

## 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

- (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.).

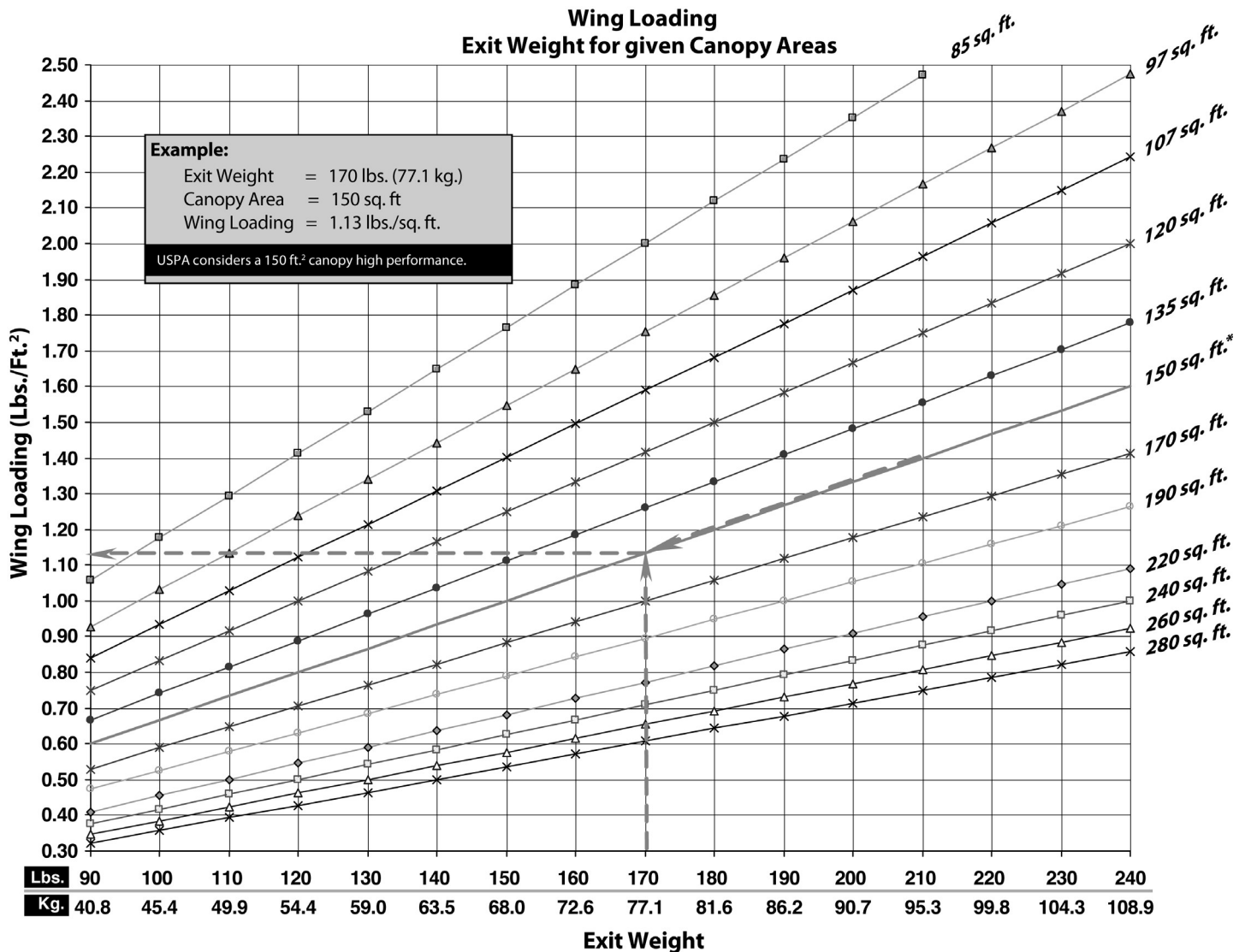
- b. A jumper should review the basics on each new canopy before proceeding with more advanced maneuvers; skipping the foundations of flight control will show up later with potentially serious consequences.
- 3. Before attempting any advanced landing maneuvers, each jumper should be familiar with the 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.