

B-License Day



Name: _____ USPA #: _____ A-License #: _____

The AXIS B-License Day is an intensive one-day course, where we will have you do 5 jumps in as many hours (weather and wind permitting). If you wish to take it, the B License written exam is available right before the Water Training.

With this tight schedule, **preparation on your part is appreciated:**

All Course Participants

- 1) If you have not already done so, please [register here](#) for an upcoming course by paying a deposit.
- 2) Bring your current [license](#) and your [log book](#).
- 3) You'll receive the USPA Canopy Piloting Proficiency Card once you have completed our course and fulfilled the necessary requirements. You will have to provide your USPA Membership Number _____ and Expiration Date ____/____/____, as well as your USPA License Number _____.
- 4) [Please read SIM sections 6-10 and 6-11](#) (find a copy on pages 3-11 of this pdf-file) Both sections are required reading prior to attending the course in order to receive the sign-offs.
- 5) [Please read SIM sections 6-5](#) (find a copy on pages 12-13 of this pdf-file) to prepare for the Live Water Landing Training.
- 6) Please check your log book and collect the information regarding the following USPA B License requirements
 - a) ["Completed 50 jumps"](#) (this is not required to participate in our course but required for the license) Your current number of jumps: _____. + 5 jumps during the course = _____.
 - b) ["Accumulated at least 30 minutes of controlled freefall time"](#) Your accumulated freefall time: _____ min.
 - c) ["landed within 33 feet of target center on ten jumps"](#) We will provide a target during the course for you to land on. Identify – signed (!) – jumps where you met this requirement and enter their numbers here:
 _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____.
 - d) [Aerial Performance Requirements:](#)
 EITHER demonstrated the ability to perform individual maneuvers (left 360, right 360, backloop, left 360, right 360, backloop) in freefall in 18 seconds or less. Identify the – signed (!) – jump where you met this requirement: _____
 OR successful completion of the planned formation(s) on ten group freefall jumps. Identify the 10 – signed (!) –jumps where you met the requirements:
 _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____ • _____

Written B License Exam

The written exam can be administered upon request between the jumps and the water training. In order to pass, you will have to answer at least 19 out of 25 questions correctly. If you need a copy of the Skydiver's Information Manual (SIM), you can locate your preferred media version of it at <https://uspa.org/SIM>.

For your convenience, these are the sections of the SIM you should be familiar with:

- 2-1 (all)
- 4, Categories D — F — G — H
- 5-1 — 5-2 — 5-3
- 6-2 — 6-4 — 6-6 — **6-10 — 6-11**
(6-10 and 6-11 are required reading! Find a copy further down in this document.)
- 9-1 FAR 91.17 — 9-1 FAR 91.211 — 9-1 FAR 119.1

Live Water Training Course

- 1) You **must be a proficient swimmer** if you want to participate in this course.
- 2) Bring **swimming attire** and a **towel**.

On the day of the course:

- Please show up **at 7:30am** and **check in with us**.
- Get and sign the **DZ waivers AND the AXIS waivers**.
- Buy **5 Hop and Pop tickets**.
- **Check your equipment – Turn on your AAD**.
If you need to rent gear, please rent a model which is appropriate for your current level of expertise and with which you are familiar.
- **Hire a packer for the day**.
This is a **requirement**, as there will be debriefs and lectures between all jumps and you will not have enough time to pack yourself.
- Bring food and drink
Stay hydrated – we are in the desert!

6-10: CANOPY FLIGHT FUNDAMENTALS

A. INTRODUCTION AND PURPOSE

1. The same ram-air parachute technology that has led to soft openings and landings, flat glides, and small pack volume has opened the door for higher performance with increased wing loadings (the jumper's exit weight divided by the area of the parachute canopy, expressed in the U.S. in pounds per square foot).
 - a. Skilled and practiced jumpers who choose to fly this equipment aggressively may achieve desirable results, given the right training and the use of good judgment.
 - b. In the hands of untrained, uncurrent, unskilled, and unpracticed pilots, this equipment and these techniques pose a potential threat to the pilot and others sharing the airspace.
 - c. The recommended training in USPA's Integrated Student Program given in preparation for the USPA A license is not adequate to prepare jumpers for advanced canopy flight.
 - d. Routine canopy descents and landings alone do not provide the kind of skills and experience necessary to safely perform advanced maneuvers under more highly loaded canopies.
2. Jumpers, particularly those new to the sport, need to understand the potential dangers of flying this kind of equipment in the skydiving flight environment.
 - a. The ram-air parachutes used in skydiving, even those considered moderately loaded, can cover a large amount of horizontal and vertical distance when handled aggressively during descent.
 - b. High-performance landings are a part of a demanding and unforgiving discipline requiring careful study, practice, and planning.
 - c. The reference for what equipment and techniques might be considered conservative or aggressive varies according to a jumper's experience, canopy size and canopy design.
 - (1) Skydivers who jump highly loaded canopies may have different goals than others they advise.

- (2) Most successful high-performance canopy pilots have practiced extensively with larger canopies before experimenting with higher wing loadings.

- (3) It is difficult for a jumper who is accustomed to more advanced equipment and techniques to remember the challenges facing less-experienced jumpers.

B. SCOPE OF PERFORMANCE

1. "Advanced" refers to practices that combine equipment and control techniques to increase descent and landing approach speeds.
 - a. A canopy designed for more performance may exhibit relatively docile characteristics with a light wing loading and when flown conservatively.
 - b. A canopy designed for docile performance that is flown aggressively and jumped with a higher wing loading can exhibit high-performance characteristics.
2. The types of errors that novice canopy flyers make on docile canopies without getting hurt could have serious consequences when made on more advanced equipment.
3. Advanced equipment generally refers to canopies loaded as follows:
 - a. above 230 square feet, 1.1 pounds per square foot or higher
 - b. from 190 to 229 square feet, 1.0 pounds per square foot or higher
 - c. from 150 to 189 square feet, .9 pounds per square foot or higher
 - d. canopies smaller than 150 square feet at any wing loading
4. Canopy design can play a significant role in skewing these numbers one way or the other.
 - a. Some canopies are designed for flaring with less-than-expert technique.
 - b. Some canopies are designed to perform better with higher wing loadings but require skillful handling.
 - c. Earlier canopy designs, particularly those using 0-3 cfm canopy fabric ("F-111"), can be more challenging to land, even with relatively light wing loadings.
5. Advanced technique generally refers to control manipulation to induce speeds greater than stabilized, hands-off, level

flight (natural speed) during descent and on the final landing approach.

6. Canopy flight characteristics and control become more challenging as field elevation, temperature, and humidity increase.
7. These recommendations do not consider the specialized information and expertise required to safely fly canopies at wing loadings approaching 1.5 pounds per square foot and beyond or canopies approaching 120 square feet or smaller.
8. Each progressive step in downsizing, technique, and canopy design should be a conscious decision, rather than considered a routine part of a skydiver's progression:
 - a. Jumpers downsizing to get a smaller or lighter container should also be prepared to handle the added responsibility of jumping a higher-performance canopy.
 - b. Jumpers at drop zones with a high-performance canopy culture need to understand that neglecting the individual training required to pursue that discipline safely can lead to serious consequences for themselves and for others.
 - c. Jumpers need to understand the design intents of the canopies they purchase to see whether those canopies match their overall expectations and goals.
 - d. The decision to progress to advanced canopy skills and equipment should include others who can be affected, including jumpers in the air and landing area who could be affected by a canopy piloting error.

C. PERFORMANCE PROGRESSION

1. Jumpers will advance at different rates.
2. The "Canopy" sections (B.) in each category of the USPA Integrated Student Program outline a series of exercises valuable for exploring the flight characteristics and performance envelope of any unfamiliar canopy.
 - a. The jumper should become familiar with a standard controllability check to determine a baseline for later comparison in the event of a minor malfunction (broken line,

detached steering control, fabric damage, etc.).

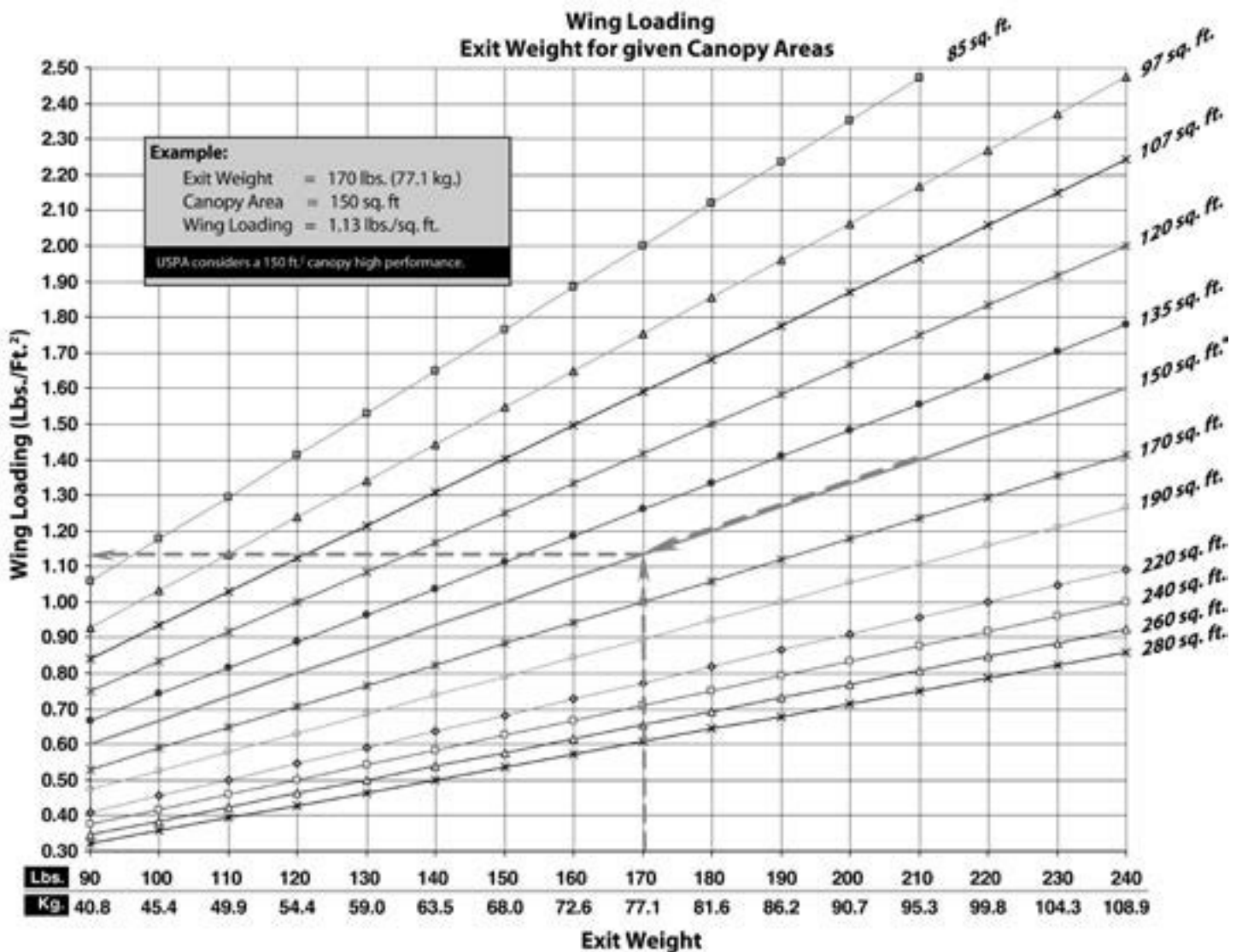
- b. A jumper should review the basics on each new canopy before proceeding with more advanced maneuvers; skipping the foundations of flight control will show up later with potentially serious consequences.
- 3. Before attempting any advanced landing maneuvers, each jumper should be familiar with the following under his or her current canopy at altitudes above 2,500 feet AGL:
 - a. reverse toggle turns (90 degrees reversing abruptly to 180 degrees)
 - b. canopy formation approaches and at least non-contact canopy formation flight

- c. back-riser turns and flaring
 - (1) If, due to a control problem, a jumper has decided to land a canopy using back risers, the jumper should be familiar with the technique.
 - (2) A jumper may decide after experimentation and practice that a canopy is not safe to land with back risers.
 - (3) A jumper should consider this decision before contemplating advanced maneuvers or wing loadings where dropping or breaking a control line on final approach becomes more significant.
- d. front-riser control, including single and double front riser maneuvers (all performed with toggles in hand)
- e. altitude loss in a variety of diving and turning maneuvers (check the altimeter at the beginning and end of a turn)

- f. aborting a turn and recovery to flare
- g. slow-flight gliding and maneuvering (braked turns)
- h. braked approach and landing

D. DOWNSIZING PROGRESSION

1. Before moving to a smaller size, a jumper should be familiar and comfortable with the following landing maneuvers on his or her current canopy:
 - a. landing flare from full, natural-speed flight
 - b. flaring for landing from slow (braked) flight
 - c. consistent soft, stand-up landings within 32 feet of a planned target in a variety of wind conditions, including downwind
 - d. beginning to flare, turning to ten-degree bank, and returning to wings-level before landing



2. Downsize increments on the same canopy design
 - a. above 230 square feet, 30 square feet
 - b. from 229 to 150 square feet, 20 square feet
 - c. from 149 to 120 square feet, 15 square feet
 - d. below 120 square feet in smaller increments
3. Before downsizing, jumpers should be familiar with any maneuver they plan to attempt or might encounter on a smaller canopy, including induced-speed landing approaches and braked landing approaches (low speed).
4. A jumper who has downsized without performing advanced maneuvers at each increment should practice them on a larger canopy first before trying them on his or her current canopy.

E. DESIGN PROGRESSION

1. Jumpers should explore only one new design element until completing and becoming comfortable with all recommended maneuvers.
2. Design increments (one design characteristic at a time at the same square footage before downsizing)
 - a. tapered or elliptical planform (degree of taper or ellipse varies according to design)
 - b. cross-bracing or other airfoil flattening or stiffening design
 - c. modifications requiring additional in-flight procedures, for example, removable pilot chutes, deployment bags, and sliders

F. PRACTICE AREA

1. To avoid danger to other jumpers, all practice of high-performance activities must take place in a landing area where other jumpers are not on approach.
 - a. Separate by exit altitude.
 - (1) Canopy pilots exiting and opening high must consider other high-opening jumpers (students, tandems, and others) to avoid descending into their airspace during approach.
 - (2) Canopy pilots exiting on a lower pass must fly clear of the opening and canopy descent area before other jumpers exit higher.
 - (3) All jumpers should be aware of other canopies in their airspace, but it is especially critical that

jumpers who choose to jump a high-performance parachute be aware of all canopy traffic that may be a factor during their descent and landing.

- b. Separate by landing area.
 - (1) Landing areas must be separated according to wind direction so that no jumper is over the practice approach and landing area below 1,000 feet.
 - (2) Canopy pilots descending into the practice landing area must be alert for errant jumpers.
2. Advanced maneuvers, turns over 90 degrees, in a common landing area must never be attempted.
 - a. It is a violation of the USPA Group Member pledge to allow high-performance landings to take place into common canopy traffic landing areas.
 - b. High-performance canopy landings with turns greater than 90-degrees must be separated by space by using a separate landing area, or by time, by providing a separate pass.
 - c. Whichever method is used to separate the canopy traffic, the high-performance landings must be separated from those who are flying a standard landing approach in such a way that the chances of a canopy collision are eliminated.
3. Canopy pilots should be completely familiar with all advanced landing characteristics and techniques in a variety of weather conditions and using a variety of approaches before—
 - a. attempting flight into a competition-style course.
 - b. landing in the vicinity of any hazard, including water.

6-11: ADVANCED CANOPY PILOTING TOPICS

OVERVIEW

A. INTRODUCTION

1. USPA recognizes that effective advanced canopy pilot training beyond the required training for the first certificate of proficiency (skydiving license) can improve jumper skills and confidence and reduce the risk of canopy flight accidents.
2. USPA encourages the development of effective canopy piloting training courses.
3. The Advanced Canopy Piloting Topics outline provides canopy piloting instructors with a list of topics in a logical presentation order to advance the canopy flight knowledge and skills of licensed jumpers.

B. BACKGROUND

1. Canopy design and flying techniques have advanced beyond what is expected of a USPA Instructor when preparing a skydiving student for the USPA A license.
2. Skydiving culture encourages skydivers to purchase and jump equipment that requires additional training to be jumped safely.
3. Analysis of accident reports indicates that jumpers are at risk without advanced canopy training beyond the A license.
 - a. Jumpers who have progressed without advanced training to average designs at average wing loadings are largely unprepared for how their canopy will handle in difficult landing situations.
 - b. Jumpers who pursue induced-speed landing techniques without training put themselves and other jumpers at extreme risk.
4. Rather than limit jumper flying style and equipment choice, USPA has pursued an “education, not regulation” strategy in coordination with expert canopy pilots, advanced canopy training schools, and canopy manufacturers.

- a. basic but comprehensive canopy flight training and discovery in the USPA Integrated Student Program, leading to the A license
- b. articles on basic and advanced canopy topics in *Parachutist*
- c. SIM Section 6-10, “Advanced Canopy Flight”
- d. this course outline for use preferably by USPA Instructors with additional qualifications as listed

C. SCOPE

1. To get the most from the topics presented in this outline, a jumper should have completed all the exercises listed under “Canopy” in SIM Section 4, Categories A-H of the ISP, and hold a USPA A license.
2. Jumpers who complete a course of instruction covering the topics listed here, including evaluations jumps and continued practice, should be better prepared to make choices regarding advanced equipment and maneuvers, as discussed in SIM Section 6-10.
3. USPA encourages all jumpers to engage in a course of instruction with a qualified course director including these topics, particularly when preparing to jump advanced equipment or perform advanced maneuvers.
4. The course conductor should organize the course to accommodate attendees according to their goals and objectives.
 - a. sufficient staff to assign to subgroups, according to performance or equipment objectives
 - b. separate courses on different dates and tailored for jumpers with like goals

D. INSTRUCTOR QUALIFICATIONS

1. USPA does not issue instructional ratings specifically for canopy coaching.
2. It is essential that the information contained in this course be presented correctly.
3. Those who intend to teach an advanced canopy piloting course should hold a USPA Instructor rating and have extensive knowledge of canopy flight.
 - a. Instructors who intend to teach this material must realistically assess their level of knowledge regarding canopy flight and instruction.
 - b. Before teaching this course, instructors must work through the

outlined canopy skills using a variety of canopy designs and wing loadings.

- c. Attending any one of several commercially available factory-sponsored canopy schools as a student is highly recommended before teaching this course.
- d. For USPA B-license requirements, a Safety & Training Advisor must approve the course director and sign the Canopy Piloting Proficiency Card once the course is completed.

E. USPA B LICENSE REQUIREMENTS

1. Every USPA B license must also include a completed and signed copy of the Canopy Piloting Proficiency Card.
2. The completed Canopy Piloting Proficiency Card must be signed by a current USPA Safety & Training Advisor, Coach Examiner, Instructor Examiner, or USPA Board member.
 - a. The supervising official must ensure that a qualified course director conducts the training in this section.
 - b. In some situations, the best candidate to teach this material may not hold any USPA ratings, but may have extensive knowledge about canopy control and landings.
 - c. These training jumps may be completed in a structured course with all five jumps completed in succession or the jumps may be completed individually.
 - d. The term course director applies to the person teaching this material, but is not an actual rating issued by USPA.
 - e. Each of the five training jumps listed on the USPA Canopy Piloting Proficiency card must be signed by a Verifying Official, who is responsible for supervision and training for the jump.
 - f. The final signature of the supervising official on the proficiency card is to verify that the training has been satisfactorily completed by the candidate.

F. EVALUATION

1. There is no “pass” or “fail” for a course of this nature, but attendees should be better able to self-assess their canopy aptitude and proficiency based on their own experience with the control maneuvers and an accurate evaluation

of each approach and landing from a course director.

2. The course director should sign and date the entries on the Canopy Piloting Proficiency Card as jumpers complete the items listed.
 - a. control maneuvers
 - b. loss of altitude in turns
 - c. landing pattern
 - d. varied approaches
 - e. approach and landing accuracy objectives
 - f. aborted approach
 - g. carving landings
3. The Canopy Piloting Proficiency Card can assist drop zone management in assessing a jumper's canopy skills.
4. Each jumper should begin a new Canopy Piloting Proficiency Card for every new model and size canopy.

G. RISK ASSUMPTION

1. USPA warns all jumpers that skydiving comes with inherent and sometimes unforeseen hazards and risks that may or may not be preventable.
2. While the goal of any skydiving training is to reduce risk, neither USPA nor the course director can predict the outcome or success of the training.
3. USPA warns all jumpers that some of the maneuvers described to develop understanding of canopy flight involve a greater risk of injury, even serious injury or death, than a routine parachute landing using a straight-in approach flown at the canopy's natural speed until flaring.
4. A canopy pilot should receive as much coaching as possible to reduce the risks under canopy; however, USPA warns all jumpers that any pilot who manipulates the canopy controls to induce additional speed prior to landings presents a greater hazard to himself or herself and others.
5. Before jumping begins, USPA advises the course director to require each participant to complete an assumption-of-risk agreement in conjunction with a comprehensive liability risk-management program applied in accordance with applicable local and state laws.
6. USPA accepts no liability for the use of this outline and does not authorize its use in any course of instruction; ideas presented here come with no implied or expressed suitability for any purpose or application.

GROUND SCHOOL TOPICS

PART 1: EQUIPMENT

A. EQUIPMENT CHOICE CONSIDERATIONS

1. Because of certain advantages smaller canopies offer, a misconception pervades the sport that all jumpers are better off overall using a smaller canopy.
 - a. Smaller canopies make for more compact and comfortable parachute systems.
 - b. Smaller canopies, especially the newer designs, can be easier to land than larger wings in ideal conditions.
 - c. Properly flown, smaller canopies provide greater versatility in higher winds.
2. Studies of USPA serious injury and fatality summaries reveal a trend where jumpers under canopies popularly considered "average sized" or "conservatively loaded" frequently mishandle them in non-routine landing situations.
3. Jumpers should seek out reliable information before changing to smaller canopies.
4. The sport of skydiving includes a series of specialized activities that require exclusive equipment, for example:
 - a. classic accuracy
 - b. canopy formation
 - c. competition freefall formation skydiving
 - d. large freefall formations
 - e. wingsuits
 - f. camera flying
 - g. high-performance landings
 - h. competition swooping
5. All jumpers should
 - a. set goals in the sport
 - b. choose the best equipment to meet their needs
 - c. learn how to use that equipment
 - d. skydive within the limits of their equipment and capabilities

B. WING LOADING

1. Size v. wing loading
 - a. The shorter lines of a smaller canopy will cause it to respond differently than a larger one of the

same design with an equal wing loading.

- b. Compared to a canopy with longer lines, a shorter-lined canopy will have—
 - (1) quicker turns
 - (2) quicker flare response
 - (3) quicker pendulum action (quicker to dive after an early flare)
 - c. A canopy with a shorter chord (front-to-back measurement) responds more quickly to flare input.
 - d. A canopy with a shorter span (wingtip-to-wingtip measurement) will respond more quickly to turn input.
2. In theory, glide angle doesn't change with wing loading.
 3. Most jumpers can get a lot more performance from their canopies without needing to downsize.

C. PERFORMANCE ENHANCING DESIGNS

1. Tapered shape (planform)
 - a. more dimensional stability (less distortion)
 - b. faster forward speed from lower and cleaner drag
 - c. faster turns and less flight stability
2. High-aspect ratio
 - a. flat glide
 - b. easier flare
 - (1) lighter toggle pressure
 - (2) shorter toggle stroke (some models)
 - (3) quicker flare response
3. Higher rib frequency to reduce billowing between ribs
 - a. seven-cell v. nine-cell
 - b. cross bracing
4. Thickness (after inflation)
 - a. thicker: slow speed, more predictable and gentle stall
 - b. thinner: faster speed, more abrupt stalls at a higher speed

PART 2: MAINTENANCE

D. DRAG REDUCTION

1. Zero-P fabric
2. Small-diameter lines
3. Collapsible pilot chute
4. Collapsible slider:
 - a. cloth or metal links with covers
 - b. larger v. smaller slider grommets
5. Risers
6. Outerwear
7. Removable Deployment Systems
8. Body Position

E. CONTROLS: TOGGLES AND BEYOND

1. Brakes
 - a. toggle types for ease of handling
 - b. steering line length to allow front riser maneuvers (toggles in hand)
2. Front risers and control enhancement discussion (loops, blocks, etc.)
3. Back risers and how they work
4. Front risers and how they work
5. Harness turns

F. ACCESSORIES

1. Jumpsuit (reinforced butt and knees)
2. Hard helmet
3. Gloves, pros and cons
4. Altimeter
 - a. altimeter use under canopy
 - b. digital v. analog
5. Weights

G. SPEED

1. The pilot perceives the forward speed more than the downward speed, so a faster canopy can seem a lot scarier to fly.
2. The faster the canopy goes, the more effect adding drag (by using a control) will have on the flight path.

H. GLIDE

1. Skydiving canopies: approximately 2.5:1 in natural flight
2. Changing the glide
 - a. using brakes or rear risers
 - b. using induced speed to temporarily add lift

A. ENVIRONMENT

1. Dirt degrades of the fabric, lines, and slider
2. Ultraviolet degrades nylon.
 - a. sunlight
 - b. fluorescent lighting (50% of the strength of sunlight)
3. Water distorts reinforcement tapes

B. COLLAPSIBLE PILOT CHUTE AND SLIDER

1. Wear results from friction as the line moves through its channel.
2. Pilot chute centerlines shrink with use.

C. SUSPENSION LINES

1. Spectra can't stretch and shrinks a lot with use.
2. Vectran is stable in both directions but abrades.
3. HMA is stable but breaks when it still looks new.
4. Dacron stretches on opening, is stable and durable, but fat.

D. BRAKE LINES

1. wear
2. shrinkage
3. the results of a broken line
 - a. upon flaring
 - b. landing a smaller canopy using risers

E. PACKING FOR AN ON-HEADING OPENING:

1. Even risers
2. Symmetrical bag
3. Line-stow placement and tension
4. 24 inches of unstowed line

F. EQUIPMENT INSPECTION

1. Pre-jump
2. During packing (various times throughout the course)

PART 3: BREAK-OFF, OPENING,
SEPARATION, AND CANOPY TRAFFIC**A. BREAKOFF**

1. Breakoff altitude should allow enough time to open clear of others and handle both routine and abnormal circumstances.
2. Tracking review
 - a. conserving altitude during turning and tracking

- b. body position and flat-track technique
 - c. opening when clear at the optimum altitude
3. Flying through the opening
 - a. shoulders level (use this time to look again at the spot)
 - b. flying the canopy through inflation
 - (1) back risers
 - (2) hips and legs stay even through the
 - c. deployment (feet together)
 4. Dealing with the standard problems becomes more difficult as canopy performance increases.
 - a. Discuss the following from the perspective of higher-performance canopies:
 - (1) line twist
 - (2) premature brake release
 - (3) locked brake(s)
 - (4) slider-brake system fouling
 - b. Spinning with a smaller canopy results in rapid altitude loss.
 5. Cut away defensively: Look below and behind to make sure you are clear of others.

B. TRAFFIC

1. As canopies fly faster, jumpers must pay better attention to other canopy traffic on descent.
2. Altitude management
 - a. use of brakes to stay aloft
 - b. relative wing loading
 - (1) self-assessment
 - (2) knowing the wing loading of others
 - c. placement in the aircraft
 - d. a dive plan, such as stacked approaches, to promote vertical separation under canopy
3. Awareness of others
 - a. Know or judge others' canopies, wing loading, and habits.
 - b. Fly the landing pattern or land elsewhere.
 - c. Fly a straight final approach avoiding S-turns.
 - d. Dealing with other's errors:
 - (1) In the event of a traffic issue, discuss the problem with the canopy pilots who were involved

- (2) canopy wake turbulence, (yours and others')
 - (3) only need to miss by a little—no low turns necessary
4. Off-wind landings (technique)
 - a. crosswind
 - b. downwind
 5. Landing away from the crowd
 - a. less pressure; room to practice
 - b. familiarity and consistency with using the same landing area every time
 6. Situations that pop up:
 - a. Crowded landing area: Follow someone you trust closely and let them know you're there.
 - b. Cutaways disrupt the plan for a normal canopy descent and landing planned for the main canopy.
 - c. Landing accidents on the ground can lead to confusion and chaos.
 - d. Off-field landing
 - (1) Plan and follow a sensible pattern.
 - (2) Keep your eyes open.
 - (3) Perform a PLF.

ADVANCED EXERCISES

A. FLIGHT PLAN

1. The course director should assist the class with an aircraft, canopy flight, and landing plan prior to each jump included in the course.
2. The plan should include an individualized progression plan for each student, according to experience and goals.
3. The plan should consider:
 - a. winds
 - b. DZ layout and target areas
 - c. traffic management to keep clear of other jumpers not participating
 - d. landing separation between canopy students

4. Landings should be videotaped for debriefing by the course director.

B. UNDER CANOPY

1. The aircraft should fly multiple passes as necessary.
2. Jumpers should arrange their exit order and opening altitudes according to wing loading.
3. Maintain vertical and horizontal separation; higher canopies should use brakes to slow descent if needed.

4. Each jumper needs to allow enough separation for the course director to video each final approach and landing individually.

JUMP 1—EVALUATION JUMP

1. The first jump in the course follows the presentation and discussion of the ground school topics.
2. The course director evaluates each student's accuracy and landing skills.
 - a. Demonstration of a straight-in approach and natural-speed landing provides the course director with a baseline evaluation of flaring and landing skills.
 - b. Each student should try for a target, with the first priority being a good landing from a straight-in approach, to provide the course director a starting point for accuracy improvement.
3. Each course candidate should inspect the canopy's steering lines while in full flight, with the brakes released.
 - a. The steering lines on most canopies should bow slightly behind the back of the canopy and its suspension lines, while in full flight
 - b. Check with the manufacturer to see what is recommended for steering line adjustments
 - c. For jumpers who use front risers, the steering lines should have enough slack that the riser can be pulled with the toggle in hand and still not deflect the tail of the canopy.
 - d. A parachute rigger should adjust the length of the steering lines if necessary, before the next jump.

JUMP 2—BASIC AERODYNAMICS, EFFECTIVE FLARING AND RISER TURNS

1. Lift
 - a. Air passing over an airfoil creates a force called lift.
 - b. Lift is always perpendicular to the velocity.
 - c. The ram-air is trimmed nose down, by cutting the A lines shorter and each group behind them a little longer.
2. Drag
 - a. The resistance created by air as an object moves is called drag.
 - b. Drag is always parallel to the velocity.

- c. The lines, pilot chute, slider, jumper's body, and even the surface of the canopy itself produce drag (parasitic drag).
3. Gravity
 - a. Gravity is a constant in the equation of forces acting on the jumper and canopy.
 - b. Using the force created by gravity, the airfoil deflects the air to make the canopy glide.
4. Momentum (force)
 - a. Mass: Doubling the mass of a moving object gives it twice as much energy.
 - b. Speed
 - (1) The term "speed" refers to the magnitude of velocity.
 - (2) Energy increases as the square of the speed.
 - (i) Doubling the speed produces four times the energy.
 - (ii) Tripling the speed produces nine times the energy.
 - (3) Inertia: The term "inertia," means that an object in motion will stay in motion until resisted.
5. Flaring
 - a. While turning or landing your parachute, the location of your body in relation to the canopy changes.
 - b. In a turn, momentum swings your body out from under the canopy.

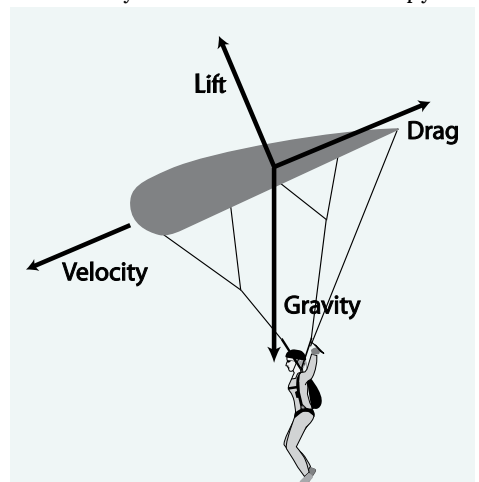


Figure 6-1. The forces acting upon a canopy in flight.

- c. During the recovery arc, your body begins to swing back under the canopy.
 - d. On final approach in natural flight your body is below the center of the canopy.
 - e. During initial flare, using toggles or rear risers, the canopy rocks slightly behind the jumper, raising the nose in relation to the tail and temporarily increasing lift (higher angle of attack).
 - f. Pulling the toggles gradually further adds drag on the tail, keeping the canopy at the correct angle and providing the most lift for the remainder of the flare.
 - g. Effective flare techniques with emphasis on finishing the flare.
 - (1) Enter the flare with the ideal stroke rate and depth that causes the canopy to fly as flat as possible, and remain flying flat as long as possible.
 - (2) Follow through by gradually pulling more toggle, timing the rate of the stroke to finish landing just prior to the stall.
 - (3) Focus on flying your canopy as long as possible before allowing your feet to touch the ground, and finish the flare completely even after your feet first touch the ground.
 - (4) Avoid a common bad habit: Many jumpers stop flying their parachute just as their feet reach the ground, raising the toggles and running out the remaining forward speed.
6. Riser turns
- a. During this jump you will make a series of riser turns above the traffic pattern altitude.
 - b. Most jumpers should have already been trained and practiced riser maneuvers as a requirement for the USPA A License.
 - c. Jumpers who are completely unfamiliar with riser turns should make a separate training jump to focus solely on riser turns.
7. Under canopy
- a. Flare the canopy five times while observing the wing throughout the flare.
 - b. Pay particular attention to your relative position under the canopy during the various stages of the flare.
 - c. Check airspace frequently to maintain separation during the practice exercises.
 - d. Repeat the five practice flares with eyes closed, paying close attention to the physical sensation during each phase of the practice flare.
 - e. Check altitude, position and traffic, and initiate two alternating 90-degree turns using rear risers.
 - f. Check altitude, position and traffic, and initiate two alternating 180-degree turns using rear risers.
 - g. Check altitude, position and traffic, and initiate two alternating 360-degree turns using rear risers.
 - h. Jumpers must stop any riser maneuver at 1,000 feet or higher above the ground.
 - i. Due to the energy required for flaring and riser maneuvers, it may be necessary for jumpers to complete these maneuvers over a series of jumps
 - j. On landing
 - (1) Make a straight-in approach facing into the wind, with minimal input for the last ten seconds before the landing flare.
 - (2) Practice an effective flaring technique, focusing on a smooth finish.
- (2) higher rate of descent
- (3) stable mode of flight for a ram-air parachute, because of the extremely low center of gravity
- b. Also called “sink” or “steady state stall”
 - c. Used in classic accuracy with low-aspect ratio seven-cell canopies
3. Full ram-air stall (reverse flight)
- a. Radical stall reached when the tail is held below the level of the nose for an extended period
 - b. Can be entered following a dynamic or steady-state stall using toggles or rear risers
 - c. Requires a smooth, gentle recovery to prevent entanglement or line twist
 - d. Reverse flight using toggles not recommended for some canopies
4. High-speed stall
- a. Occurs at any speed when the canopy reaches too high of an angle of attack
 - b. Easily induced as a result of distorting the wing too far during a rear-riser flare
5. Common stall characteristics
- a. Separation of air from the upper surface of the wing
 - b. Wing loading and stalls (helpful knowledge for landings):
 - (1) Higher wing loadings stall at faster forward speeds.
 - (2) Decreasing the wing loading by putting your feet on the ground allows the canopy to fly slower before it stalls.
6. Stall practice
- a. Full ram-air stalls using toggles
 - (1) Gently apply brakes to a point where forward flight diminishes and the canopy begins to sink.
 - (2) Continue to depress the brakes fully down until the canopy “bow ties.”
 - (3) Slowly raise the toggles until resuming forward flight.
 - (4) High-performance canopies:
 - (i) Full stalls may induce a line-twist malfunction with cross-braced or highly elliptical canopies and are not recommended.
 - (ii) Cross-braced and fully elliptical parachutes may be

JUMP 3—STALLS

1. Dynamic stall

- a. Occurs after a dynamic pitch maneuver and is followed by the jumper swinging back under the canopy
- b. Can cause an abrupt dive once the jumper has reached the end of toggle effectiveness in a flare
- c. Sometimes occurs less noticeably at the end of the recovery arc following a diving maneuver, such as a turn

2. Aerodynamic stall

- a. Point that loss of lift occurs as the pilot gradually applies brakes or back risers
 - (1) decreased glide

flown to very slow flight and a dynamic or aerodynamic stall without entering reverse flight or “bow tying” the canopy.

- b. Stalls using rear risers
 - (1) Slowly pull down the rear risers until forward flight ceases.
 - (2) Adding more riser input, the canopy will eventually sink and begin to descend in a backward direction.
 - (3) Risers should be slowly raised to recover to forward flight.
 - (4) Rear riser stalls are not as violent but occur more abruptly than toggle-induced stalls.
- 7. Under canopy
 - a. Practice riser flares and stalls
 - (1) Rear riser flare without stalling the canopy
 - (2) Full ram-air stalls using rear risers
 - (3) Full ram-air stalls using toggles
 - b. Plan and execute an appropriate downwind, base leg and final approach landing into the wind.

JUMP 4—FLAT TURNS AND CROSS-WIND LANDINGS

- 1. Reasons for flying in brakes
 - a. Vertical separation from canopy traffic
 - b. Slow forward speed and descent rate
 - c. Returning from a long spot
 - d. Flat turns as a defense tool at low altitudes
- 2. Techniques for initiating a braked turn
 - a. Bring both toggles to mid-stall position to start.
 - b. Raise one toggle slightly to turn in the opposite direction.
 - c. Pull one toggle down slightly to initiate a turn in the same direction.
 - d. Most effective method for flat turns: Raise one toggle slightly and pull the opposite toggle down slightly to initiate a turn in the direction which the toggle is pulled down
 - e. Avoid stalling the canopy.
- 3. Effect of brakes on glide
 - a. Slower forward speed

- b. Lower descent rate
- c. Change in glide:
 - (1) The pilot needs to experiment to determine the change in glide path at different degrees of flying in brakes.
 - (2) Most modern nine-cell canopies fly flatter when a slight amount of brakes are applied.
 - (3) Some lower-aspect canopies are designed to sink for a classic accuracy approach, which is less effective when performed under a higher-aspect ratio canopy in low-wind conditions.
- 4. Flaring from a braked position
 - a. Expect a different glide on a braked final approach.
 - b. Expect a shorter and quicker stroke needed to flare.
 - c. Prepare for a harder landing.
- 5. Under canopy
 - a. Practice flaring several times from the quarter-, half-, and three-quarter-braked positions, and focus on making an effective flare from each position.
 - b. Practice braked turns using all the methods discussed.
 - c. Fly a landing pattern that allows for a crosswind final approach and landing.
 - (1) For purposes of training and familiarization, the crosswind landing should only be performed in winds up to five miles per hour.
 - (2) All jumpers on the same pass must use the same landing pattern to promote a smooth flow of traffic.
 - d. On final approach, focus on crosswind correction necessary to prevent crabbing.
 - e. A crosswind landing may require pulling the upwind toggle deeper than the downwind toggle to keep the jumper going in the same direction and reduce the ground speed upon landing. Performing an uneven flare in this manner increases the stall speed of the canopy. A parachute landing fall is recommended for any unusual landing

JUMP 5—LONG SPOT

- 1. Projected landing point
 - a. Discovery of how to locate the point on the ground the parachute will reach while flying at natural speed
 - b. Altering the glide using brakes and rear risers
 - (1) Minimize the drag.
 - (i) Collapse the slider.
 - (ii) Pull legs up, arms in, and arch to reduce air resistance
 - (iii) Loosen the chest strap to improve glide.
 - (2) If holding brakes, reducing fatigue by hooking your thumbs in the harness. (Be careful not to hook onto your cutaway or reserve ripcord handles.)
 - (3) Decide by 1,500 feet about a new landing area.
 - (i) Allow enough altitude for the final turn.
 - (ii) Expect the winds to weaken as you get lower.
 - c. Choose an alternate landing area if necessary, and follow off-field landing recommendations.
- 2. Under canopy
 - a. Exit the aircraft at 5,000 feet AGL at least 1.5 miles upwind of the main landing area.
 - b. Determine the glide path of the canopy and the landing point using the projected landing point to determine the point on the ground which is neither rising or sinking.
 - c. Alter the glide
 - (1) using brakes
 - (2) using rear risers
 - (3) comparison of effectiveness
 - d. If the intended landing area cannot be reached by an altitude which allows for a safe landing, a reasonable alternative should be used.
 - e. On landing, follow the flight plan and continue to work on effective flaring

6-5: WATER LANDINGS**A. WHY JUMP IN THE WATER?**

1. A number of fatalities have resulted from accidental water landings, usually because of the absence of flotation gear, use of incorrect procedures, and landing in extremely cold water.
2. Water landing training is recommended to improve chances for survival from both intentional and unintentional water landings.
3. The purpose of wet training (required for the USPA B license) is to expose the individual to a worst-case scenario in a controlled situation.
 - a. Drownings are usually brought on by panic.
 - b. Proper training should decrease the likelihood of panic and therefore decrease the likelihood of a drowning.
4. The potential always exists for unintentional water entry due to spotting error, radical wind changes, malfunctions, and landing under a reserve rather than a main.
5. Intentional water jumps are preplanned jumps into a body of water.
 - a. With a few additional precautions, a water jump can be the easiest and safest of all skydives.
 - b. Physical injuries and drownings are almost unknown on preplanned, intentional water landings.
6. These recommendations provide the USPA S&TA, Instructor Examiner, and Instructor with guidelines to train skydivers to effectively deal with water hazards.
7. This section covers recommendations, procedures, and references for the following:
 - a. training considerations for unintentional water landings
 - b. wet training for water landings, both unintentional and intentional
 - c. intentional water jumps

B. TRAINING FOR UNINTENTIONAL WATER LANDINGS

1. In the USPA Integrated Student Program, training recommendations for unintentional water landings are included in the obstacle landing training of Category A (the first-jump course).
2. A more complete and detailed briefing outline is contained in SIM Section 5-1.F.

DRY (THEORETICAL TRAINING)

1. This training (including the date and location) should be documented in the student's logbook and A-license application or on a separate statement and signed by a USPA S&TA, IE, or Instructor.
2. Theoretical training should include classroom lessons covering:
 - a. techniques for avoiding water hazards
 - b. how to compensate for poor depth perception over water
 - c. preparation for water entry
 - d. additional risks of water landings in cold water temperatures
 - e. recovery after landing
3. Practice should combine both ground and training harness drills and should continue until the jumper is able to perform the procedures in a reasonable amount of time.

WET (PRACTICAL TRAINING)

1. Wet training
 - a. should be conducted following a class on theory
 - b. should take place in a suitable environment such as a swimming pool, lake, or other body of water at least six feet deep
 - c. meets the USPA B license training requirements for intentional water landings
2. This training (including the date and location) should be documented in the jumper's logbook and signed by a USPA S&TA, IE, or Instructor.
3. Safety personnel should include properly trained and certified lifeguards.
 - a. If suitably qualified skydivers are not available, assistance may normally be solicited from the local American Red Cross or other recognized training organization.

- b. Flotation gear and other lifesaving apparatus is recommended for non-swimmers.
- c. Persons conducting this training need to consider the safety of the participants.

4. Review all theoretical and practical training.
5. Initial training may be conducted in swimsuits, but final training is to be conducted in normal jump clothing to simulate a water landing.
 - a. Non-swimmer: Training is to include basic skills covering breath control, bobbing, and front and back floating.
 - b. Swimmer: Training is to include all of the above, plus the breast stroke, side stroke, back stroke, and treading water.
6. While wearing a parachute harness and container system and all associated equipment, jump into the water.
 - a. The USPA Instructor should then cast an open canopy over the jumper before any wave action subsides.
 - b. Any type of canopy may be used.
 - c. The jumper should then perform the steps necessary to escape from the equipment and the water.
 - d. Repeat this drill until proficient.

C. INTENTIONAL WATER LANDINGS

1. Any person intending to make an intentional water landing should:
 - a. undergo preparatory training within 60 days of the water jump
 - (1) The training should be conducted by a USPA S&TA, IE, or Instructor.
 - (2) The training (including the date and location) should be documented in the jumper's logbook and signed by a USPA S&TA, IE or Instructor.
 - b. hold a USPA A license and have undergone wet training for water landings
 - c. be a swimmer
2. Theoretical training should include classroom lessons covering:
 - a. preparations necessary for safe operations
 - b. equipment to be used
 - c. procedures for the actual jump

- d. recovery of jumpers and equipment
 - e. care of equipment
3. Preparation
- a. Obtain advice for the water jump from the local USPA S&TA or IE (required by the BSRs).
 - b. Check the landing site for underwater hazards.
 - c. Use an altimeter for freefalls of 30 seconds or more.
 - d. Provide no less than one recovery boat per jumper, or, if the aircraft drops one jumper per pass, one boat for every three jumpers.
 - e. Boat personnel should include at least one qualified skydiver and stand-by swimmer with face mask, swim fins, and experience in lifesaving techniques, including resuscitation.
 - f. Each jumper should be thoroughly briefed concerning the possible emergencies that may occur after water entry and the proper corrective procedures.
 - g. opening altitude
 - (1) Jumpers should open no less than 3,000 feet AGL to provide ample time to prepare for water entry.
 - (2) This is especially true when the DZ is a small body of water and the jumper must concentrate on both accuracy and water entry.
 - h. A second jump run should not be made until all jumpers from the first pass are safely aboard the pickup boat(s).
4. After canopy inflation: In calm conditions with readily accessible pickup boats, the best procedure is simply to inflate the flotation gear and concentrate on landing in the proper area.
5. Landing
- a. In strong winds, choppy water conditions, in competitive water jump events, or if the flotation gear cannot be inflated, separation from equipment after water entry is essential.
 - b. Instruments:
 - (1) Water may damage some altimeters and automatic activation devices.
 - (2) Skydivers jumping without standard instruments and AADs should use extra care.

D. HIGH-PERFORMANCE LANDINGS IN WATER

1. Water may reduce injuries for jumpers who slightly misjudge high-performance landings, but jumpers have been seriously injured or killed after hitting the water too hard.
2. Jumpers should obtain coaching from an experienced high-performance canopy pilot familiar with water hazard approaches and contact prior to attempting high-performance landings across water.
3. Raised banks at the approach entry and exit from the body of water present a serious hazard.
4. An injury upon landing in a water hazard can increase the jumper's risk of drowning, so high-performance landings involving water should be approached with the standard water landing precautions, including the use of a flotation device.
5. The area around the body of water should be clear of hazards and spectators in case high-speed contact with the water causes the jumper to lose control.

E. WATER JUMP SAFETY CHECKS AND BRIEFINGS

1. A complete equipment check should be performed with particular attention to any additional equipment to be used or carried for the water jump (refer to SIM Section 5-4 on equipment checks).
2. Boat and ground crew briefings:
 - a. communications procedures (smoke, radio, buoys, boats)
 - b. wind limitations
 - c. jump order
 - d. control of spectators and other boats
 - e. setting up the target
 - f. maintenance of master log
 - g. how to approach a jumper and canopy in the water (direction, proximity)