

FFI Formation Guidelines and Standard Procedures Canard Supplement, Version 4

May 2024

This document highlights formation flight procedures for canard aircraft. In conjunction with the “FFI Formation Guidelines and Standard Procedures”, this Supplement establishes the Berkut / Cozy / LongEZ / VariEze standard. Other variants of canards can use these guidelines as a baseline, and specifics for those variants may be added to this supplement. All procedures contained in this document should be briefed.

There are considerable variations in performance between canard designs including fixed or constant speed propellers, weight, retractable main gear and engines. There are also major differences between other types such as Van’s RV aircraft and the canard designs. Flight Leads should evaluate the characteristics of aircraft in the formation and brief alternate procedures and airspeeds if required.



Hand-propping: Some EZs (mostly VariEzes) don’t have starters. Lead should set an engine start or check-in time to accommodate those in the flight that need to hand prop.

Taxi and Speed Brakes: Canards are pushers and therefore FOD sensitive. Formation taxi increases risk of FOD, so if installed, taxiing with the speed brake extended is standard procedure. To minimize the risk of FOD damage, staggered taxis are preferred. The signal to move from staggered into trail taxi is to cycle the elevator. Keep in mind the location and size of the elevators may make the signal difficult to see hence it is advisable for Lead to back up the cycling signal with a radio call.



Canopies: Typically, canards taxi with canopies open. Consideration should be given to taxiing with canopies closed in high wind conditions or cold temperatures.



Takeoff Readiness: If canopies are open after the thumbs up for takeoff is passed, Lead will ensure the flight's canopies are closed prior to taking the runway. Given the danger involved in taking off with a canopy open or not fully latched, Flight Leads should brief their preferred signal and method of ensuring canopies are closed. Typically, this is signaled by Lead grasping their canopy frame with their hand, then, all canopies in the flight are closed in unison once all have repeated the signal.

Formation Takeoff Position reference: Line up with the element lead's winglets visually aligned with each other.

Rotation Speed: Nose wheel off at 60-70 KIAS, main wheels off at 70-80 KIAS. Cozy and Berkut aircraft will rotate at the upper end of this speed range. If one of these aircraft is in the element, discuss delaying rotation appropriately.

Nose wheel retraction: Canards have a variety of retraction mechanisms; some are electric and some are hand crank. Brief nose wheel retractions with the flight. Stack level with Lead (Lead's head on horizon) until gear is up and then close to fingertip.

Climb-out: 110 KIAS and 500 FPM until all aircraft have rejoined.

Rejoins: The bearing line for joining on a canard aircraft is defined by Lead's inboard winglet (as seen by Wingmen) on or directly under (depending on Lead's bank angle) the outboard tip of Lead's canard.

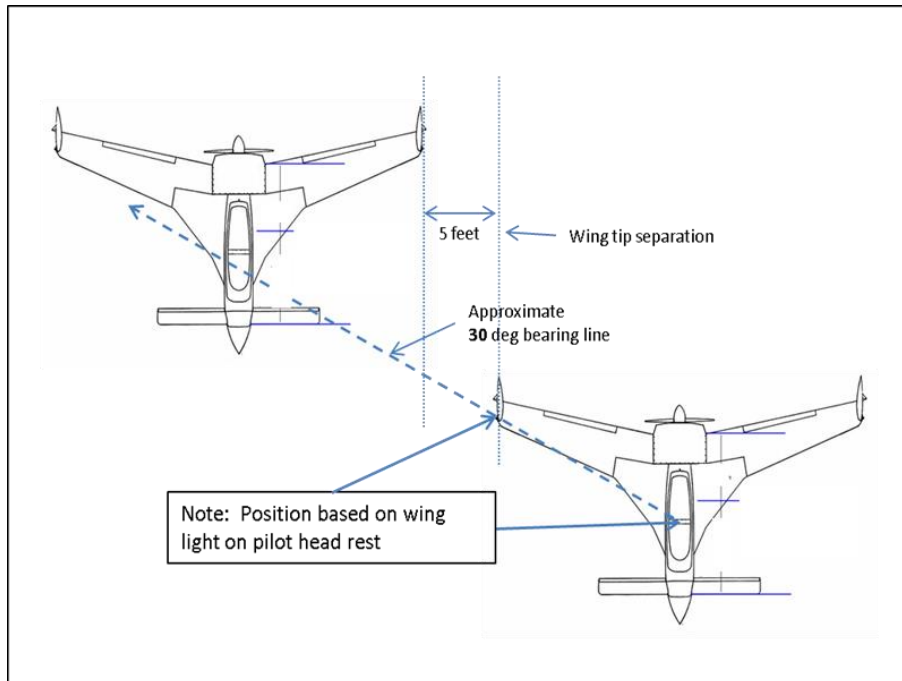
There are configuration-driven challenges with rejoins in a canard aircraft. In the case of Cozy and Velocity, left turning rejoins require loosening shoulder straps and leaning to the right to maintain sight lines out the canopy/right window.

Additionally, depending upon pilot seat position relative to his canard, a level rejoin on the bearing line may result in the Wingman's canard overlaying Lead and other aircraft ahead, momentarily blocking the pilot's view. One technique in this situation is to momentarily dip a wing or use rudder every few seconds to move the canard out of the way and gauge closure on the aircraft ahead.

Berkut / Cozy / LongEZ Fingertip References (30-degree line): The following diagram highlights the correct position for a LongEZ fingertip position.

Note: In the event some aircraft in the formation have significantly different configurations (for example the StaggerEZ or another modified canard type) those variances should be noted during the brief and adjustments made, if necessary, to visual references to establish proper station keeping.

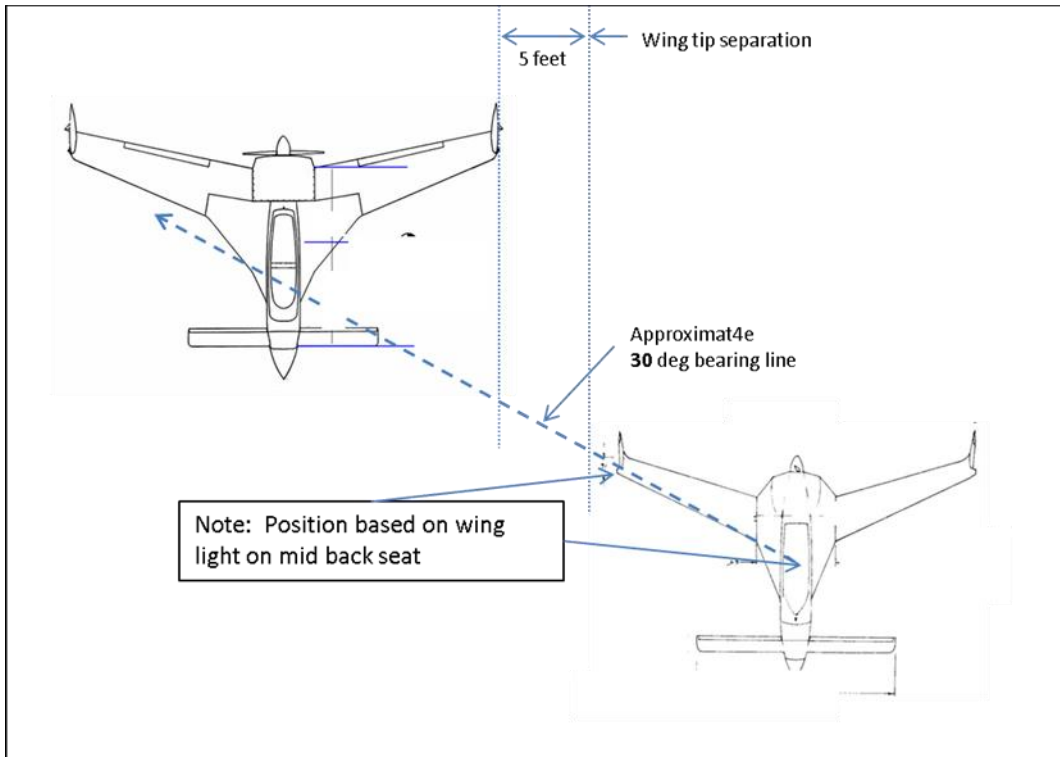




1. Step down: Keep the wheel pants/tires level
2. Bearing line: Align wingtip light with pilot's headrest
3. Spacing: Approx 5 feet between winglets. Once established, check where the spinner (if installed) or prop disc 'cuts' the far wing. This can be a secondary reference for correct position on the desired bearing line. For example, aft end of spinner just inboard of the outboard vortilon.

VariEze Fingertip References (30 degree-line):





1. Step down: Keep the wheel pants/tires level
2. Bearing line: Lead's wing light on the middle of back seat
3. Spacing: Approx 5 feet between wingtips

Reference Speeds, Angles and Other Procedures:

Route Reference: Flying off a canard Lead, place the leading edge of the winglet over the back seat or line up with leading edge of Lead's wing;



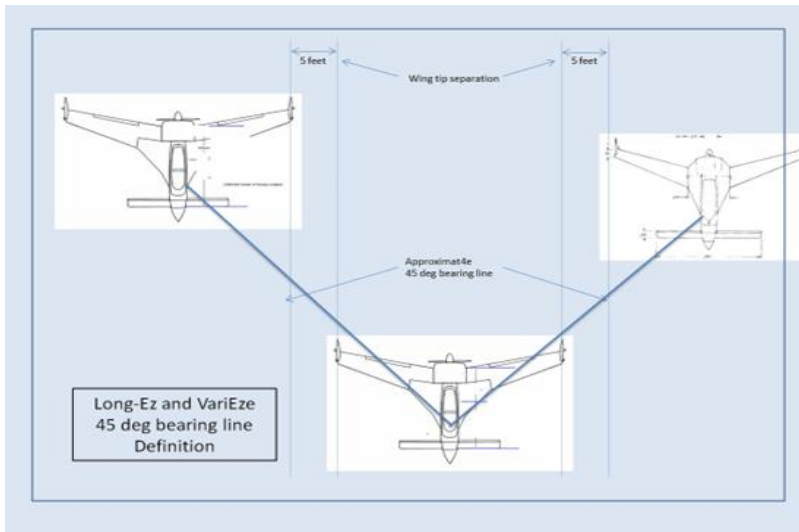
Maneuvering Speed: When there is a VariEZE in formation, baseline speed should be lowered to 120 KIAS, if a Berkut is present increase to 140 KIAS.

Close Trail Spacing: One plane length between aircraft, or as briefed by Lead with adequate stack down in case of engine failure of the preceding aircraft. Note the triangle of sky (see the image below) between the landing gear bow and the canard as this is a good reference for the stack down line.



Dissimilar aircraft formation reference: Other types of aircraft (RVs, T-34s, etc.) utilize a 45 degree bearing line in fingertip and echelon. The bearing line to use depends upon the Lead aircraft; if the Lead normally utilizes a 45-degree line (RVs) then all Wingmen will use that line. Outboard Wingmen (#4 in fingertip or #3 and #4 in echelon) line up heads to stay on the 45 degree line. Flying outboard of a canard aircraft on the 45-degree line, for example #4 looking through a canard #3, you will see the pilot's head behind the winglet. If a canard aircraft is Lead, utilize the 30 degree line. Outboard Wingmen still line up heads. Flying outboard of an RV on the 30-degree line, you will see the middle of the outboard wingtip superimposed on the spinner. A straight-wing aircraft flying off a swept wing canard on the 30-degree line puts the wing's closer together fore and aft. Maintain wingtip lateral spacing.





45-degree line

Additional dissimilar aircraft considerations include different acceleration and deceleration rates due to **different drag profiles** or constant-speed prop effects during maneuvering. For example, a canard on the inside of a steeply descending lazy 8 turn with an RV Lead may have to make a large power reduction to keep from overrunning Lead. Conversely, as an RV Lead begins his descending turn away from a canard on the outside of a lazy 8 turn, the canard pilot may initially have to add a lot of power to stay in position followed by a big reduction as the descent continues. Drag profile differences are also evident on descent to the airport.

Drag profile differences are less noticeable on the shallower maneuvers Lead may perform at the start of a set of Lazy 8s or with less experienced Wingmen. If necessary, techniques for Lead to minimize the effect of different drag profiles during maneuvering flight include 1) shallowing the maneuver (less pitch amplitude) or 2) metering in back pressure on the descending turns to limit pitch change rate.

Additionally, canard aircraft have a slower roll rate than RV's and some other aircraft. This characteristic becomes evident in pitchouts and lazy 8s.

Landing: Given a canard's reduced deceleration rate, the preferred method is the "fade" to the cold side method found in the FFI Formation Guide.

Approach to Landing Speeds:

Downwind	100 KIAS
Base	90 KIAS
Final	80 KIAS

Extend speed brake and landing gear as required for position or speed