

Formation Practice

ON YOUR OWN

DISCLAIMER

Flying an airplane entails definite risks. Formation flight is inherently more dangerous than most other forms of flight. The following suggestions have been abstracted from the T-34 Formation Flight Manual, personal instruction and experience. This list of suggestions has not been compiled by a certified flight instructor or formation flight expert, is not intended to be complete and I do not consider it authoritative. Anyone practicing formation flight must do so at his or her own risk.

It is mandatory that everyone practice formation flying in the months preceding Oshkosh. There will be some who cannot attend either Texas or one of the regional practice sessions.

The T-34 Formation Manual is the official manual for all the warbird formation groups. At the Texas practice session it will be the course manual. For those who must practice on their own, the following suggestions are offered, but consult the manual for any questions and use it to resolve any conflicts.

BRIEFING

A good formation flight begins with a good briefing. Discuss what you want to accomplish, engine start time, taxi, take-off position, who will be lead, take-off power, gear speed, communication frequencies and frequency changes, a mutual air to air frequency, landing and taxi back. Discuss use of signals for gear up/down and flaps up/down.

Lead is responsible for obtaining a weather briefing and making a go/no-go decision. Lead briefs the flight on weather conditions. Formation flight should not be attempted in IMC, marginal VFR or at night.

Turbulence, crosswinds and wind shear have greater effects on formation flight than on individual flight. A heavy A36 responds differently in turbulence than a light early V-tail. All members should agree that the conditions for formation flight are appropriate.

Lead briefs the flight on the general route of flight, altitude and airspeed. Lead indicates minimum altitudes for the area, major landmarks, obstructions, hazards, MOAs, restricted areas and similar flight issues. This assists wingmen should they need to break-off the formation and navigate individually.

Lead initiates all ATC contact. Wingmen monitor the ATC frequency and flight lead. Lead has the transponder on VFR or as directed by ATC. Wingmen have the transponder on standby.

The multi-com frequency for air-to-air communication is -----. At Oshkosh, the wingmen maintain radio silence, except in an emergency.

Procedures should be discussed for lost communications due to radio failure, electrical problems or frequency confusion. The military uses hand signals, but prudence would indicate breaking-off formation flight practice in such circumstances.

TAKE-OFF

A formation takeoff eliminates the need for join-up after takeoff. Choose airports with runways 150' wide. Except for major airline hubs, most towers will readily grant formation take-offs and landings. If in doubt, call the tower on the telephone.

The formation used for take-off depends on the wind and number of aircraft.

In a flight of two, lead should assume the downwind side of the runway with wingman upwind. This ensures that lead's prop wash will not affect his wingman. It also ensures that the wingman will point away from lead should he weather into the wind. Use the entire runway width. It is permissible to have a wing overhang the grass.

In a flight of three, lead follows the centerline. Wingmen pick a line on the left or right and follow that line.

Wingtip clearance is mandatory.

Take-off roll should be in unison. At RFD we line up parallel. It has been our experience that wingmen quickly fall behind because of relative inexperience. For practice sessions the T-34 manual and most training formats practice wingmen lining up in the acute position, well forward of the 45°, but not quite in parallel. This precludes lead swerving in front of the wingman should he blow a tire. Lead indicates spool-up to take-off power with a hand signal (usually by a finger-up circling motion). At Oshkosh, the flight leader announces "Element xx rolling". Elsewhere brake release is signaled by a head nod. Power is added smoothly. Less than METO power is generally necessary to allow wingman to maintain position (not "sucked"). Aircraft are held on the ground until slightly above takeoff speed

Formation leader should discuss the appropriate emergency "out" procedures for take-off.

Door popping open – fly the airplane and do not swerve toward other aircraft. Return and land.

Any emergency – follow AC manual but:

Do not swerve – brake or fly straight ahead.

If runway blocked, brief off runway exit procedure.

CLIMB

Wingman never, never, never turns his belly to lead. Losing site of lead leads to danger of collision.

Lead should adjust his climb power to match the engine performance of his wingman. Less than full power will be required.

Discuss when gear will be raised adjusting for various gear speeds on different model Bonanzas.

Discuss and brief emergency landing areas and return to airport procedures.

FORMATION CRUISE

The wingman has complete focus on flight lead.

Wingman should never be looking at his gauges or navigating, only at lead. Once the RPM is set, it stays there the entire flight. It will be helpful to have a co-pilot to handle radio work. It is appropriate for the flight lead to spread the formation for a minute or two with a yaw of the tail signal when cruise altitude has been achieved allowing wingmen to momentarily divert attention more safely to reset RPM, change frequencies, accomplish other cockpit chores. Parade formation is re-established by a wing rock signal.

Escape for the wingman is always down. It need not be more than one or two hundred feet. More just makes rejoin more difficult and will greatly accelerate your plane in front of lead.

Wingman always has his wings parallel to lead. According to the T-34 Flight Manual, closeness "is controlled by coordinated use of aileron and rudder (mostly rudder)." In most of our training sessions we have stressed keeping wings parallel to flight lead and using primarily rudder to slide in and out. It is uncomfortable for lead to see an inexperienced wingman making gross corrections banking towards or away from him. While "mostly rudder" is not coordinated flight, it works adequately. As skill improves and corrections become more minor, truly coordinated flight is preferred. A one-degree difference in coordinated bank angle will adjust position a few feet per second. There is no need to correct more rapidly.

The wingman banks only to follow lead in a turn. Wingman never turns his/her belly to lead.

Wingman assumes a step-down position. He should be able to see the undersurface of the lead airplane wing and the belly. This is the safety position and is used in almost all formation flying.

Wing overlap is avoided. You are practicing "en route" formation flying, not air show Blue Angel or Thunderbird formation.

Stay as far lateral as you feel comfortable and safe, but maintain sufficiently forward position that lead can always see you easily. Avoid a deep "V".

The closer you are, the easier it is to see change in position and make adjustments. Again, being comfortable and safe is more important than being close.

Lead is responsible for the safety of the formation. His is the responsibility for avoiding other aircraft, towers, etc. A second pair of eyes is helpful.

AIRSPEEDS AND ALTITUDE

The Oshkosh flight is usually at 1800' AGL. Practicing at least 2000' above any possible obstructions is appropriate. Higher altitude degrades performance and makes adjustments in airspeeds more difficult.

Slower airspeeds are better. Practicing at 120 - 140 kts is comfortable and useful. Vary speeds. You can expect that in the formation flight into Oshkosh.

THROTTLE CONTROL

Fly at 2400-2500 RPM. Less will not enable you to have available power to catch up when needed. Know the manifold pressure needed to fly at 125KTS at 2500 RPM as a base point for

setting throttle. Forget leaning the engine in formation. This will be a hard habit to break for many of us who are used to managing our aircraft for efficiency.

With experience comes fine throttle adjustment. When learning, large throttle movements are often needed. When necessary use them and forget the vernier. If falling behind (getting "sucked"), you will need a large throttle movement to catch up. As you catch up retard throttle an inch or two to stop acceleration so you do not pass lead ("acute"), then immediately come back in slightly less than before to avoid getting sucked again. With experience comes anticipation and smaller throttle changes. If others will be in the plane with you, warn them that the gear warning horn may sound with large throttle movements. Reassure them in advance it is not the stall warning.

Anticipate throttle changes in turns. If you are on the inside of a turn, immediately back off on power; don't wait until you are in front of lead. If on the outside of a turn, immediately add power; don't wait until you have fallen behind.

AVIONICS

Lead is responsible for communicating, navigating and safety avoidance.

Wingmen should not monitor moving maps, GPS, engine monitors, autopilots or any cockpit instruments. Formation flight is a wonderful stick and rudder exercise. Consider turning off these distractions.

LANDING

Practice 5 mile straight in approaches and landing long (all runways 150' wide are sufficiently long to accommodate this. Taxi to the end of runway. Never cross in front of the airplane behind to exit the runway.

Discuss gear extension speeds, which vary significantly by model. Lead will extend gear at the appropriate speed and the others will follow.

Discuss over-the-numbers speed that will be comfortable for all flight members. Lead will maintain the agreed speed and the wingmen will follow.

Lead will be especially vigilant for other aircraft in the pattern. Lead will not be looking at the formation, but will be focused on landing. Wingmen must follow lead.

At Oshkosh we land two aircraft on the main runway and one on a parallel taxiway that is used as a runway for the convention. Practice landing in flights of two, even if you have a three ship practice flight. The third aircraft should practice landing on half of the runway.

Lead should land on the downwind side. If you are uncomfortable changing sides, allow wingman to assume the lead for landing, thereby avoiding prop wash and wing tip vortices.

Wingman flies lead's wing and maintains position until short final. It is not necessary to be staring at the runway. You will know when you are there. Trust your lead to bring you there.

Most of us land on runways 75' wide. A runway 150' wide is sufficiently wide for formation landing for pilots of average skill. Obviously you will not be practicing this in strong crosswinds.

Practice landing on a narrow runway (less than 50'?????) in single flight if you will be a wingman who may have to land on the taxiway.

Practice high-speed taxi: 30 to 40 Kts. Oshkosh always requires high speed taxi to minimize time on the runway.

Discuss landing emergencies.

If an aircraft is experiencing any kind of difficulty, terminate formation flight.

Discuss balked landing (go-around) procedures.

Decide each aircraft's on ground emergency exit is if the runway or taxiway is blocked.

Practice a maximum braking landing in case you have to stop short.

POST FLIGHT BRIEFING

A formation flight always ends with debrief and discussion of what was good, what was poor and how things could have been made better.

Rear seat passengers are not recommended during formation practice even if they are experienced pilots (unless you provide them appropriate plastic bags).

Consider a practice session with the aircraft loaded as will be for the Oshkosh.