



How To Avoid



Canopy Collisions

A USPA Safety Day Presentation

Easiest Way?



Jump Alone

(OK, NOT Practical)

Because Skydivers Like To Jump In Groups

Historically, The Two Greatest Risks Of A Canopy Collision:



Deployment



Landing Pattern

Deployment Separation

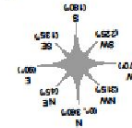
CANOPY OBJECTIVES

Performance goals:

Airport orientation: The runway at West Point Skydiving Adventures is 3,700 feet long, about 3/5 (.6) mile. Aircraft enter their traffic pattern at 1,000 feet. Add "0" to the runway number for compass heading. (Runway 9 is 90 degrees, 27 is 270 degrees.) Compare the number on the runway to this compass rose (below right) to determine direction.

Landing pattern: Show the direction of the surface winds on the DZ photograph. Draw the planned wind line, spot, and landing pattern, including ground checkpoints and altitudes. Identify all significant landing hazards.

Ground checkpoints	Altitude
1.	Opening Altitude
2.	1,000
3.	600
4.	300
Landing hazards:	



Planning starts on the ground
BEFORE the jump

Two Considerations Regarding Collisions up high

1. Separation Between Groups

2. Separation Between Jumpers
IN each group

Group Separation

1. Type of jump
2. Size of group
3. Ground speed of aircraft

Group Separation

Exit Order

Slow fallers (belly) largest to smallest

Fast fallers (freeflyers) largest to smallest

Students-solo gear first, then tandems

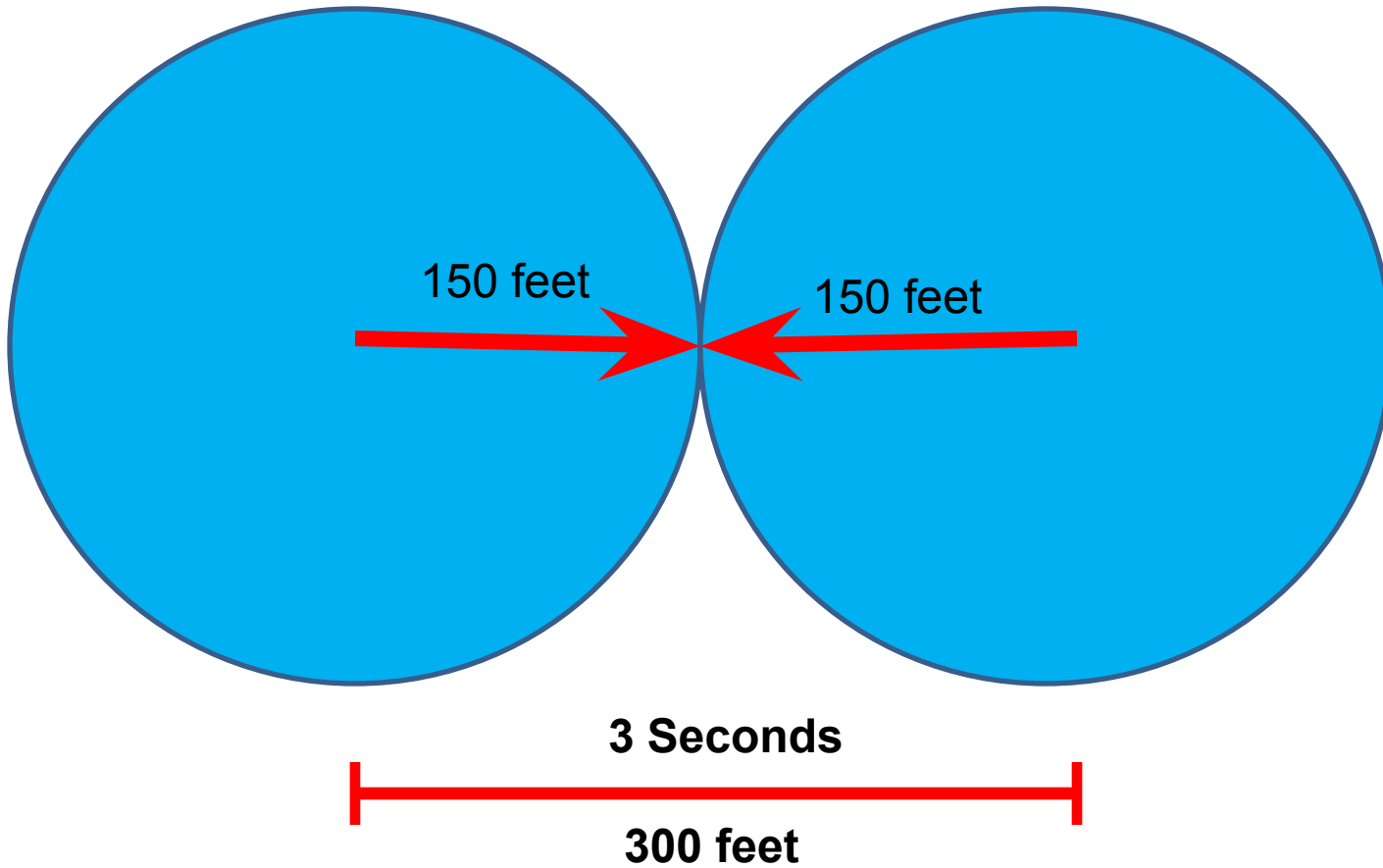
High deployments

Angle Fliers, Tracking Groups, Wingsuits

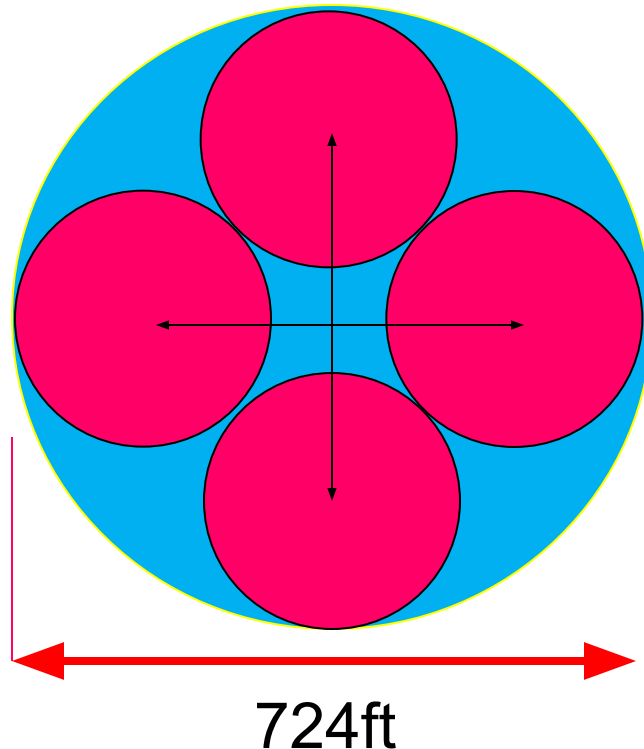
Minimum Distance?

1. Canopy speed = 30 mph
(44 feet per second)
2. Three seconds required to see and respond to an approaching canopy
3. Two canopies on a head-on collision
Will cover 300 feet in three seconds

Minimum Separation 2 jumpers



To obtain 300' separation between jumpers in a 4-way, need to track 212 ft from the center so the individuals' columns of air don't overlap.



3 seconds after opening there could be canopies anywhere in an area 724 ft in diameter. *Each **group** needs its own column of air.*

The corresponding area for an 8-way is more than 1,000 ft. across.

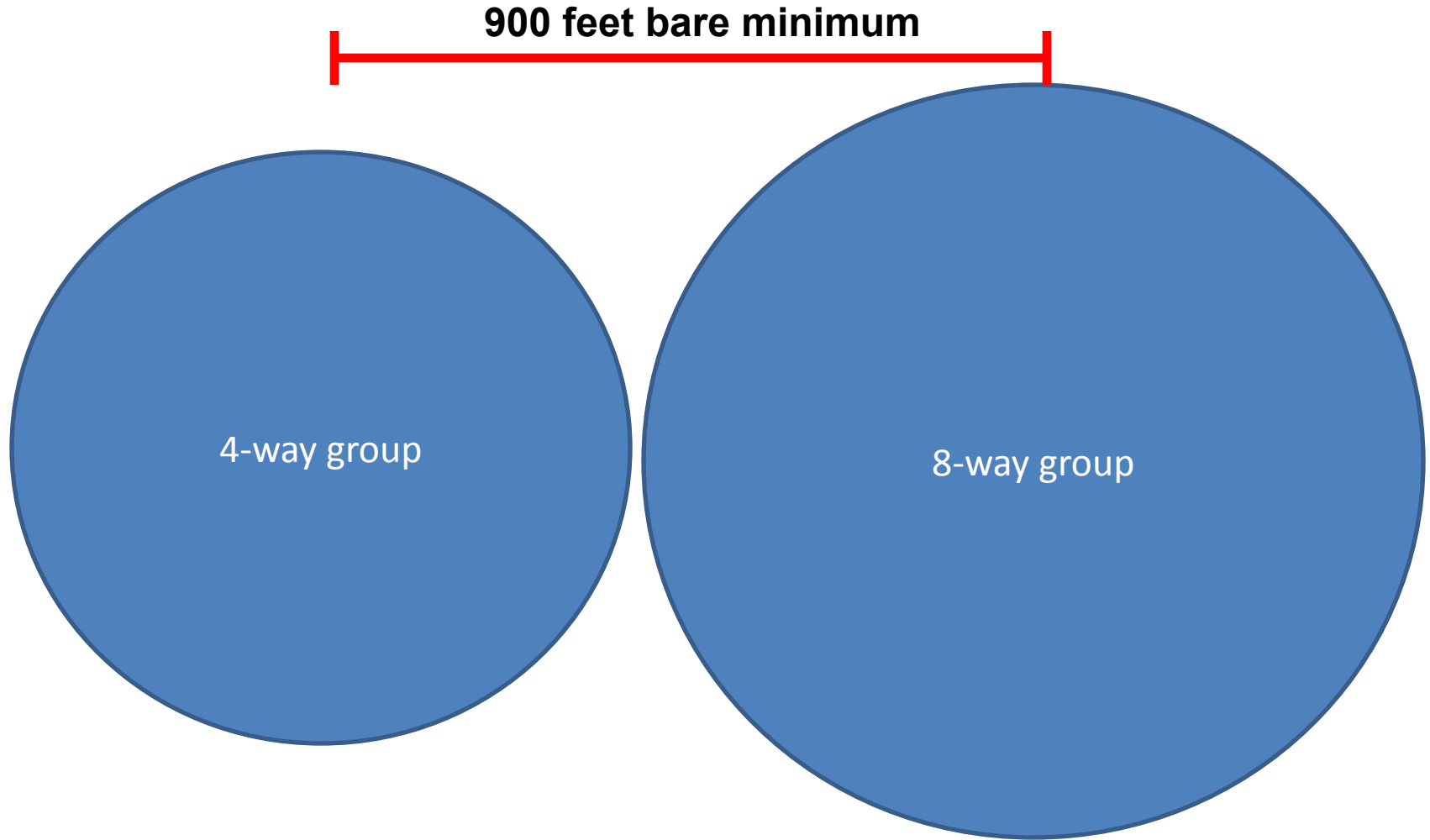
Break-off and Deployment Issues

- Lack of separation from other jumpers
(Poor tracking skills)
(Low break-off altitude with less tracking time)

Followed By

- Jumpers unable to control the parachute after deployment
(Line twist)
(spinning canopy due to one brake release)

Distance Between Groups



This does not account for higher break-off, longer tracks, sliding groups
More distance is actually required

Distance Between Groups

For jump runs flown into the wind,
Ground speed of the aircraft is a large factor

The stronger the upper winds, the slower
the aircraft ground speed will be

Wait longer between groups with strong
upper winds

Crosswind Jump Runs-Winds have less
influence on group separation

(Direction of ground winds will also play a large role in separation requirements)

Separation Chart In Aircraft

Aircraft Ground Speed (knots)	Time for 1000' Separation (sec)
100	6
95	7
90	7
85	7
80	8

Inserting a separation chart near the door of the aircraft can help provide guidance to jumpers for the necessary amount of time required between groups.

No deployment collision

Now what?



Orderly Flow

Closest canopies pose the most immediate threat of a collision

Identify the nearest traffic to determine what needs to happen next

Make adjustments that will help promote an orderly flow of canopies towards the landing area

**Wing-loading plays a significant factor
In maintaining separation**

**Try to remain near the same area
with your group**

**If you catch up to another canopy
During your descent, allow for
Plenty of room while passing**

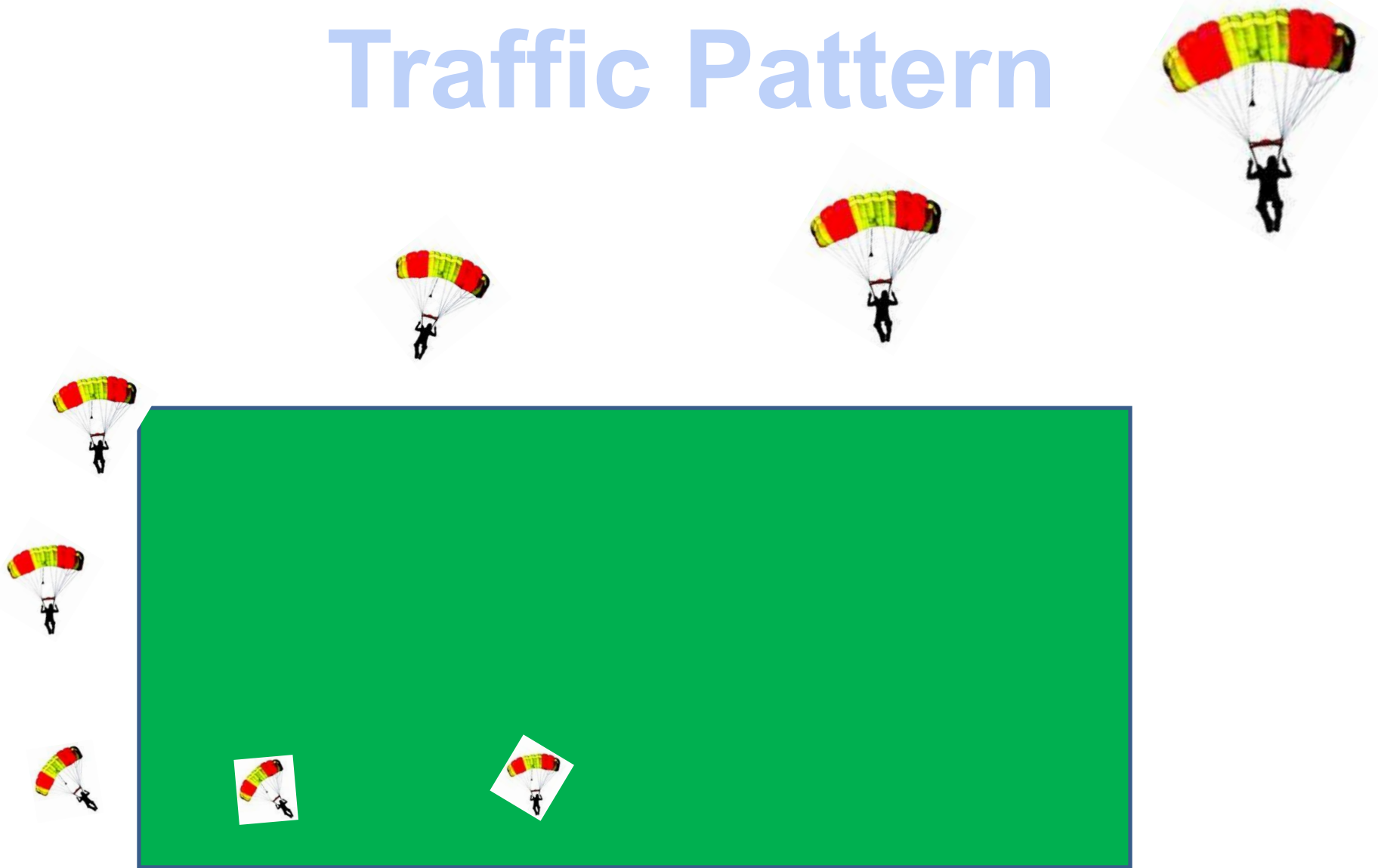
**Be aware of blind spots
(above and behind)**

Traffic Flow



Landing Area

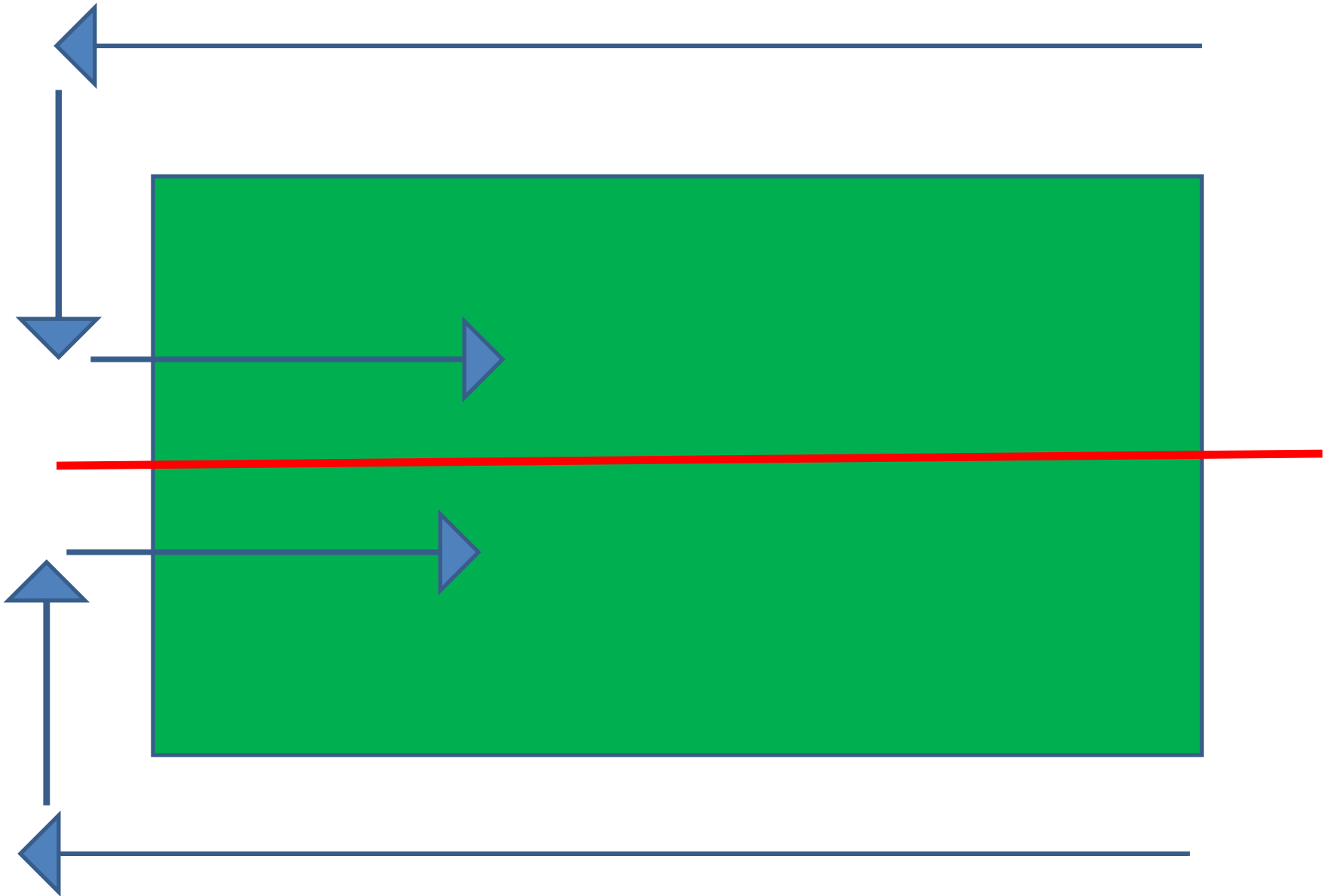
Traffic Pattern



No wind? Pick a direction
for landing and stick with it!



Split Landing Area



Landing Pattern Issues

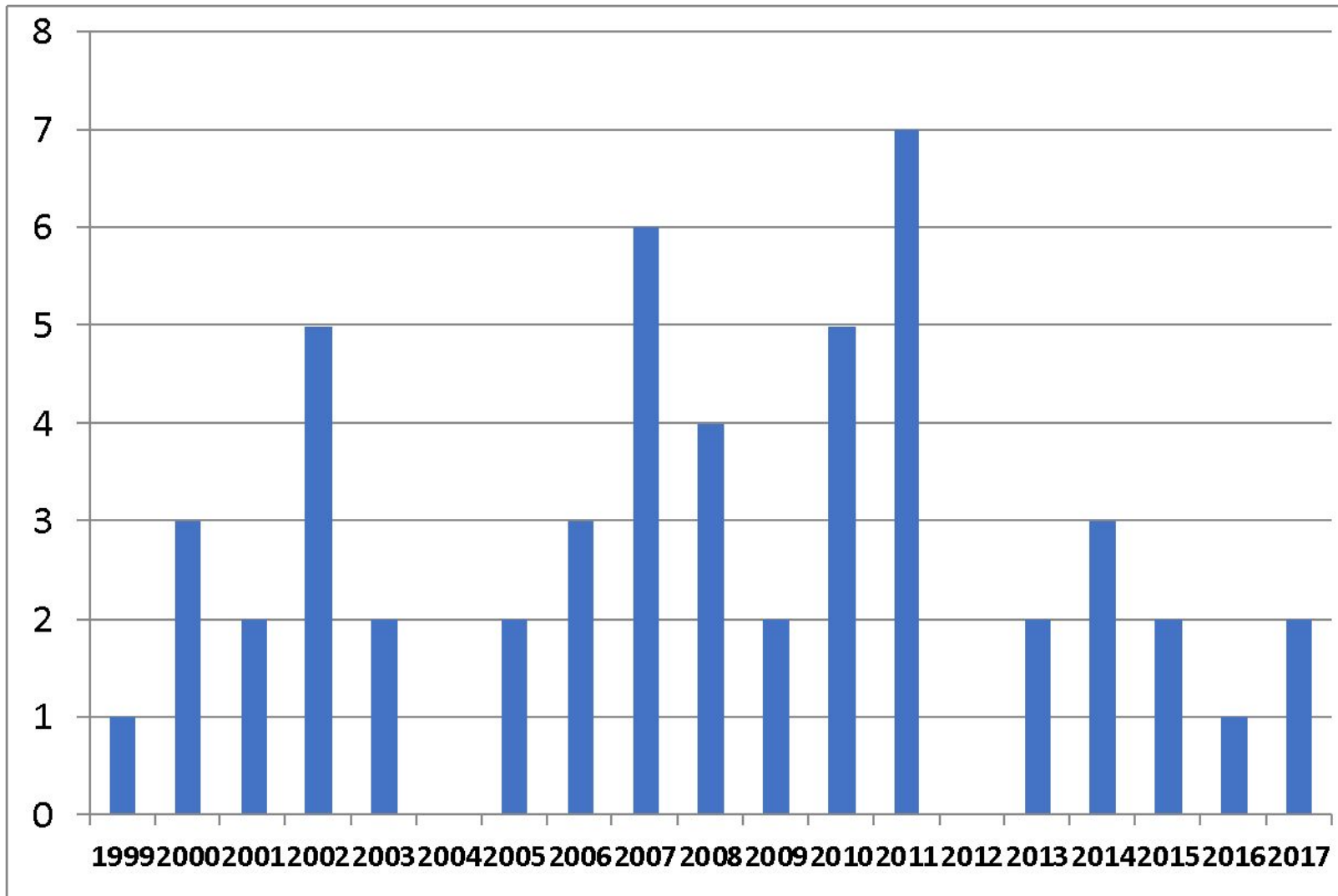
High-Performance approaches must be separated from standard landings

- **Separate landing areas or;**
- **By time, using separate passes for H-P landings**

Fly a predictable landing pattern

- **Defined Downwind-Base-Final**
 - **Straight-in final approach**
- Without S-Turns**

Canopy Collision Fatalities 1999-2017



Thanks to Professor John Kallend for use of his separation formulas!