



**RV Supplement, 1st Edition
to T-34 Formation Flight Manual, 4th Edition**

Supplement to T-34 Formation Manual for RV Aircraft

These procedures are meant as a supplement to the T-34 Manual, not to conflict with it, but rather to fill in the holes with airframe related considerations.

Page 9, **General Recommendations**: The wear of parachute, helmet, and flight gloves is at the discretion of each pilot.

Page 10, **Station Keeping**, Para 2: In the RV, line up the outside aileron hinge on the prop spinner for the primary line of position (LOP), then look for a small amount of opposite side elevator tip behind the rudder to fix a point on that primary LOP. This reference will give fore/aft, up down, side to side positioning. Keep wings level with lead at all times. Fly like your picture will be taken at any moment.

Page 23, **Radio Procedures**: Normally frequency changes are done in the route position. Frequency changes will be either signaled or called (preferred). If called, lead will say either “**Go**” or “**Push**” xxx.xx or Channel X. If “**Go**” is called each flight member in sequence will respond “twoop”, “threep”, “fourp”. If one member fails to respond, the next pilot in the sequence will wait a few seconds and then respond. That way lead knows who heard the call and who did not and can deal with just the laggard. When all flight members have responded, each pilot will change the frequency. If “**Push**” is called by lead (such as when in an ATC environment), flight members will not respond and immediately switch the frequency by “**PUSH**” of the radio Flip-Flop. After about 10 seconds, lead will call for a check in and all flight members respond in sequence. If flying cross country or IFR and lead has two radios, it is best for lead to put the flight on a single air-to-air freq on one radio and use the other radio to talk with Center. Every 30 minutes during a flight, lead should find a time when his flight is in route or extended trail to call “**Ops Check**”. It should be acknowledged by his wingmen in sequence and each member should check his instruments and switch fuel tanks as appropriate. Each wingman should monitor his fuel during the mission and if his fuel gets to a state where returning to land is required (normally 5 gals, or as briefed), he should call “**Bingo Fuel**”. Lead will cease all maneuvering and recover the flight.

Briefing. All formation flights, without exception, will be briefed. If aircraft in a planned flight are located at different airfields, it is preferred that they all co-locate to brief, but a telephone briefing is acceptable. Use of a briefing guide, such as displayed in the Manual or local standard, is encouraged.

Start. If flight members are all in sight of lead, the flight lead will use a hand signal to start engines. If not, lead will issue a time hack to start engines. Lead will allow a minute after engine start for all flight members to start, get avionics on, and get cockpit ready. He will then check the flight in on briefed frequency.

Taxi/Run up. If leads taxies off the taxi line, the flight will stagger taxi, alternating left and right of the line. If lead taxies on the line, the flight will taxi in trail with lead. If in stagger and lead moves his elevator full up and down several times, the flight passes the signal and will taxi in trail no matter where the line. Normally all turns will be in sequence with lead. If lead wants the flight to make a Flank Turn with him, he will, unless briefed, call “(Call Sign), In Place 45/90 right/left, now”, and all members will turn simultaneously with lead. In the run up area, all members will line up as briefed and line up the heads using #2 as reference on lead. Each member runs up, passes the thumbs up forward when ready, and checks other flight aircraft for any discrepancies.

Takeoff. Lead will brief the takeoff line up and sequence based on winds, and runway width. When lead signals run up, wingman will run up to 1700 RPM, check instruments, look at lead, and if ready give a head nod when lead looks at them. If a formation takeoff was briefed, lead will give a large head nod for brake release. Lead will advance power but insure a power advantage for wingmen during a formation takeoff. After liftoff and approaching 100 KIAS or as briefed, lead will signal a power reduction and maintain 100 KIAS for join up and climb.

Join up. If a join up turn was briefed, wingmen will accelerate to a slight airspeed advantage, move out to the rejoin line (vertical stab on outside wing), and close to position. Unless briefed otherwise, #2 will join up on lead's inside wing, and #3 and #4 will join up on his outside wing by passing through close trail. In a straight ahead join up, unless briefed otherwise, #2 will gain an airspeed advantage and join to lead's left wing, and #3 and #4 will join to the right wing.

Climb. Normal climb speed will be 100 KIAS. Lead will push up the power as high as possible without leaving any wingman behind. Wingmen will call "(Call Sign) gimme one" if necessary. Climb out is normally conducted in either fingertip or route formation, or both.

Route. Lead gives the fishtail signal by small movements of right and left rudder. Route formation is flown at 2-4 ship widths wide and forward of the normal reference, aligning the leading edge of the wingtip on the spinner. In turns, members on the inside will maintain the normal route reference (down), but members on the outside of the turn will turn level with lead by putting lead on the horizon. If cross country, lead will brief desired spacing after level off until descent.

Maneuvering. Formation maneuvering speed for RVs is normally 130 KIAS (or as briefed), which gives power available to wingmen on the outside and sufficient airspeed to wingmen on the inside. Cruising speed will be determined by lead setting power so that the aircraft with least power can maintain position with an appropriate power setting.

Lazy 8 Maneuvering. Lead will use appropriate pitch and bank according to the experience level of his wingmen. 60° of bank and 30° of pitch is normal with highly experienced wingmen. Lead should smoothly increase and decrease rates of bank and pitch. Wingmen will keep their wings level with lead at all times during maneuvering and make small quick throttle movements as required to maintain perfect position. It is much easier to make small changes quickly than to wait and need to make large changes. Wingmen should anticipate power changes by advancing power immediately when lead turns away and by automatically reducing power when lead turns into them. To prevent over controlling, wingmen should secure the elbow so that only finger pressure and wrist move the stick. At all times the

formation should look like it is welded, hence the term **Welded Wing**. During 4-ship maneuvering, **IF BRIEFED**, it is appropriate to go from one formation to another without returning to fingertip. Otherwise, use the T-34 Manual standard. A small wingrock from lead indicates a return to Fingertip formation. Fingertip, Diamond, and Trail station keeping is very important as building blocks for larger formations.

Fingertip. The Fingertip reference for #2 and #3 is to put lead's outside aileron hinge on the spinner and a little opposite elevator tip behind the rudder. #3 will dress across on #2. #4 will attempt to fly the same position off #3 but will also line up the heads of #3 and lead. If #3 bounces a bit, #4 looks through #3 and flies off lead.

Diamond. In Diamond, #2 and #3 fly the same reference as in Fingertip, but #4, after receiving the "#4 Go Trail" thumb signal, crosses behind/below #3 to the in trail position on lead. He should line up lead's tail wheel with his head (or look up his exhaust pipes) as his primary reference and also attempt to line up the aileron hinges and spinners of #2 and #3 as concentration allows. Side by side RVs should line up their centerline. Prevent over controlling by using just finger pressure to make small stick movements

Trail. Lead will signal Trail formation by a porpoise (small and quick elevator movements so as to wag the tail up/down without changing altitude) and #2, #3, and #4 will drop back and into trail in sequence. If briefed, only #4 calls when in position "4s In". Each aircraft should attempt to fly just below the prop wash/wingtip vortices by lining up the tail wheel with the pilots head (or looking straight into the exhaust stacks). Spacing between aircraft should be $\frac{1}{2}$ to $\frac{3}{4}$ of a ship length from rudder to prop. Keep the wings level with lead and if the aircraft in front bounces a bit, look through him and fly off of lead. Trail is a power anticipation exercise. Think about what is happening with lead's airspeed and anticipate. If lead is passing through the horizon downward, add power then, not when you reach horizon or you will be sucked fast. Similarly, if he is passing the horizon upward, ease off power then so you don't close. Once stabilized replace power to stay in position. A rejoin to fingertip is signaled by a very shallow wing rock.

Extended Trail. Lead signals extended trail by a radio call. It is normally entered from trail (Lead turns and wingmen delay turn to achieve spacing) or after a pitchout. Spacing is normally 500' to 1000' in trail. Last man calls "In" when all ships gain proper spacing. Whereas trail is a power management exercise to keep position, extended trail is a relatively constant power energy management exercise. To keep position, follow the leader's flight path, but fade a little inside or outside of the turn as needed to close or extend. Match leader's bank and pitch at the point he was when you get there. Rejoin to fingertip is signaled by lead's large wingrock.

Cross-unders. As described in Manual, Page 13.

Echelon and Echelon Turns.

Echelon: Using the appropriate signal, lead moves all flight members to the right or left side. #2 will fly normal fingertip reference but level with lead, and #3 and #4 will lineup the heads. If a flight member is bouncing, following members should fly off lead by looking through the bouncer.

Echelon Turns: In turns, wingmen maintain the same angle of bank as lead but remain level with the horizon. Wingmen require significant power since they are on the outside of the turn, so they should automatically add power as lead turns. Also, as lead passes 30° of bank, he will be adding some back pressure to remain level, so wingmen should anticipate and also add some back pressure to remain level with lead. To maintain good echelon turn position, wingmen should think "If lead rolls out NOW, am I in position?" Lead should always roll out with a slow reduction of bank.

Pitchout (Break) at Altitude. Pitchouts are started from echelon formation. Experience has shown that RVs using 2 seconds between breaks will yield approximately 1000' spacing on downwind. Lead gives the pitchout signal followed by the fingers for seconds between breaks (normally 2). If the break will be delayed after giving the signal, lead will give a kiss off signal, then breaks. If the break will be immediate after the signal, leads **rolls** to 45-60° bank, then **pitches** using approximately 2 Gs, leaving power steady, and makes a 180° level turn. #2 looks ahead to the horizon and counts (one thousand one, one thousand two) and banks, then pitches. #3 and #4 do same in sequence. During the first part of the break, wingmen should concentrate on holding a level G turn, leaving power steady. During the second

half of the turn, wingmen should look up, acquire the aircraft in front, and adjust bank and G as needed to roll out directly behind him at same altitude. After the last member rolls out there should be a straight, level line up with similar spacing and he will call “4s In”. Wingmen should take a brief moment to look around the cockpit and switch tanks if appropriate.

Rejoins. Page 12 of the Manual has a good description of the rejoin. Lead will signal a rejoin by a large wingrock and begin a 20-30° bank turn. For RVs, the desired rejoin reference is to line up the vertical stabilizer on the outside wing. When lead begins the rejoin turn, wingman should initially match his bank angle until the rejoin reference is obtained, then adjust the angle as required to maintain the reference and keep lead just slightly above the horizon. While closing, wingman should bank as required to maintain the reference. As distance out reduces, wingman should also align fuselages with lead. As wingman distance out reduces to several hundred feet, wingman should change reference to standard outside aileron hinge and spinner. Power throughout the rejoin remains relatively constant until close in, then as required, as the rejoin is accomplished by angle off rather than power advantage. Number 2 wingman joins on the inside. Numbers 3 and 4 rejoin to the outside of lead by remaining on the reference line as long as possible and then passing through close trail behind lead up to outside wingtip. Power should be reduced as required when nearly on the Fingertip reference. If #4 closes on #3 faster than #3 is closing on lead, #4 should slow his rejoin and maintain a distance on #3, unless briefed otherwise. As rejoin proficiency increases, a small amount of power can be added upon starting the rejoin to reduce the time to join, but constant vigilance must be used to monitor rejoin power and rate to ensure safe closure rates. If an overshoot is evident, wingman should reduce power, pass **behind and slightly lower** than lead, dissipate speed, and continue the rejoin. For a **straight ahead rejoin**, unless briefed otherwise, #2 will join on the left and #3 and #4 will join on the right of lead. Wingman should adjust power to gain a speed advantage and maintain a slightly wide approach on lead to better monitor rejoin rate. Reduce power as appropriate to close on lead.

Descent. Flight lead will normally position the flight in **Route** for better lookout and the frequency change. He should signal power reduction and change power appropriately so that engines are not cooled too rapidly and fixed pitch props do not overspeed. If a wingman is at the RPM limit, call (Call Sign) Lead, gimme one. Lead should normally maneuver the flight so as to reach initial for an overhead pattern no less than 3nm out, and position the flight into Echelon.

Overhead Patterns. The Overhead Pattern should start with a 3nm initial approach in a stable Echelon at traffic pattern altitude (or as directed) at 120-130 KIAS. The pitchout is as previously described except that after the **Roll** and **Pitch**, the **Power** is reduced to idle. Fixed pitch aircraft should pull power smartly to idle, whereas constant speed aircraft should pull the power smoothly back so as not to “stop” in front of a fixed pitch. All aircraft should attempt to roll out at 100mph (87 kts) (flap speed) directly behind the aircraft in front at the same altitude and lower flaps immediately to help control speed. Maintain 100mph and altitude on downwind. Lead should adjust for winds and maintain altitude until turning base. Then he should reduce power as required to descend and slow to 90mph half way around base and then 80mph rolling out on final. Each member should follow lead’s flight path around base and obtain the same airspeeds.

Landing procedures. The T-34 Manual standard suggests flight members land on alternate sides of the runway with a flight member on the Cold (Turn Off) Side calling “(Call Sign), Clear” to a member in front on the Hot Side when speed and closure is appropriate to cross over. A preferred alternate method, if briefed, is for all members to land in sequence on the centerline and, when “under control”, move to the Cold Side. This method provides for the Hot Side to be always available for passing or go-around, if necessary, and does not require the radio call.

Formation Landing. As described in the Manual.

Taxiback and Shutdown. Lead will position himself on the taxiway after landing so flight members can match his position and configuration turning off the runway. When all members are in position, the formation taxis back staggered or in trail, as appropriate. Turns will be in sequence unless called (briefed) by lead as “In Place”. When in parking position, wingmen should prepare for shutdown and look at lead. Lead will signal a shutdown by a head nod.

Squawk and Flash. Unless briefed otherwise, only the lead will squawk and only last member will flash strobes.

Debriefing. All members will attend lead’s debriefing following the mission. All discrepancies from the briefed mission or standards will be discussed with the attitude of correcting the problem for the next mission. The debrief will be led by the flight leader but open to all for comment. No one is exempt from appropriate critique.

Emergencies. Any emergency during the mission will temporarily terminate maneuvering while the problem is dealt with. If necessary the problem aircraft will be escorted back to base, as briefed or designated by lead. If an engine begins to fail while in formation, the pilot should pull smartly up and out of the formation, and then clear left or right, so as to not cause a closure problem by trailing aircraft.