



Formation And Safety Team (FAST) Formation Maneuvers Guide

The FAST Maneuvers Guide is published by Formation and Safety Team FAST for member or applicant signatories. All FAST Standardization documents provide guidance in the development of an effective training and evaluation program for members of the FAST organization.

This is not a training manual. Please see your member signatory for all training material related to the maneuvers shown here. Absolutely no liability is implied with the publication of this document.

This publication will not be altered, edited or changed without the explicit written approval of the FAST organization.

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Policy on training

(Reference: *FAST Foundation and Principals*)

Signatories will maintain applicable training guidance for their specific aircraft in all aspects of normal and abnormal formation procedures applicable to the maneuvers contained here and included in the practical test guides for wingman and flight leader. Signatory guidance must include, but is not limited to:

1. Guidance for aircraft movement on the ground
2. All Formation departures and recoveries listed herein
3. All FAST formation in-flight maneuvers listed herein
4. Abnormal procedures applicable to all phases of flight
5. Formation radio communications and visual signals

When developing a signatory training program for the basic FAST qualification, members will reference all FAST Standardization Documents, which include;

1. *FAST Formation Maneuvers Guide* (this document)
2. *FAST Radio Communication and Cockpit Visual Signals Guide*
3. FAST practical test guides (wingman and flight leader)
4. *FAST Foundation and Principals*

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FAST Formation Maneuvers:

- 1. Parade (also known as Fingertip)**
- 2. Vic**
- 3. Finger Four**
- 4. Cross-under**
- 5. Close Trail**
- 6. Diamond**
- 7. Echelon**
- 8. Route**
- 9. Rejoin (also known as Rendezvous)**
- 10. Under run (also known as Overshoot)**
- 11. Lead change**
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 - a. Element Takeoff**
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- 13. Recovery and Landing**
 - a. Overhead Pattern/Interval Landing**
 - b. Staggered Interval Landing**
 - c. Hot-Cold Interval Landing**
 - d. Element Landing**
- 14. Mass Formation**

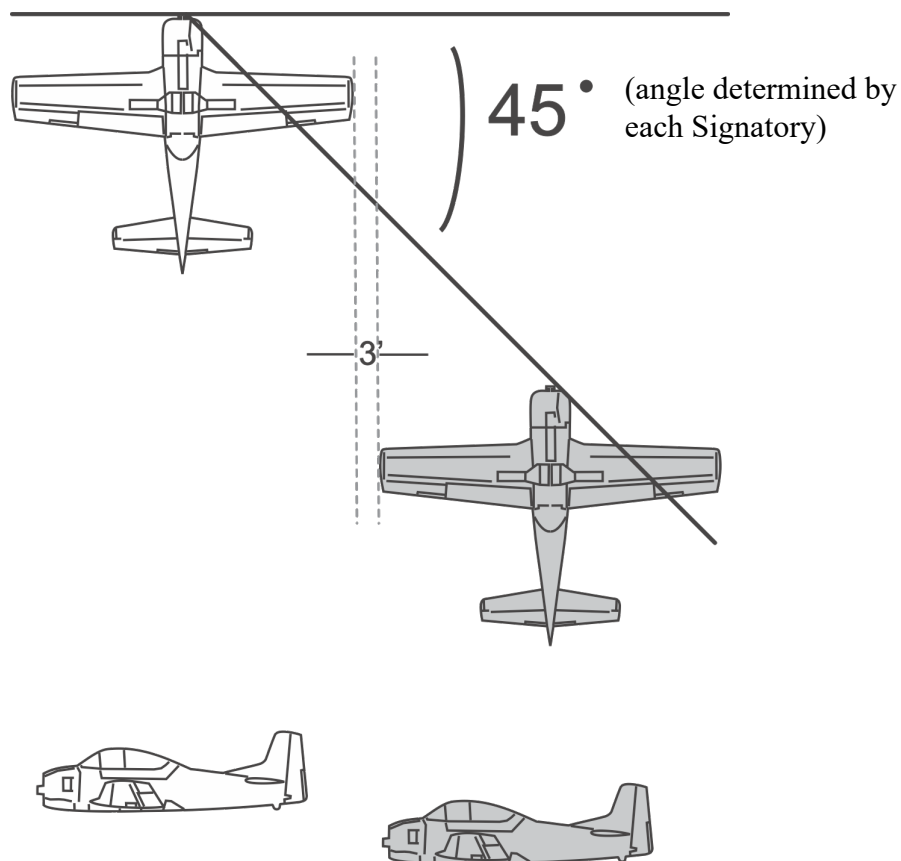
1. Parade (also known as Fingertip)

Position:

Wingman positioned on bearing line with some vertical step down from the lead aircraft and minimum of three feet of lateral wingtip clearance. Vertical step down and bearing-line angle will be determined by signatory/aircraft type. Large bomber/transport aircraft (B-25 and larger) will fly no closer than 25 feet lateral wingtip clearance. Medium bomber/transport aircraft (Beech 18 and similar-sized) will fly no closer than 10 feet lateral wingtip clearance.

Maneuver

All turns, climbs and descents. FAST qualification criteria per applicable Practical Test Guides.



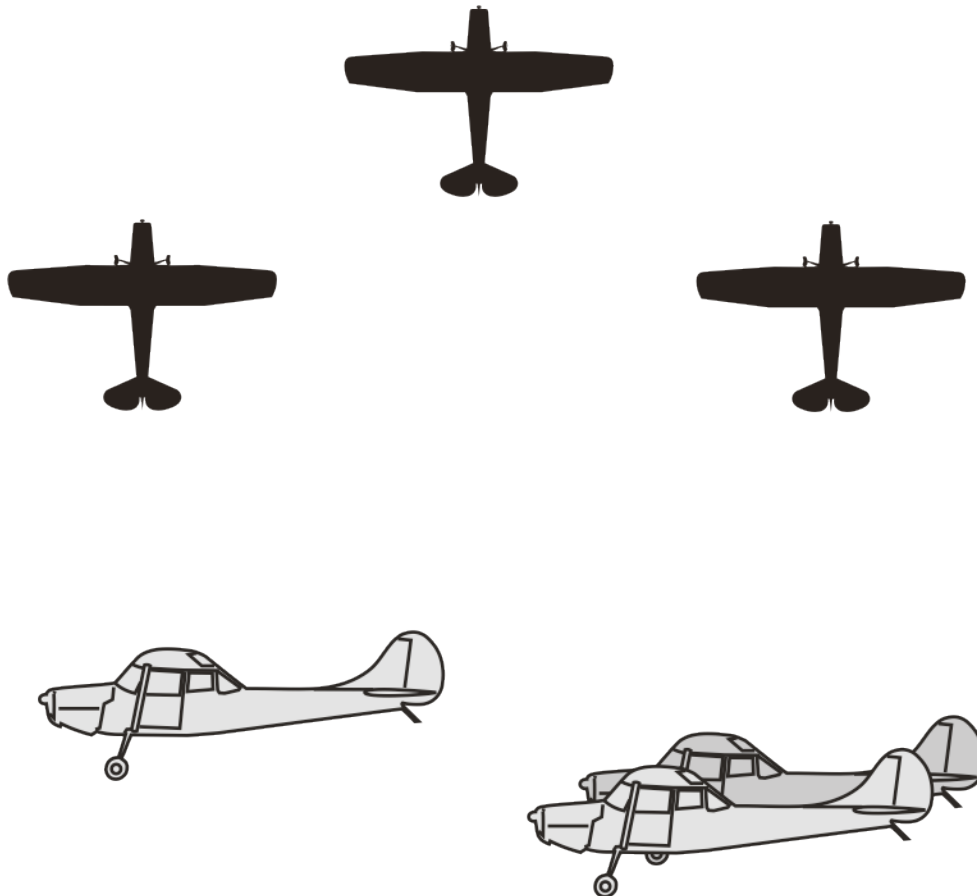
2. Vic

Position

A wingman positioned on both sides of the lead aircraft, on bearing line with some vertical step down from the lead aircraft and minimum of three feet of lateral wingtip clearance. Vertical step down and bearing line angle will be determined by signatory/aircraft type.

Maneuver

All turns, climbs and descents. FAST qualification criteria per applicable Practical Test Guides.



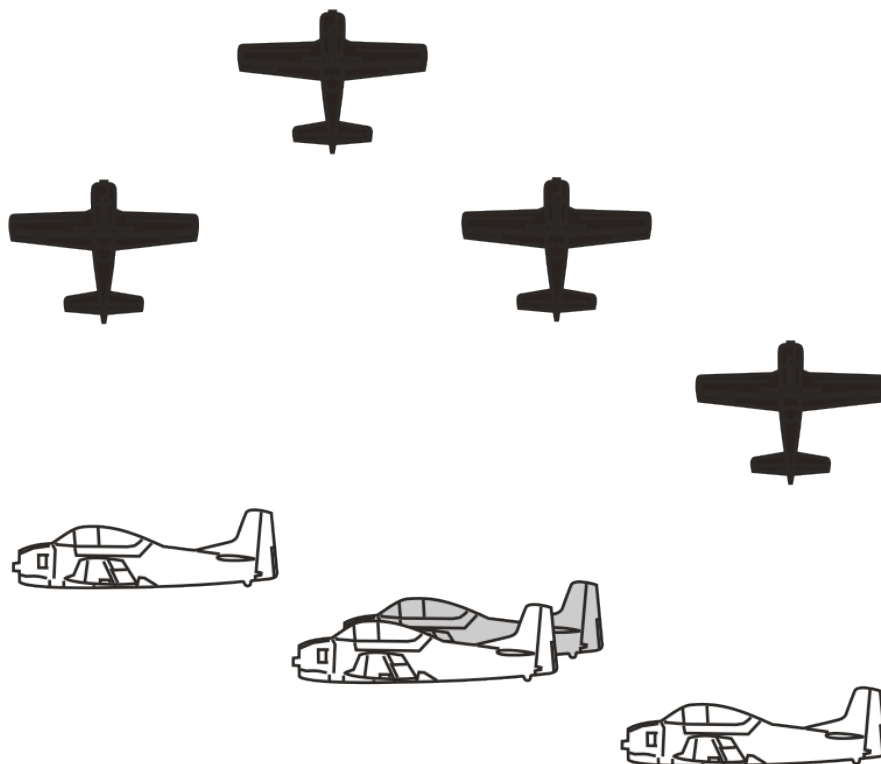
3. Finger Four

Position

Two elements combined to make a four-ship formation. Consists of a wingman positioned on one side of the lead aircraft and an element positioned on the opposite side (strong right depicted), on bearing line with some vertical step down between aircraft and minimum of three feet of lateral wingtip clearance. Vertical step down and bearing line angle will be determined by signatory/aircraft type.

Maneuver

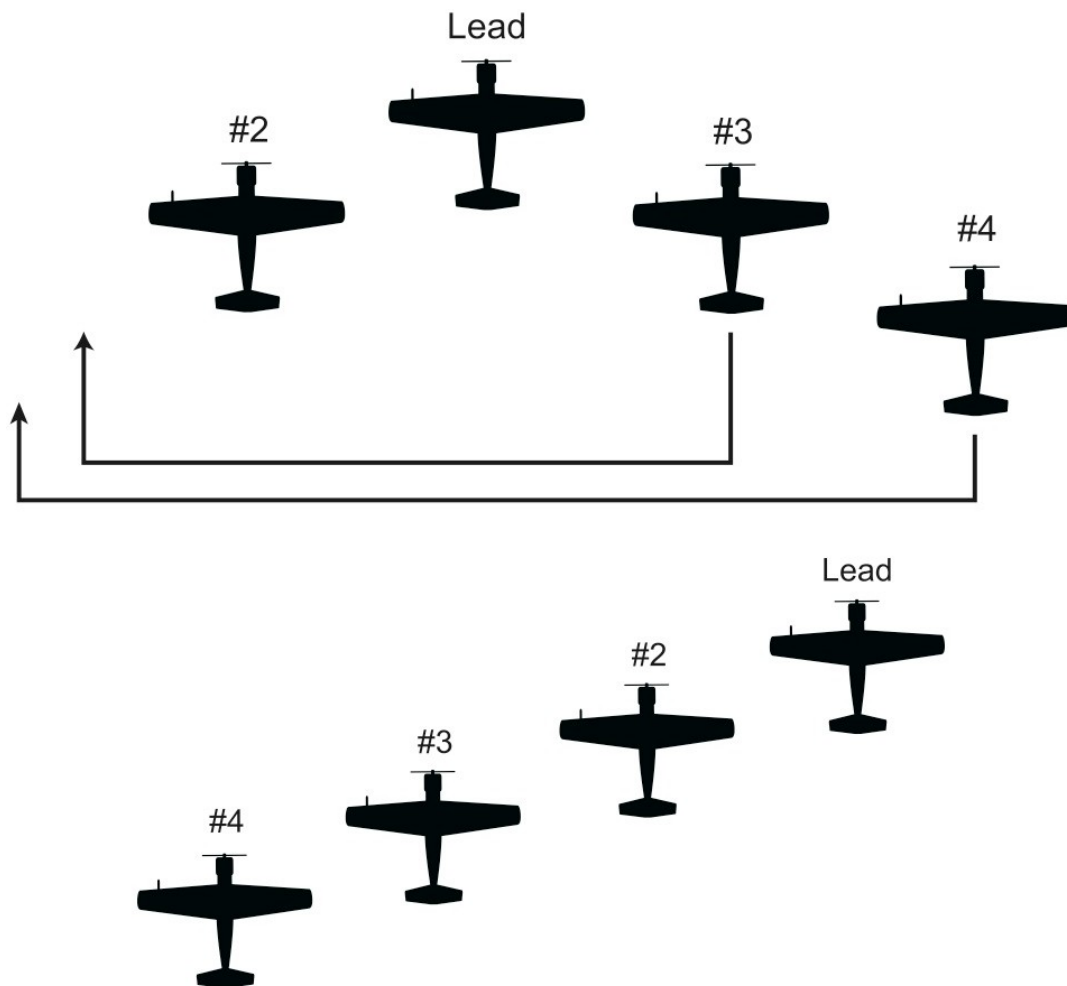
All turns, climbs and descents. FAST qualification criteria per applicable Practical Test Guides.



4. Cross-under

Maneuver

Move one or more wingmen from one side of Lead to the opposite side of Lead.



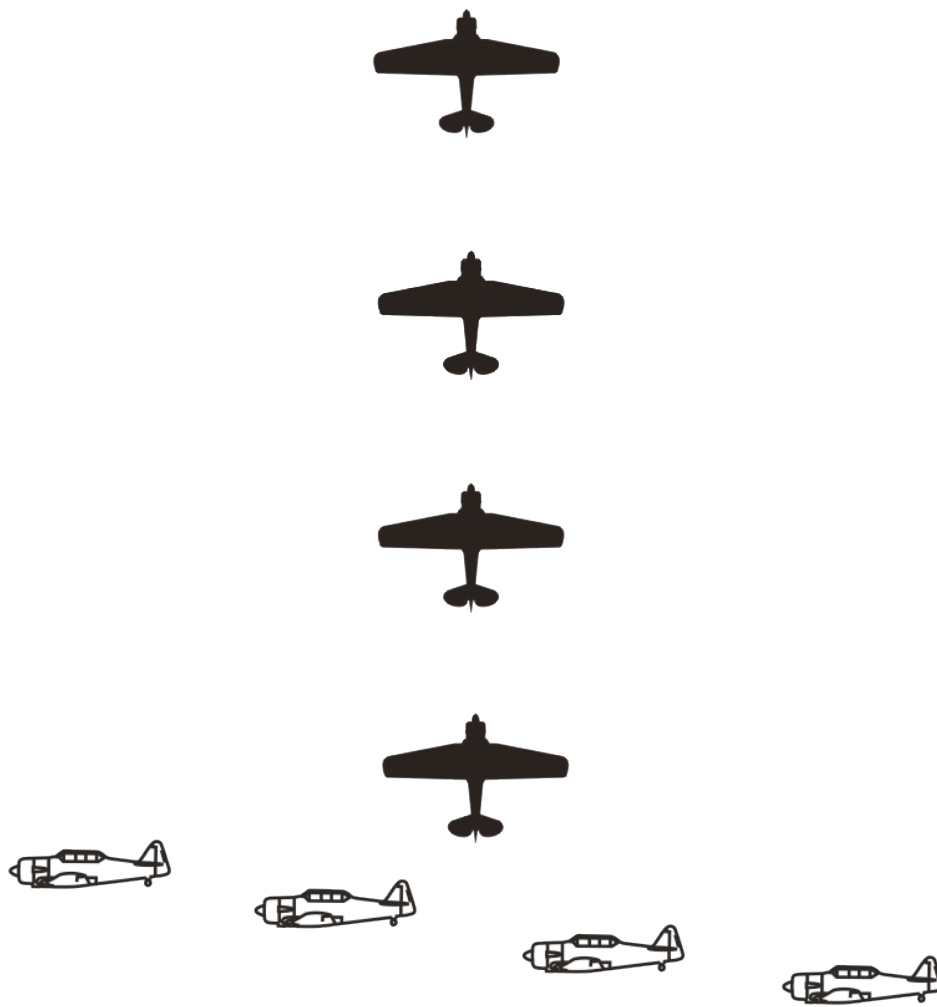
5. Close Trail

Position

Up to three wingmen positioned in-trail of lead/one another with approximately one ship-length of spacing and some vertical step down. Vertical step down and in-trail spacing will be determined by signatory/aircraft type.

Maneuver

All turns, climbs and descents. FAST qualification criteria per applicable Practical Test Guides.



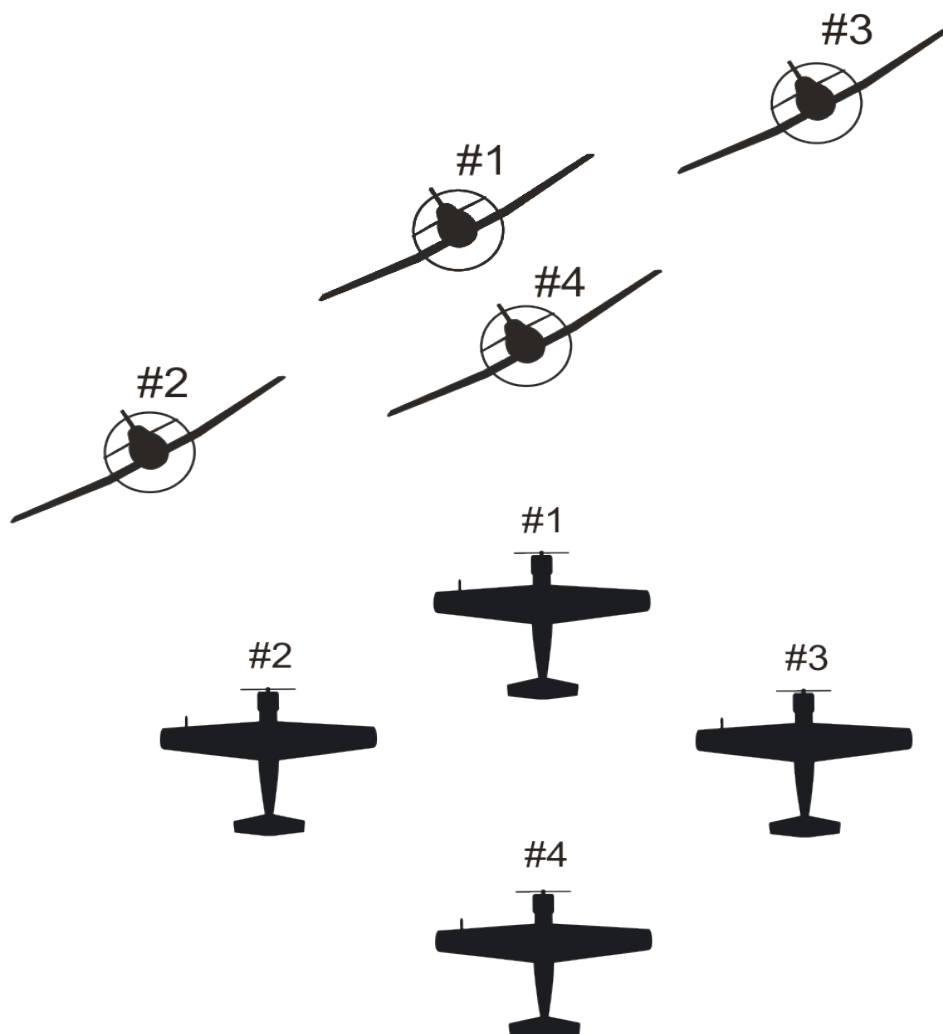
6. Diamond

Position

A wingman on the bearing line, positioned on both sides of the lead, and one (#4) wingman in trail. Wingmen maintain some vertical step down between aircraft and minimum of three feet of lateral wingtip clearance. Vertical step down and bearing line angle will be determined by signatory/aircraft type.

Maneuver

All turns, climbs and descents. FAST qualification criteria per applicable Practical Test Guides.



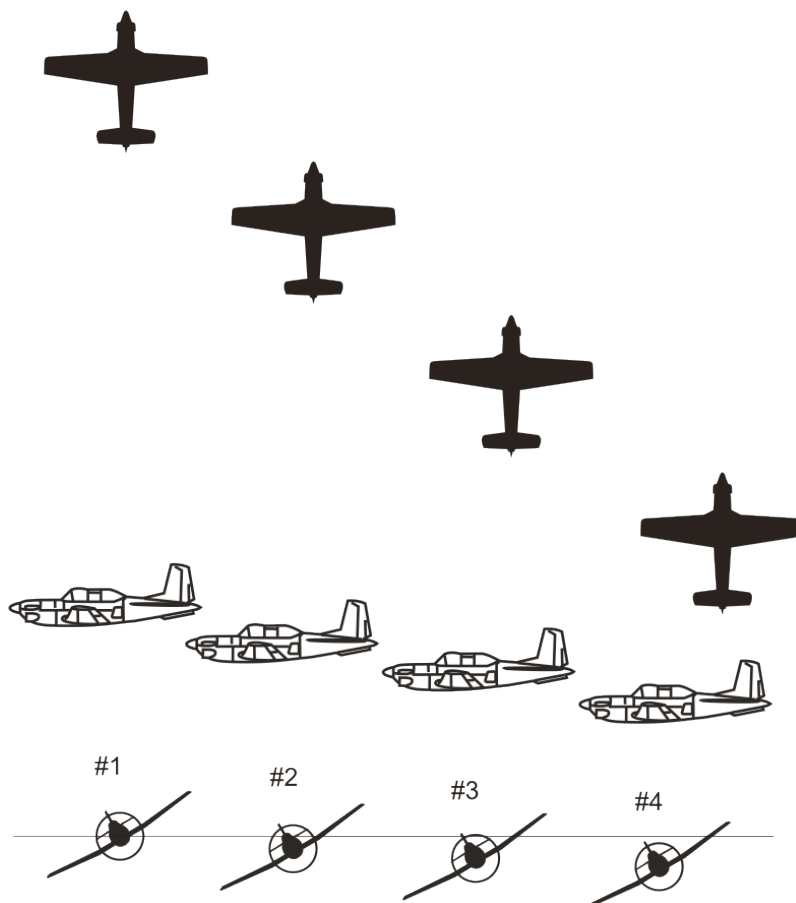
7. Echelon

Position

Up to three wingmen on the bearing line, all positioned on one side or the other of the lead aircraft (echelon right depicted). Wingmen maintain some vertical step down between aircraft. Vertical step down and bearing line angle will be determined by signatory/aircraft type.

Maneuver

Turns are executed away from the wingmen. FAST qualification criteria per applicable Practical Test Guides. Signatories may elect not to authorize Echelon turns based on type considerations (e.g., limited visibility in biplanes).



8. Route

Position

A flexible formation position identical to parade or finger four (based on number of aircraft) with the distance between aircraft limited to a range of from 2 ship-widths to 500 feet.

Maneuver

Route may be called for by the flight lead for all radio frequency changes, checklists and other times, as needed. Wingmen will maintain position between the bearing line and the 3-9 line while moving out to the prescribed interval. During maneuvering (turning), wingmen on the outside of the turn will maneuver in echelon using in-plane references. Wingmen on the inside of the turn will descend only as needed to keep the flight lead in sight.

9. Rejoin (also known as Rendezvous)

Rejoins should be conducted with the rejoining wingman's aircraft at or slightly below the Lead aircraft's altitude until approaching the route position with controllable closure. Controllable closure described as little or no heading crossing angle (fuselages aligned) and nearly matched airspeeds. Rejoin is then completed to the parade position.

If rejoining more than one aircraft in sequence, such as during four-ship maneuvers, each aircraft or rejoining element will maintain a minimum of 100 feet from preceding aircraft until that aircraft is stabilized in route or parade position. See also: wingman and flight leader practical test guides.

10. Under run (also known as Overshoot)

The ability for one aircraft (wingman) to safely maneuver away from all other aircraft during an unsafe rejoin.

Procedure

During the turning rejoin, if closure is excessive or wingman position is unsafe, the wingman will not rejoin to parade position, but will under run (pass behind and below) to ensure at no time a potential for collision exists between any and all aircraft in the formation.

Wingman will stabilize to the outside of the turn, not higher than Lead, before resuming the rejoin.

During a straight ahead rejoin, if closure is excessive, the Wingman will turn slightly away from Lead, keeping Lead in sight. Wingman will stabilize, slide aft of Lead's 3-9 Line before resuming the Rejoin.

11. Lead Change

The ability to safely identify and transition to a new flight leader.

Lead change procedures may be conducted from a route formation or where only the aircraft taking the lead moves out to route.

12. Takeoff

Formation operations that necessitate Two or more aircraft departing a runway either simultaneously as an Element or separately using a prescribed Interval.

Runway Requirements

The runway's total width must allow for all aircraft to maintain a minimum of ten feet lateral wingtip clearance at all times.

The runway length for element takeoffs should be no less than a minimum of 20% greater than the normal calculated takeoff roll for all aircraft provided by their Pilot Operating Handbook/Operating Specifications.

Element Takeoff

An element aligned on the runway with the wingman on a selected bearing line with a minimum of ten feet lateral wingtip spacing. The element pilots initiate brake release and takeoff roll simultaneously and maintain the same relative position throughout rotation and lift off. Gear and flap retraction, if applicable, are normally accomplished in unison.

Multiple elements departing the same runway with tailwheel aircraft will not commence the takeoff roll until lift off is confirmed with the preceding aircraft/element (because of the inherent visibility).

Element takeoffs are not authorized for bomber/transport aircraft.

Interval Takeoff

An element aligned on the runway with the wingman on a selected bearing line with a minimum of ten feet lateral wingtip spacing. Aircraft will depart individually, and rejoin after takeoff. Tailwheel aircraft will not commence the takeoff roll until lift off is confirmed

with the preceding aircraft (because of the inherent visibility restrictions); Signatories may authorize an earlier takeoff roll based on type considerations.

13. Recovery and Landing

Overhead Pattern

A landing pattern conducted under VFR conditions to recover multiple formation aircraft efficiently. The formation is maneuvered to an Initial position approaching the landing runway in level flight typically in echelon ("initial"). Altitude is typically equal to or greater than the airfield published pattern altitude, but will be determined by the flight lead. At a point typically near the approach end of the landing runway, Lead will perform a level turn away from the flight not to exceed 60 degrees of bank and continue the turn approximately 180 degrees to an inside downwind leg while reducing to downwind airspeed as required by aircraft specifications/POH. Lead will then configure for landing and begin a descending turn to final. Each formation aircraft will follow suit, beginning the turn to inside downwind at an interval specified by Lead, or each pilot will use five seconds between aircraft if no interval is provided.

Landing

Two or more aircraft in simultaneous movement on a runway for landing/roll out.

Runway Requirements

The runway's total width must allow for both aircraft to maintain a minimum of ten feet wingtip clearance.

Staggered Interval Landings

Each aircraft will land on opposite sides of the runway with the lead aircraft typically landing on the side of intended runway exit. Minimum landing interval will be determined by Signatory.

When landing more than two aircraft using staggered procedures, each pilot landing on the side of intended runway exit will verbally clear the preceding wingman to cross to their side (runway exit side) when it is safe to do so.

Staggered, interval landings are not authorized for bomber/transport aircraft.

Hot-Cold Interval Landings

This is an alternative to staggered landing procedures and requires the same runway width criteria. The lead aircraft will land on the side of the runway of intended ramp exit, thus designating the “cold” side of the runway.

All subsequent aircraft will land on the opposite side (“hot” side) or favor the hot side of centerline. Upon touchdown and when safe to do so, without unnecessary delay, each wingman will move to the cold side to complete landing roll out and runway exit, thus providing a clear, hot lane for following aircraft to land. Minimum landing interval will be determined by Signatory.

Hot-cold, interval landings are not authorized for bomber/transport aircraft.

Element Approach and Landing

A formation approach with two aircraft in a modified parade formation position. Modified parade position requires a minimum of ten feet of lateral wingtip clearance and wingman near level with Lead and configured during final approach and touchdown. Aircraft will land together (wingman should touchdown first or simultaneously with Lead) on their respective sides of the runway.

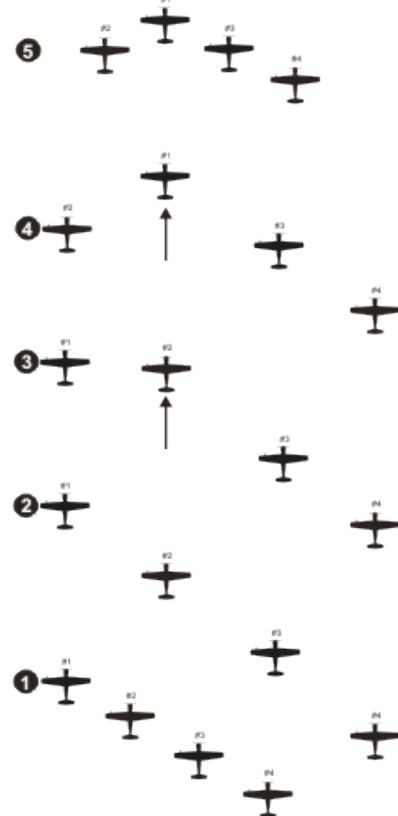
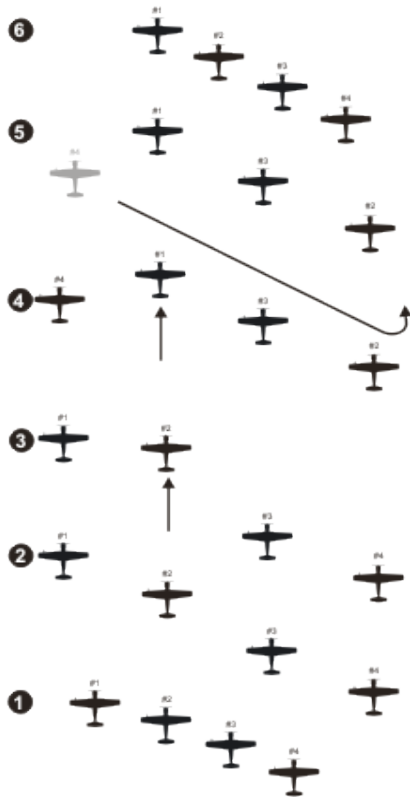
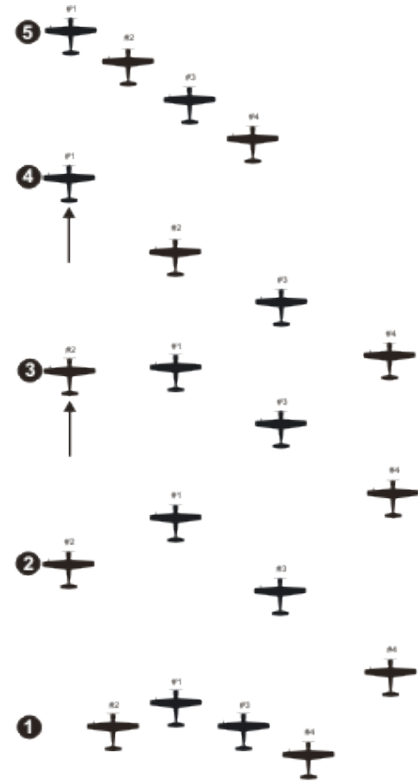
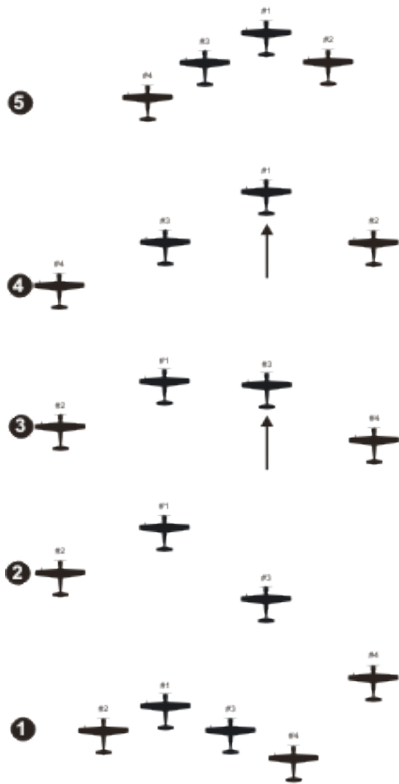
Element approach and landings are not authorized for bomber/transport aircraft.

Signatories will provide applicable procedural and training guidance for the element landing and potential go-around.

14. Mass Formation

The term “mass formation” reflects any formation of more than eight aircraft and may be comprised of one or several of the formations contained in the FAST Maneuvers Guide. Signatories will maintain applicable guidance on training and evaluation of mass formation activity.

Image: Lead Change Options



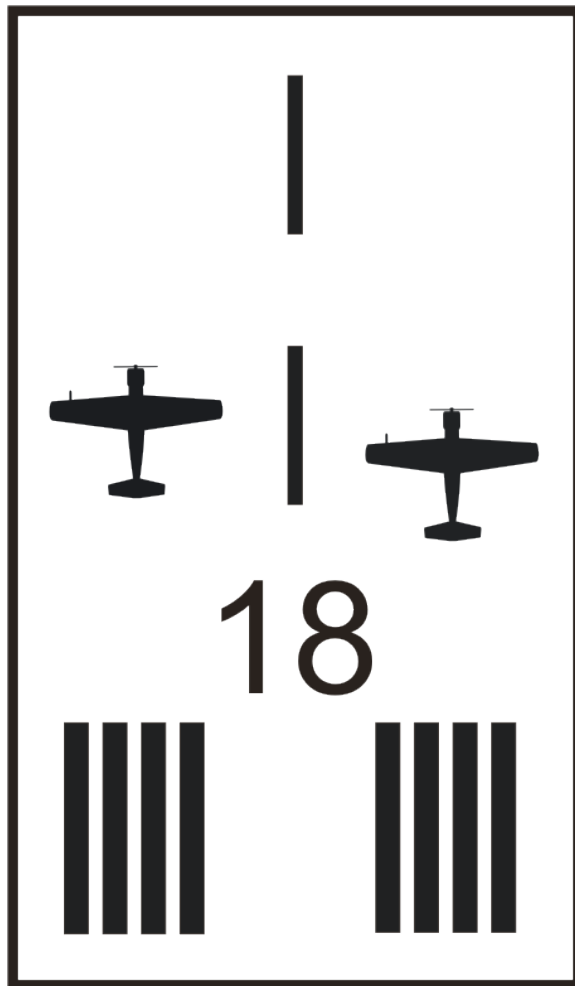


Image: Runway Width Criteria

Runway width criteria for landing or takeoff require a minimum of 10 feet of lateral wingtip clearance while aircraft are in motion regardless of procedure used (element or interval takeoff/landing)

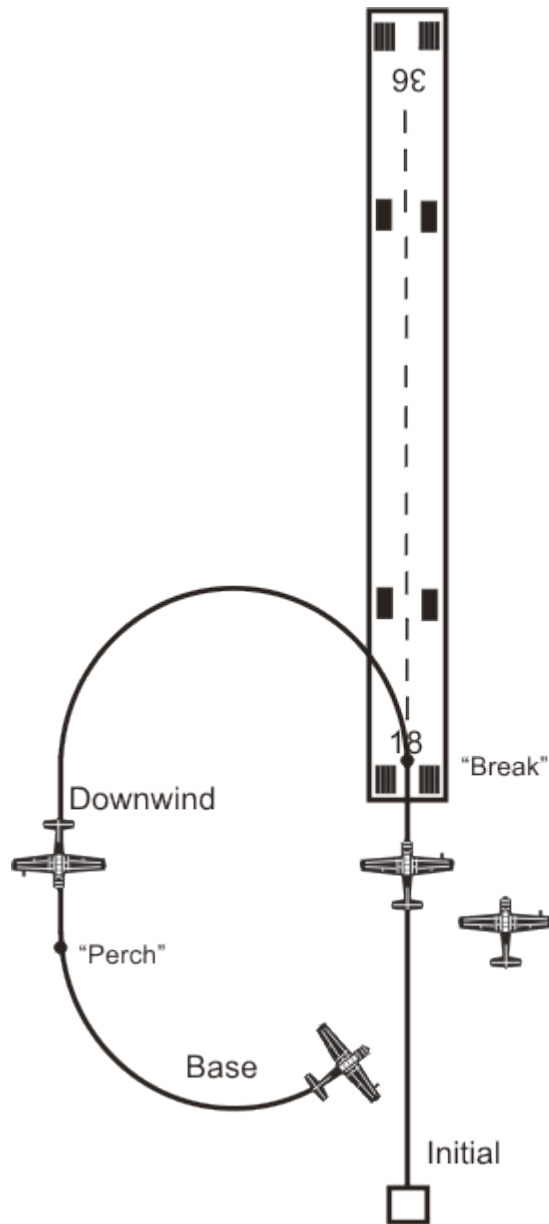


Image: Overhead Pattern

The overhead pattern provides for rapid recovery of formation aircraft. While the flight lead may choose any “break” interval (time between individual aircraft maneuvering to the downwind leg), all aircraft must establish a minimum safe interval between aircraft for landing, as determined by Signatory.

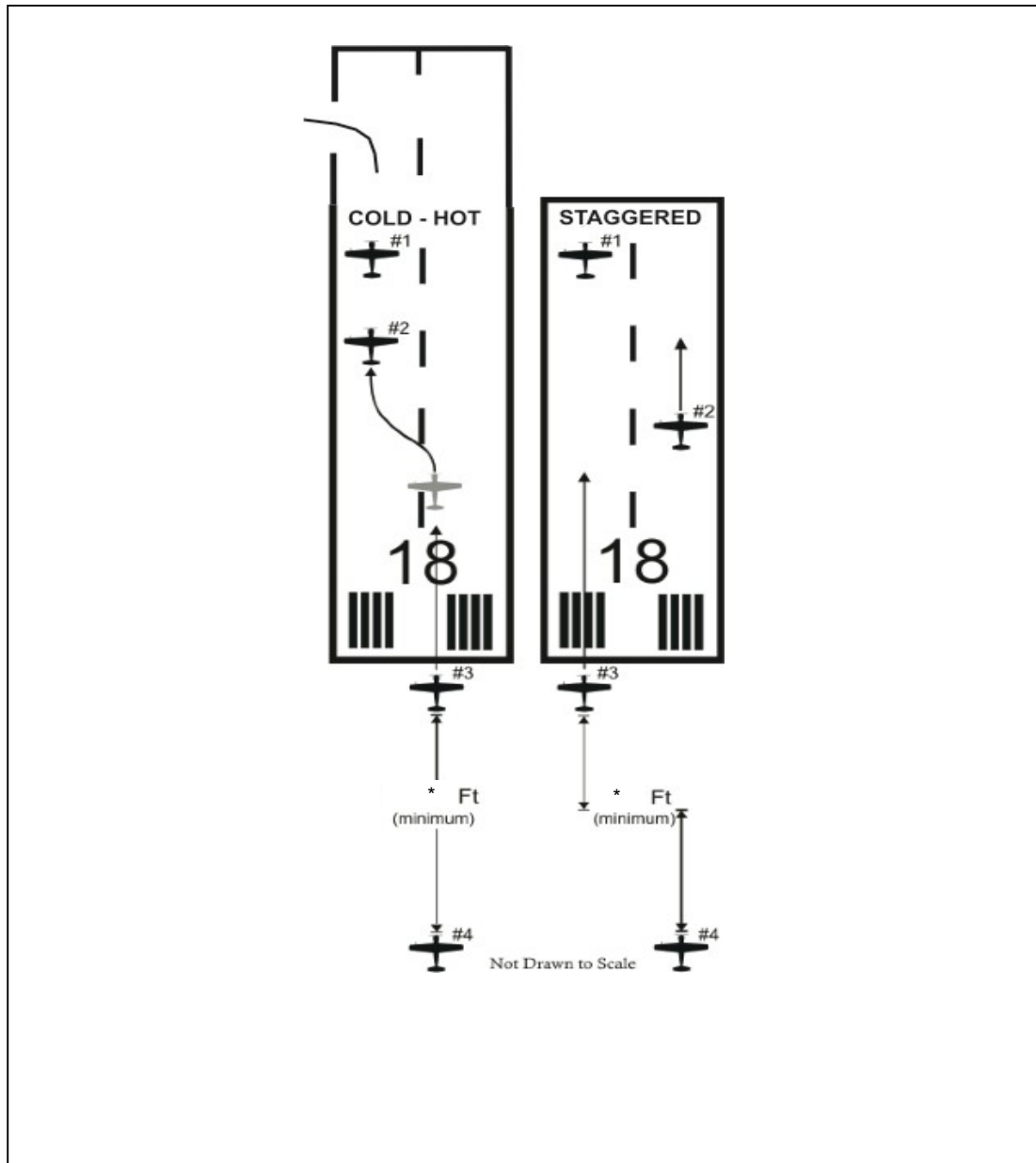


Image: Interval Landing

*Signatories will determine recommended minimum safe intervals for their aircraft type(s) to mitigate the potential for aircraft collision or forced runway departure should a pilot experience a mechanical failure or other emergency.