quickest possible time.
- Skyhook can and does truly provide a faster reserve deployment.

Arguments for using an RSL on Tandem jumps:

- *Eliminates low/no reserve pull from loss of height awareness after cutaway.*
This is undoubtedly true.
- *Prevents potential problem where the Tandem Master may be unable to pull reserve handle due to passenger interference after cutaway.*
This is probably the strongest reason for using an RSL on tandems. Tandem passengers will frequently panic and grab anything in their reach when they feel the drop of the cutaway. This may be prevented to some extent by getting the passenger to cross their arms or grasp their harness prior to cutting away, but the results are far from guaranteed.

- *Ensures immediate opening of reserve container following cutaway.*
It can be argued that this immediate deployment means the reserve is out before the tandem pair have a chance to go unstable or flip onto on their back. This is probably true for a reasonably stable cutaway but may not be true for more violently spinning malfunctions.
- *Allows use of Skyhook system (on rigs so equipped).*
Notably, the UPT Skyhook system has been shown to deploy the reserve to line stretch so fast that the tandem pair has practically no chance of tumbling through the lines. It also has the benefit of increasing the safety margin on low cutaways due to extremely fast deployment of the reserve. The Skyhook system requires that the RSL must be connected in order to function as designed; if you want Skyhook you must attach the RSL.

Arguments against using an RSL on Tandem jumps:

- *RSL removes independence of main and reserve systems.*
A connected RSL does not allow staging of cutaway and reserve deployment (unless the Tandem Master remembers to disconnect RSL prior to cutaway). A properly staged deployment allows time to become stable, giving the best possible platform from which to launch the reserve. The usual higher tandem cutaway altitudes allow time for this; in most cases it is not necessary or even desirable to deploy the reserve in the fastest possible time, and definitely not if this compromises the chances of a good deployment.
- *RSL may deploy the reserve while unstable or turning after cutaway.*
Instability may result after even a simple stable cutaway but is highly likely in the event of cutting away from a spinning malfunction; the tandem pair is likely to end up on their back at some point and they will almost always be spinning as the reserve opens (even with Skyhook systems). This is likely to result in line twists in the reserve.
- *Extra complication of already complicated emergency procedures.*
There are emergency situations where a staged deployment may be crucial; for example, a canopy collision or drogue entanglement with camera flyer. In these circumstances a connected RSL must be disconnected before cutaway, but this may be easily forgotten in the heat of the moment and while busy with an already complex emergency situation. This is even more likely to be a problem if the new Tandem Master is also “new” to the use of RSL’s. The RSL also needs to be disconnected if cutting away the main after landing in high winds (however this will only ever result in a popped reserve container, which is a nuisance but not a safety concern).
- *RSL may deploy reserve into horseshoe malfunction if a cutaway is executed before the drogue is released.*
If the main has begun to deploy while the drogue is still attached, and the Tandem Master responds incorrectly by initiating a cutaway prior to clearing the drogue, an RSL will activate the reserve with a high likelihood of entanglement. This can of course be avoided by executing the correct emergency procedures in response to an out of sequence deployment and is not really a fault of the RSL system as such, but it can make an already bad situation rapidly worse.
- *RSL may deploy reserve before cutaway is complete.*
A failure at the 3-ring of the riser connected to the RSL can activate the reserve while the main remains connected to the harness by the other riser. Tandem systems have design features to prevent this from happening by completing the cutaway of the other riser (i.e. Collins lanyard or similar). When functioning correctly these systems make sure the cutaway cable is pulled, but they cannot ensure that the riser actually disconnects; a jammed 3-ring can still result in an incomplete cutaway. These systems can also fail or be miss-rigged.

- *Possible hang up of a very low-drag malfunction on the RSL after cutaway.*
Although unlikely, it is possible for a low-drag malfunction to not have enough force to activate the RSL immediately, meaning the cutaway will still be attached to the harness by the RSL itself. This allows a chance for the tandem pair to tumble and become entangled with the trailing rigging.
- *Increases possibilities of premature deployment from extra snag points.*
This is always a possibility but is very minor with properly rigged and maintained equipment.
- Unnecessary complication of rigging increases chance of miss-rigging*. Although this should not happen—history shows that it does.

Note*: Whether you are for or against their use, what is very clear is that poor maintenance and miss-rigging is a significant contributor to many accidents involving RSLs and has resulted in a number of fatalities. Many of the situations described above may be largely avoided by correct knowledge of how the RSL system is designed to function on your equipment and due care when inspecting the equipment before a jump. It is also important to realise that the different manufactures of rig often have different RSL design features that must be fully understood to make sure they are rigged properly.

Considerations if using an RSL on Tandem jumps:

- Check that the connected RSL is correctly rigged, will operate the reserve system as designed and not interfere with the normal function of the two action system. Make sure the Collins lanyard (or equivalent system) is installed and correctly rigged.
- Must remember to disconnect RSL if a staged deployment is needed and build this into emergency procedure rehearsals.
- Must be confident of ability to rectify line twists in reserve.
- Correct order of handles in emergency procedures even more crucial.
- Must remember to disconnect RSL if cutting away on the ground in high winds.

Considerations when not using an RSL on Tandem jumps:

- Check that the disconnected RSL is rigged and stowed correctly and will not interfere with the normal function of the two action system.
- Must be sure that the reserve handle is in hand before cutaway and be confident that reserve pull can be completed (with or without passenger interference).
- Must be confident of height awareness after cutaway.
- Must be confident of ability to regain stability after cutaway.

Appendix C: Sigma and Vector Student Harnessing Guides

Introduction to the Sigma / Vector Tandem Student Harness

The Sigma / Vector Student Harness is quite a departure from previous tandem student harnesses. It was designed, with the help of a cardiologist, to safely contain the human body without cutting off normal blood flow. Disrupted blood flow is why almost all students on older student harnesses were uncomfortable, and why many got sick or even passed out.

A hip-hugging horizontal back and belt strap combination allows the main lift webs to be positioned, and held, more toward the front of the upper body than on other designs. This prevents the “squeezing” of the upper body and the inside of the upper legs which can cut off blood flow. It also automatically lifts the legs up and forward after opening, putting them in a safer position for landing.

The Student Harness was designed to comfortably and safely fit a wide range of body sizes and types. To accomplish this, it has twelve points of adjustment. This wide range of adjustment means that it is possible to give a tandem student a truly comfortable experience on their tandem skydive. However, the harness must still be adjusted securely to fit the student’s body to prevent them from falling out in extreme situations and unusual body positions.

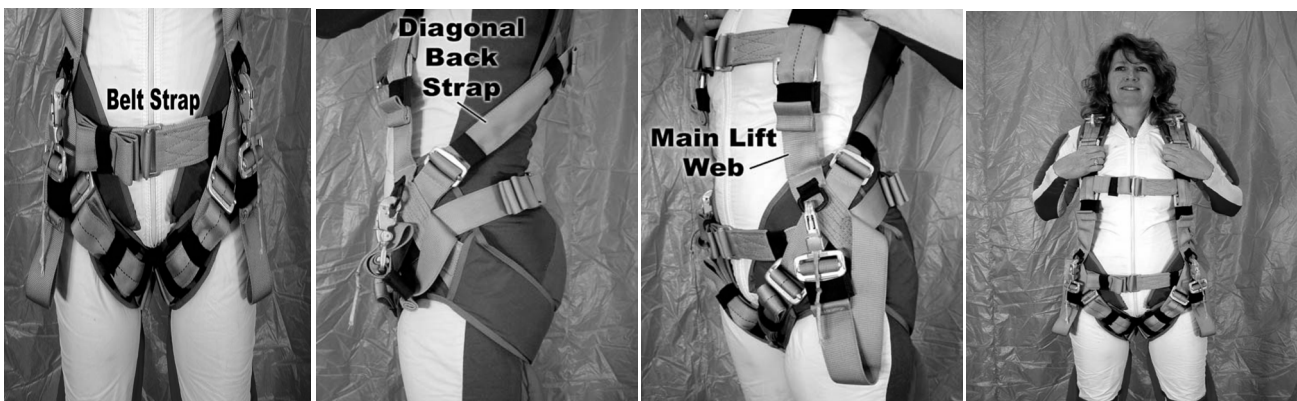
While fitting this harness on a tandem student is not difficult, it is different from other harnesses you may have used in the past. The most important point to consider is the security of the student. You must insure that all straps are comfortably snug against the student’s body.

Please use the following guide to keep your students safe and comfortable.

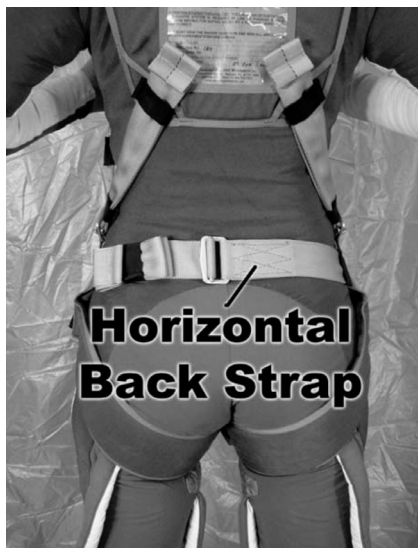
THE SIGMA / VECTOR TANDEM STUDENT HARNESS

Adjustment Guide

1. Loosen the harness before donning.
2. Rotate the harness on the student’s shoulders so the Top Attachment Snaps will be easy to hook-up.
3. Adjust the chest strap loosely.
4. Adjust the Belt Strap so the main lift webs are positioned as shown. The Horizontal Back and Belt Straps should be tightened firmly around the hips.
5. Adjust the Main Lift Webs and Diagonals so the harness’s Hip Junctions are resting squarely on the student’ hips.
6. Tighten the Leg Straps.
7. Slide the Chest Strap vertically into the correct position and tighten.



Tip: It’s recommended to hook up and pre-hang your student so the harness conforms to the student’s body. Release the student and check all adjustment points. You may find it necessary to tighten the harness a bit more.



The Horizontal Back Strap must be positioned low and securely tightened. This is what keeps the student from falling backwards out of the harness on a hard opening.

On anyone with a larger body frame, the Main Lift Webs should be positioned further apart than on a smaller person. There is no single right way to fit every size or shape of the human body.

The harness has 12 points of adjustment. Use them to totally surround and contain the student's body. Notice how the main lift web is positioned more toward the side of the body than it would be on a smaller person. From this position, six straps, going in every direction, totally contain the pelvic area.

This containment appears appropriate on this person when the Main Lift Webs are further apart.



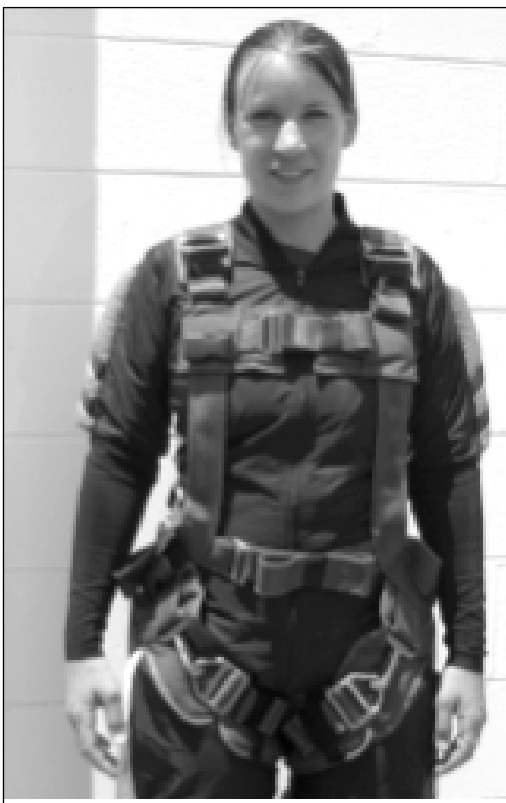
Appendix D: Strong Enterprises Dual Hawk System

1.5.2 Instructions for fitting the Standard Tandem Passenger Harness

PN 240075-5 For use with the Strong Tandem Systems

Congratulations on your purchase of a Strong Enterprises Standard Passenger Harness. Following the nine simple steps below will assure your passengers safety and offer them a comfortable Tandem Skydiving experience.

1. Extend all 8 adjustments completely out to the stops.
2. Help the student step into the leg straps (or fasten B-12 snaps) and position the harness on the student's shoulders.
3. Fasten the chest strap securely.
4. Fasten the bellyband so that the hip rings are to the front of the wearer's hips and the chest strap and bellyband are equally snug. The main lift webs should be parallel from shoulders to hip.
5. Tighten the leg straps with the flat leg pad just under the butt and the apex of the leg strap at the hip.



6. Begin adjusting the main lift web so the sewn risers is centred on the shoulder, and that the Butterfly snap rests just rear of the shoulder.



7. Tighten the rear diagonals so that the passenger harness is secure against the passenger's back.
8. Tighten the horizontal back strap. The lower harness should now be fitted and snug.



9. Follow Y-Mod instructions below.

Your student should now be comfortable and secure in the harness. Be certain to stow the extra webbing in the keepers provided.

1.5.2.1 Y-MOD HARNESS INSTRUCTIONS (Ref. Service Bulletin # 24)

The addition of the Y-Mod passenger harness modification does not change the original fitting instructions of the Dual Hawk Tandem System passenger harness. The Y-Mod should be treated as an additional step in proper harness fitting when installed.

The Y-Mod allows the horizontal back strap to pass through its webbing and be securely tightened, as per normal passenger harness fitting instructions.



Once the horizontal back strap has been securely tightened, and all other traditional webbing adjustments have been made, the Y-Mod can then be tightened by pulling down on the excess webbing protruding from the friction adaptor located just below the harness back pad.



The tightening of the Y-Mod webbing will secure the Y-Mod webbing and leg straps in place. The excess Y-Mod webbing can then be stowed under the fabric keeper.

Appendix E: Tandem Incidents with Injuries

Analysis of Documented Incident Reports

On average 70% of tandem student injuries and 75% of tandem master injuries occur on landing.

Of these student landing injuries; approximately 50% are lower back injuries and 50% are limb injuries (usually broken or sprained ankles). Compared to tandem master landing injuries; 20% lower back injuries and 80% limb injuries.

*Note: Another common tandem student injury is shoulder dislocation during freefall, generally from a pre-existing injury that isn't disclosed during registration.

Causes:

The majority of tandem student* and tandem master back injuries are due to sink from turbulent conditions or pilot error. Pilot error includes the following:

- Over piloting during circuit resulting in lack of speed for final flare,
- Planeing out high from a final turn resulting in lack of speed for final flare,
- Final turn too low requiring early brake input resulting in lack of speed for final flare,
- Not finishing the flare in any of the above situations.

The majority of tandem student ankle injuries are due to students reaching for the ground with their feet, or the student is unable to get their legs up for landing.

The most common cause of tandem master limb injuries is their foot getting caught in rough terrain when sliding in for landing.

*Tandem student lower back injuries can also be due to improper harnessing, causing the student to hang low in the harness resulting in their lower back being the first point of impact on landing.

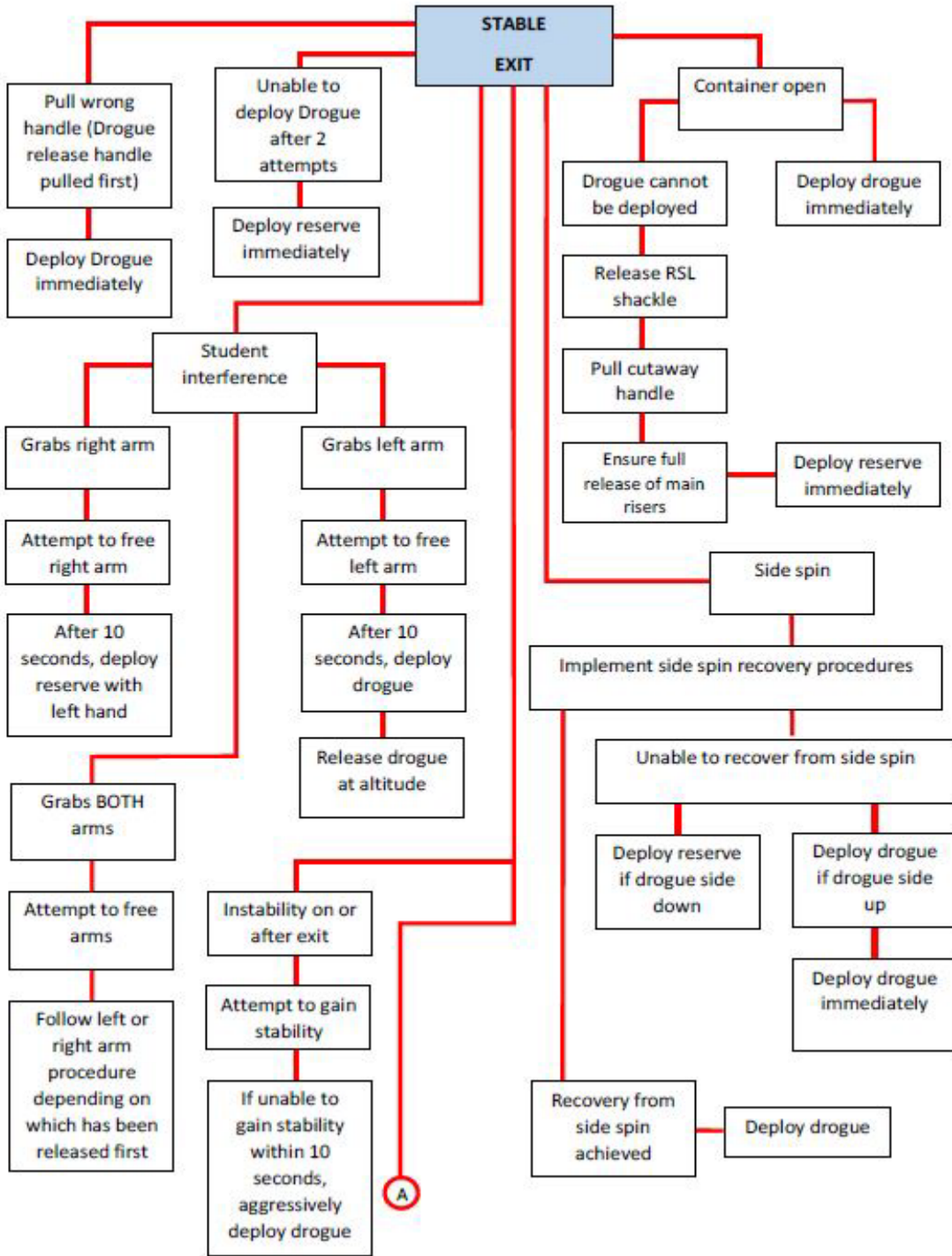
Solutions:

Most tandem injuries are avoidable. Here are some suggested solutions to the above problems:

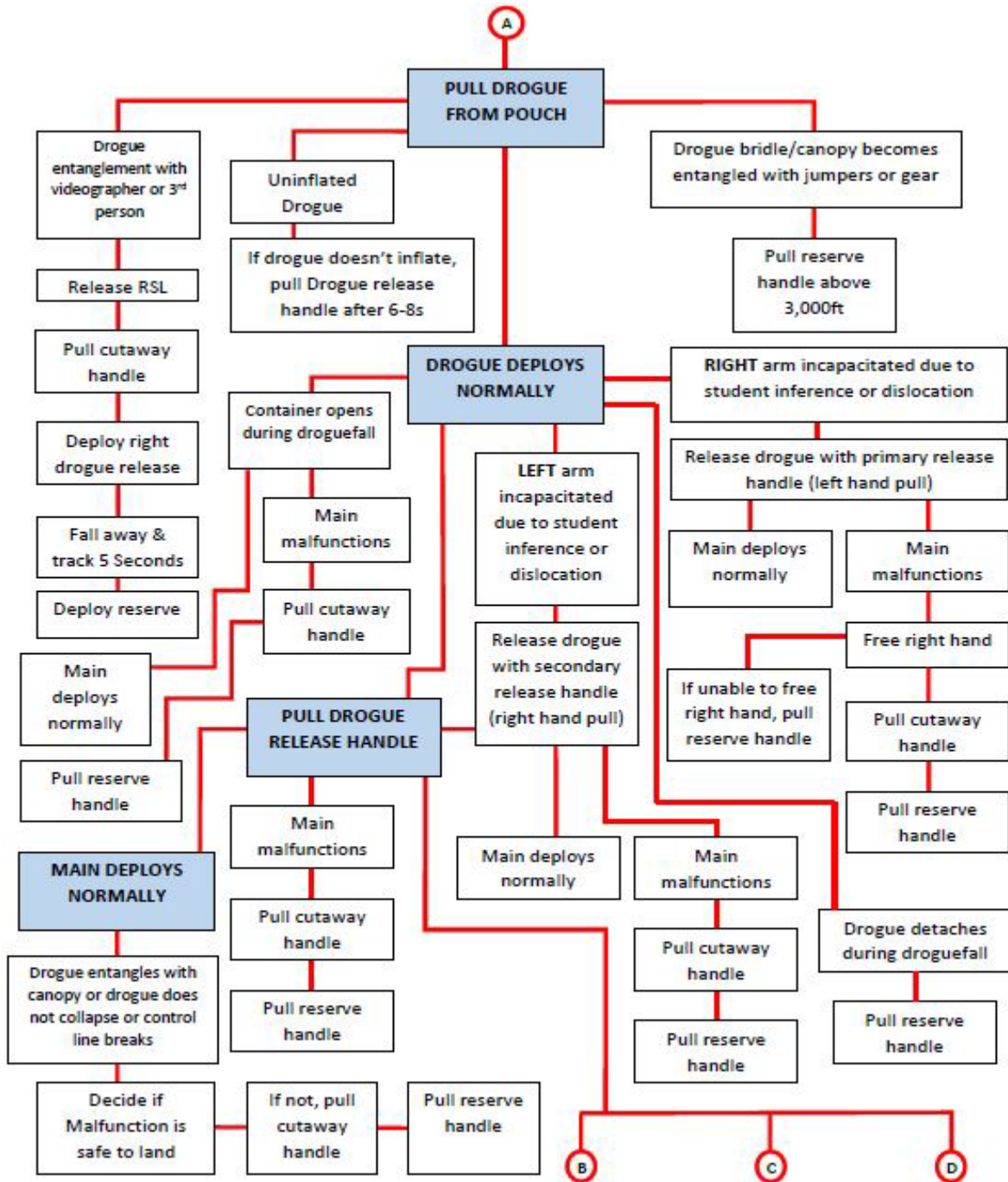
Problem	Solution
Sink from mechanical turbulence	Avoid landing behind obstacles
Sink from thermals or wind shear	Pilot the canopy with speed and avoid over-piloting. Don't jump in extremely turbulent conditions
Over piloting	Use less inputs and after each input return to full drive to maximise speed
Student reaching for the ground	Proper briefing and verbal reminders prior to and during landing to keep feet up
Student cannot get legs up on landing	Fit harness correctly and adjust under canopy if necessary
Student hanging too low in harness	Fit harness correctly
Tandem master catching foot in rough terrain	Slow the landing before touchdown
Student shoulder dislocation	Ask student prior to skydive if they have a pre-existing injury

Appendix F: Sigma and Vector Deployment/Emergency Flow Charts

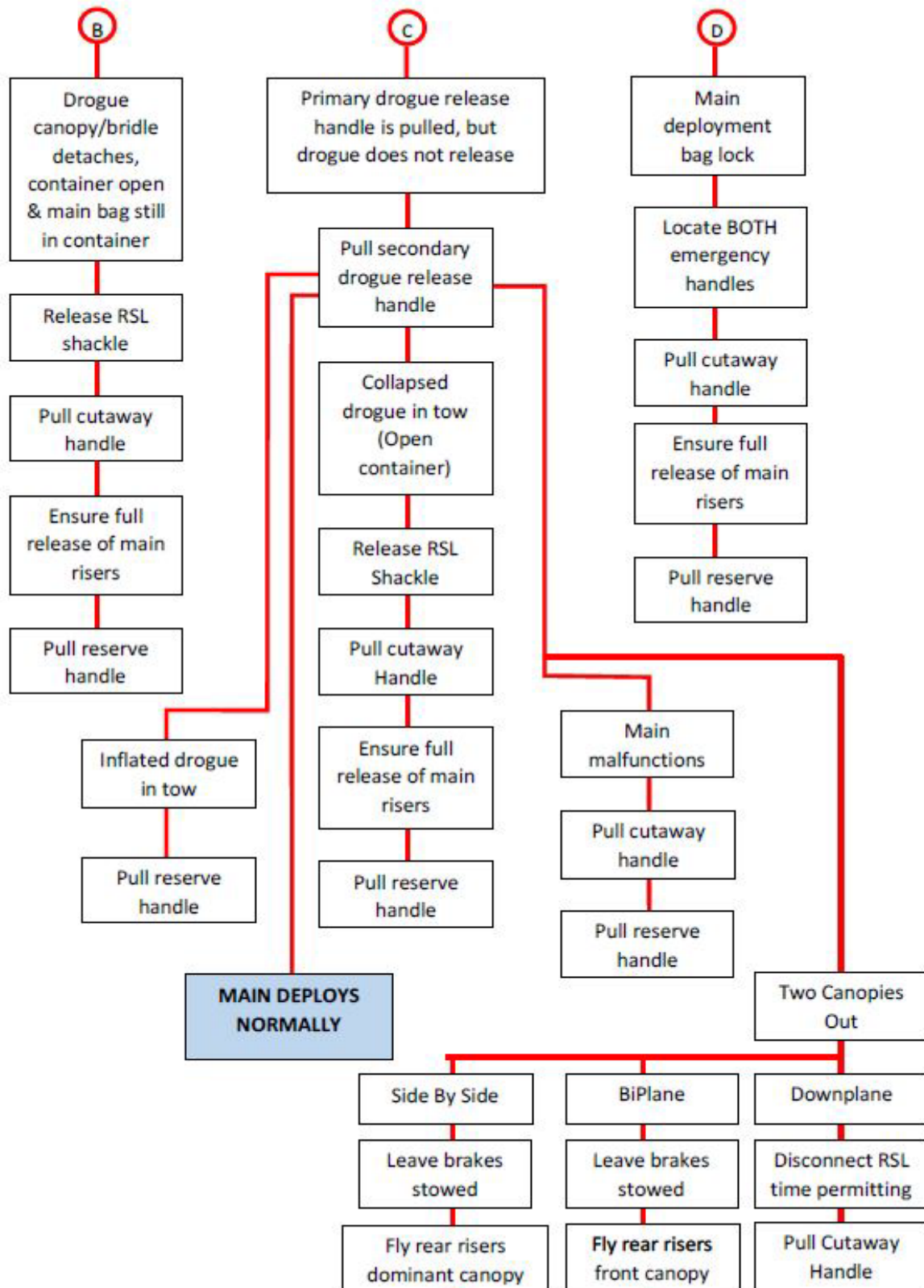
Sigma Malfunction Procedure Diagram Part 1



Sigma Malfunction Procedure Diagram Part 2



Sigma Malfunction Procedure Diagram Part 3



Appendix H: Canopy Training for Tandem Endorsement Candidates

The APF recommends the Tandem Endorsement candidate attends a canopy course or seeks canopy training from a qualified canopy coach with a tandem endorsement before commencing their Tandem Endorsement training.

Canopy flight for a Tandem Master can be challenging due to several variables on every skydive, such as:

- Different passengers – size, weight
- Different canopies – type, size, age and condition
- Changes in weather – wind speed and direction, air density, turbulence
- Different landing areas – size and shape, terrain and surface

Prior to commencing Tandem Endorsement training, a candidate should have a thorough understanding of flying a large canopy with varying wing loadings. The candidate should practice canopy skills and demonstrate consistent circuits and landings using a large canopy* before they assume the responsibility of landing tandem passengers.

***Canopy Recommendations:**

Skills practiced should include at least one of the following types of canopy with a wing loading of no more than 1.3*: (Using different size canopies or adding weight will simulate the different wing loadings that occur due to different sized passengers.)

- Student canopy
- 9 cell canopy with flat trim (Safire, Stiletto, Pilot, Pulse, Silhouette, Electra, Prime)

**Candidates who weigh less than 90kgs should choose a canopy no smaller than 170 sq/ft*

**Candidates who weigh more than 90kgs should choose a canopy no smaller than 190 sq/ft*

In-Air Skills

Flying a tandem canopy is different to flying a sport canopy – there are less inputs available to use. Riser inputs are heavy and almost impossible to use, and harness inputs are not very responsive. A tandem master uses toggles as their main input for flying and controlling the parachute from opening to landing. The following drills will aide the candidate in being proficient with using the toggles for canopy flight and should be done no lower than 2000 feet. Candidates should practice skills with varying amounts of speed and use both left and right toggles for turning maneuvers. It is important to use smooth inputs and repeat exercises noting the difference in altitude loss of each maneuver.

- Flare technique (see below for technique to practice)
- Flat turns
- 90 degree toggle turns
- ¼ brake surge
- ½ brake surge

Circuit

Consistent accuracy comes with good awareness. Immediately after opening, constant assessment of the groundspeed and descent rate will assist in setting up for an accurate landing.

Because of the varying wing loading of tandem canopy, utilizing visual cues of the ground is more effective than relying on height readings on an altimeter. It is important to arrive at the correct set up point at the correct height to start your circuit, then use visual cues for groundspeed and descent rate to make minor adjustments to the circuit.

Here is a rough guide for reference heights**:

- Final wind check should be done at approximately 1000 feet.
- Circuit height should start at approximately 600-800 feet.

***If you find yourself using these heights and consistently getting onto finals too early then lower the circuit starting height, alternatively if you find you are consistently having to make a low turn onto finals then increase the circuit starting height.*

Landing Approaches:

During a landing approach, it is important to keep the canopy pressurized. If a toggle input is required to adjust heading or lose height, this should be followed by full drive to maintain canopy pressurization before using any another toggle input (particularly in turbulent conditions).

It is important the tandem candidate can utilize different landing approaches, should be able to demonstrate these consistently and choose the correct approach to suit the weather conditions.

Braked approaches should only be used in smooth weather conditions.

Understanding the flight cycle of a parachute is imperative to avoid pilot induced sink on landing or being 'in the corner'. If the candidate does not understand the flight cycle then they must attend a canopy course with a qualified canopy coach before commencing tandem endorsement training.

See 'Pre-Tandem Endorsement Canopy Checklist' for different approaches that should be demonstrated by the candidate before commencing Tandem Endorsement training.

Flare technique

A tandem canopy has a greater toggle pressure than a smaller sport canopy. As the weight increases under canopy, so does the toggle pressure. It is important to master a good 'two stage flare' technique to achieve a complete flare:

- Stage one of the flare: pull down the toggles to shoulder level.
- Stage two of the flare: rotate the arms so that the elbows are higher than the hands, then push down as far as you can whilst leaning forwards (hands should be behind the torso as chest leans forwards, then push hips forwards as you finish the flare).

Flare Timing

It is important that the Tandem candidate can both stand up and sit down a landing smoothly and consistently. Trying to run out a fast landing whilst attached to another person increases the risk of injury to the tandem master and passenger. Timing of the flare is slightly different for a stand-up landing opposed to a sit-down landing.

Surface terrain will also dictate the ability to slide a landing or come to a complete stop before touchdown.

- Sit down landing (smooth terrain or hard sand): The best technique for landing a tandem pair with any amount of forward speed (when the wind is light) is a sit-down, sliding landing. Flare timing for a sit-down landing is slightly later than for a stand-up landing, allowing the canopy to plane out at a height that allows the tandem instructor's feet to slide across the ground with a smooth transition to a seated position. Leaning back in the harness assists this smooth transition and protects the lower back.
- Sit down landing (rough terrain or soft sand): Flare timing is similar to above, but the tandem master must complete the flare to reduce forward momentum before touching down.
- Stand up landing: when the winds are stronger it is possible to stand up the tandem landing.
- Practicing the two-stage flare technique will help develop muscle memory that will assist when landing with heavier passengers.

Pre-Tandem Endorsement Canopy Checklist

It is recommended that prior to commencing Tandem Endorsement training the candidate should consistently demonstrate the following canopy skills to the satisfaction of their CI using at least one large canopy with varying wing loadings (maximum 1.3 wing loading) in different weather conditions. Demonstrating consistency would require successfully achieving each maneuver below a minimum of ten times including accuracy within 20m of the target.

- Sit down, into wind landing in light winds (0-10kts)
- Sit down, crosswind landing in light winds (0-10kts)
- Sit down, downwind landing in light winds (0-10kts)
- Stand up landing in light winds (0-10kts)
- Stand up landing in stronger winds (above 10kts)
- Straight in approach
- ¼ brake sink surge approach
- ½ brake sink surge approach
- 90 degree smooth toggle turn approach

