Appendix B

Formation Flying

http://www.ez.org/Formation1.htm - For a color text PowerPoint version

Some pilots like formation flying. Dan Patch is one and wrote the following guide to help us learn to fly in formation safely. Dan is Safety Officer for the Southern California EZ Squadron.

Notice

Information contained in this briefing has been drawn from a number of sources and from the author’s personal experience. It is appropriate, however, to specifically acknowledge the T-34 Association for its excellent formation video and companion flight manual, which I recommend.

The central objective of this presentation is to promote safety in formation flying. This briefing was originally created for the San Diego EZ Squadron, a group of composite aircraft builders and fliers who have met monthly since 1976.

Subsequently, extensive comments have been added to the notes pages in an effort to expand on and further clarify the summary points made in the briefing. This document, however, is not intended as a substitute for qualified instruction from an experienced formation pilot, including appropriate ground school instruction and a full briefing before each formation flight.

The use of the procedures described in this briefing is entirely at the option and the discretion of the formation’s pilots. Neither the San Diego EZ Squadron nor the author, Dan Patch, assume any liability for the use or failure to use any or all of this information. It is strictly your responsibility to ensure your own safety and that of your flight mates!

This briefing is placed in the public domain in the interest of furthering flight safety, however, this notice must not be removed nor the contents of the briefing altered without permission.

Formation Flight – Getting Started

This presentation has been organized to follow the time-line of a typical formation flight – preflight, taxi, departure, join up, cruise, and landing. It is aimed at the knowledgeable private pilot who is competent in a typical single-engine, light plane, and who has always wanted to try formation, but has never had the opportunity. The objective of the briefing is to cover some of the basics of what makes a formation flight work smoothly.
By no means is this presentation comprehensive! It is not reasonable (nor possible) to learn formation flight on the ground! Rather, the intent is to focus on areas that may give the novice formation pilot the most trouble, and on the fundamental dynamics of formation flight. Important topics such as power management, formation configuration changes, basic hand signals, practice formation exercises, and much more generally are left to the more appropriate realm of ground and air instruction with a competent formation instructor.

I have tried to stick to the formation flight procedures that have been developed by the military over the course of millions of hours of flight time. Most of these time proven procedures are directly applicable to civilian formation flight. There are a few aspects of “traditional” military formation flight, however, that I believe require some modifications to better match the operational world of the civilian pilot. For example, radio procedures in the military typically call for extreme discipline. The flight leader talks (occasionally); while the rest of the flight watches for his hand signals, monitors the air-to-air frequency, and generally observes radio silence. But the civilian pilot often has neither the experience nor the station holding skills to rely on hand signals. Thus, for the safety of the flight, more radio communications usually are required in civilian flights. I will try to note those instances where I believe that military procedures might not be the “full story” for the civilian formation pilot.

Introduction

This presentation is limited to a few basic pointers
- Emphasizes flight characteristics/limitations of our canard planes
- Covers major problem areas for beginners, based on my experience

Don’t fly formation until you are proficient in type
- Formation is not the place to learn to fly or to look for switches
- You need to know your aircraft performance limits

Best approach is video/text ground school followed by in-flight experience with a qualified instructor
- This ensures that all essentials are covered
- Safer and quicker than the free-lance approach
- Teaches standardized procedures

But the reality is most of us will be largely self-taught.
- We didn’t learn to fly or get an instrument rating this way
- But basic formation flight is not that difficult
- To my knowledge, very few mid-air collisions have occurred

This presentation is limited to the basics of formation flight. It focuses on typical flight characteristics for our homebuilt aircraft. That is, relatively low-powered, low-drag, piston-engine, aircraft. Much of it is based on professionally produced material – Thanks T-34 Association! I have, however, incorporated a lot of actual formation experience accumulated over more than 400 hours in my VariEze. While I have made my best
effort to emphasize safe formation flight techniques, it is strictly your responsibility to ensure your own safety and that of your flight mates! I cannot accept any liability for this responsibility!

The middle of a formation flight is not the place or the time to be learning how to fly! Before participating in any formation flight, you must be comfortable with your plane’s handling, its control response, and its instrumentation. Because you aren’t going to be able to divert much attention from the task of maintaining safe separation in the air, flying your plane should be second nature.

The place to pick up basic formation concepts is on the ground prior to flight. The cockpit is not a conducive environment to resolving uncertainties about what you should be doing! Obviously, a firm grasp of basic formation concepts before launch will make for safer and more effective practice in the air. Another major advantage of learning from a professional source is the use of standardized procedures. This will make formation flight with similarly trained pilots much more predictable, and hence safer and more enjoyable. As a good place to start, I would recommend the T-34 Association’s 4-hour video “Formation Flight - The Art” and the associated manual.

It is true, however, that most civilian pilots are likely to be largely self-taught. That formation flight can and usually is successfully learned this way is a testament to the fact that formation flight is really not that difficult. The key is to always remain within your skill and comfort limits, while still continuing to hone your proficiency. Overall, civilian formation flight has an excellent safety record.

**Preflight Briefing**

Required by FAA Regulations – that also require
- Formation must be pre-arranged (no surprise join-ups!)
- Separation must be adequate to ensure safe flight
- Flight separation of <1 mile horizontal and <100 feet vertical
- ATC handles the flight as if it is a single plane

It is critical that all flight members know exactly what is expected throughout the flight
- Who is the flight lead
- Their own position in the flight (lead, wing, #3, etc.)
- Route of flight, altitudes, restricted areas, etc.
- Frequencies – particularly air-to-air en route
- Arrival procedures with alternatives
- Any pilot and/or aircraft limitations

Don’t put the novice in charge!

FAA regulations governing formation flight are minimal. There are no requirements for special training, logbook endorsements, limitations to similar aircraft types, or operational restrictions (e.g., day-VFR, no Class Bravo, etc.). The regulations do require that the flight be pre-arranged by the participants and that flight separation be adequate at all times. What is “adequate” is left to the judgment (and skill) of the pilots. Be assured – if you have a collision, your spacing was not adequate and you are in violation of the FARs (and worse!).
Formation flight can be a high workload environment. Uncertainty in any aspect of the flight dramatically increases the potential for errors, and can result in a collision, runway incursion, penetration of restricted airspace, etc. It is critically important that every member of a flight know exactly what is expected at all times. If there is any doubt about what is happening (or about to happen), the situation absolutely must be clarified before it deteriorates into an unsafe condition. The need for radio discipline always is secondary to flight safety! A thorough preflight briefing is the first line of defense against mix-ups in the air. Do use a formal checklist in this preflight briefing to ensure that all points are covered. Also, be sure that you discuss the experience level and limitations of every pilot and every aircraft in your formation.

One all too common problem is for radio frequency screw-ups. When to switch and what frequency to use are critical items to brief because the safety of the flight is seriously compromised when communications are lost! Hand signals, while useful, generally do not provide a reliable form of backup communications for civilian formation pilots.

Putting an inexperienced (or poor) pilot in the lead is a common error. While flying lead may look easy, it requires in-depth knowledge and experience! A poor lead places the entire formation in jeopardy. Besides, if the guy really is so green that you can't trust him to fly wing, then he clearly needs more experience before it is safe for him to fly in formation.

**Taxi and Takeoff**

- Conduct a pre-taxi radio check on the air-to-air frequency
  - Verifies that everyone has the right frequency and is ready to taxi
  - Lead relays essential ATIS information and frequency change
- Flight leader should lead on the ramp – Look Sharp!
  - Leader in front helps prevent runway incursions
  - I prefer a staggered taxi position to avoid prop wash and debris
- Don't rush your run-up!
  - Everyone sets tower frequency in the run-up area
  - Only the lead squawks the transponder code
  - Thumbs up to go and pass the signal along to the lead
- Start with staggered departures until you have experience
  - Take alternate sides of the runway – lead on downwind side
  - Wing delays 3 to 5 seconds before starting his take-off roll

The time to find out that someone's radio doesn't work, or that he has the wrong air-to-air frequency is on the ramp, not in the run-up area – or even worse, in the air! Only the lead needs to get the full ATIS information. It's more important for the flight to be waiting for him on one frequency.

After getting the ATIS, lead will call "EZ flight, radio check… one" The flight will respond "two …, three, … etc." to verify that they are up and ready. Based on the ATIS, lead then calls "EZ flight … expect runway #, wind xxx at xx, altimeter xx.xx," and any other pertinent ATIS information. The lead may choose to exclude extraneous ATIS information (airship operations on a closed runway, etc.) if it isn't relevant to flight safety. Lead then calls "Eze Flight … monitor ground on xxx point x", and he looks for "thumbs
“thumbs up” from #2 to begin his taxi. A “thumbs up” from #2 indicates that #2 is ready and that #2 has a verified “thumbs up” from #3, #3 has verified #4, etc.

When taxiing on the ramp, precision is just as important as in the air – perhaps more so since you are more visible, and a collision is arguably more likely (no step-down here!). The military guys like line-in-trail taxi; but you eat a lot of wind in an EZ, and a tight angle-off taxi looks sharper.

Rushing your run-up is a very bad idea! Take your time and be sure you are completely ready before committing with a “thumbs up”. You are going to have very little time on the roll to catch a problem, so do it right at run-up! Ideally, lead would instruct the flight to switch to tower prior to launch. The ground controller, however, will not like you using his frequency for your flight communications! This comment goes double for the tower and ATC, so don’t “borrow” controller frequencies for use by the flight. The best procedure is for everyone to switch to tower prior to “thumbs up”, just like solo flight. If you don’t hear tower clear the flight to depart, you messed up.

Remember – only the lead’s transponder should be on. Multiple transponders will generate a mid-air warning on ATC radar that will drive the controllers crazy. Definitely expect to hear from them if you forget to turn your transponder off!

Even though it makes join-up a bit more difficult, start off by using staggered departures.

Two-Ship Departures

Wing should be positioned nearly abreast of element lead
- Acute position reduces the potential for a collision on the ground
- Tire or brake failure may not be controllable – Don’t hit the lead!

The wingman must maintain an acute position on the roll
- Lead must stay within the wing’s available power envelope
- Leave close formation on departure to the Blue Angels

Call an abort immediately if something isn’t right
- Remain on your side of the runway if at all possible
- Wing must be prepared to make a go/no-go decision

Multiple elements depart in flights of two
- Don’t rush the preceding element
- Start your roll as soon as the previous element breaks ground

Once you have some formation time under your belt and have built up your confidence, you are ready for a two-ship (or element) departure. Leave three- and four-ship departures to the pros!

Generally, two-ship departures are quite easy to accomplish since the lateral clearance offered by most GA runways more than adequate. The key to safe departures is for the wingman to maintain the correct “acute, angle-off” geometry with respect to the lead aircraft throughout the roll. Obviously, he also has to stay on his side of the runway centerline.

A nearly universal mistake is for the wingman to fall behind the lead (become “sucked”) during take-off. If the lead has some type of tire, brake or wheel failure, a “sucked” wingman stands an excellent chance of participating in a ground collision! A second major source of take-off error is improper power management by the lead. The
lead must leave the wingman some power margin so that he can maintain the correct angle-off position. Departing at less than full power is something that the average pilot finds highly unnatural. Thus, all else being equal, it is advantageous to have the lower performance plane take the lead on departure so that he can use full power, with the wingman pulling off power, as required, to maintain position.

The possibility of an abort on departure should be pre-briefed, and both pilots should be prepared to abort at any time. Either pilot can call an abort. However, unless a “flight abort” (as opposed to “abort, abort”) is called, the safest course of action may be for the “non-abort” plane to continue the take-off. This is a pilot decision that each flight member must be prepared to make.

If a multiple-element (i.e., more than two-plane) departure is planned, each element should delay its roll until the preceding element breaks ground. Reducing this delay by rolling early makes join-up easier, but it isn’t worth cutting into the safety margin of the flight.

Note that with a staggered departure, each plane can start to roll when the plane on his side of the runway is off the ground. Thus a multi-element flight can be launched nearly as quickly by using a staggered departure procedure as it can by departing as a series of two-ship elements.

Join-up on Departure

Poor power management, rapid climb, and/or tight turns by the lead will make things difficult at best for his wingman
- Lead should maintain the initial runway heading longer than usual
- Keep the climb gentle – especially with a staggered departure
- Make wide crosswind and downwind turns
- Allows wing to turn inside lead to join-up
- Prevents whipping the wing into a "sucked" position
- Straight-out departures call for moderate climb and power levels

Poor join-up technique disrupts the flight and increases the danger of a midair collision
- Always use geometry (turns) not power whenever possible for join-up
- Turn inside the lead to catch-up
- Turn outside the lead to fall back or reduce closure rate
- Inexperienced wingmen tend to seriously underestimate
- The power required to catch up to the lead from an in-trail, sucked position
- The power reduction needed to arrest the high closure rate that develops

Departure puts a heavy demand on the skills of both the lead and the wingman. Things happen fast once an element breaks ground! This is definitely one of the most demanding phases of formation flight, and it is not the time to demonstrate what a “sierra hotel” formation pilot you are! Leave that to the Thunderbirds and Blue Angels. Give the lead enough room so that you both can get your gears up, climb rates stabilized, and generally get into the “groove” of flying.

In the case of the lead, his central objective is to fly a flight profile that is readily achievable by his wingman. In particular, he must moderate his power and flight path
because too much power, too high a climb rate, and/or tight turns will blow the wingman away into an impossible, “sucked” flight geometry. Extending the departure before turning cross- and down-wind almost always is a good idea, particularly if there are more than two planes in the formation. This gives stragglers room to “cut the corner” in order to catch up.

The wingman’s job on departure is to maintain 100% eye contact with the lead, and to accomplish a smooth and safe join-up. Nothing is more discouraging than hearing on downwind that your wingman is already lost! It happens, sad but true, and it is a sure sign of a major screw-up. The wingman will soon learn that catching the lead by using power is difficult and dangerous. It seems to take forever, and then suddenly he is faced with an unexpected and horrendously high closure rate that can easily result in a severe overshoot. Be smart and use turn geometry, not power, to control your join-up! The time to catch the lead is on the crosswind and down-wind turns. Turn inside the lead to overtake, turn outside to fall back.

In the case of a straight-out departure, the lead needs to cut the wingman some slack in both the power and climb departments. Also, the wingman should avoid catching the lead from directly behind where an overshoot becomes both more probable, and more dangerous.

**More on Join-ups and Turns**

Overrunning the lead is the greatest safety concern
- If needed, fly under and behind the lead to the outside of the turn to prevent an overshoot
Never go belly up on the lead – You may hit what you can’t see!

Anticipate power requirements and don’t be timid
- Immediate action to correct a drift out of position is essential to avoid large corrections and a potential PIO situation
- You are never "in formation" just maneuvering to get closer to it
- All turns require significant power changes by the wingmen
- Outside turns require power to accelerate, to speed up, and to climb
- Inside turns require a power reduction to avoid overshooting
- Beginners often fail to reverse the power drill at the completion of the turn
- Turns into the wing require extra skill by both lead and wing, particularly toward the strong side of a finger four formation
- Lead should never initiate a turn into an echelon formation

It is hard to overstress the importance of avoiding an overshoot condition! The only two things that are worse are: flying over the top of the lead, and hitting him! Common situations leading to overshoot are:

1) Misjudging the closure rate on join-up
2) Lead turning into the wing, and
3) Bunching up in the pattern and on final to land.
The natural inclination when joining up on the inside of a turn with an excessive closure rate is to increase your bank angle to avoid hitting the lead. This is very dangerous! Increasing your bank angle decreases the turn radius, further increasing the closure rate by cutting off the lead. Additionally, wing is likely to lose sight of the lead when he goes “belly up”. This is a tailor made prescription for a mid-air! The correct procedure is to pass below and behind the lead to the outside of the turn where the longer flight path can “soak up” the excess speed. Once wing has his speed under control, he can again cross-under and behind the lead to take his assigned position.

In station keeping (as in most other phases of formation flight), relative motion is everything! The sooner undesirable relative motion is detected and decisive corrective action taken, the smoother and easier it is to fly formation. A common mistake by the new formation pilot is a failure to make prompt and aggressive power changes. A wingman using this “walking on eggshells” approach to power management quickly finds himself drifting out of formation at an increasing rate. The belated response then is a really big power change to arrest a deteriorating situation – which culminates in a wild excursion in the other direction (i.e., PIO, pilot induced oscillation). A key characteristic of our planes is a very sluggish response to power changes. They respond more like an ocean liner than a car – and they don’t have brakes! Anticipating this delay is a skill that the formation pilot can only acquire with practice, but it is crucial to precision station keeping.

In contrast with relatively aggressive power changes, accurate station keeping calls for continuous, but very small changes in pitch, bank and yaw. Remember, formation flight is not aerobatics!

**En route Formation**

Wing should try to maintain a constant "angle-off" from lead
- Adjust your spacing by moving up and down "the line"
- Flying far behind the lead ("sucked") looks terrible and is:
  - Extra work for you
  - Can make you lose sight of the formation – not good!
  - Bugs the lead big-time because he can’t see you
- Don’t show off by flying too close for safety
- Always maintain nose-to-tail and wing-to-wing horizontal clearance
- Maintain "step-down" for vertical clearance
- Give yourself extra room when performing cockpit "chores"

Keep the radio chatter under control
- No need for lead to call heading changes except for beginners
- Don’t use the radio for a chat line – other flights need the frequency
- Wing must convey flight information and power requirements to lead

En route formation is what almost everyone thinks of when they think of formation – that is, flying in a precise position with respect to another (leader) plane. To state what is perhaps the obvious, it is the job of the wing to hold his position with respect to the lead. Lead should never attempt to control the position of his wingman by turning or altering power. Any decent wingman will immediately alter his course and/or power to
match the leader’s change, because he is flying where he is for a reason – namely, because that’s where he thinks he should be and/or where he is comfortable. If the lead wants his wing in a different position he needs to tell the wing what he wants. If this is outside the comfort zone of the wing (e.g., too close to lead) it’s his call, and the lead must respect wing’s personal limits. Conversely, wing may want to fly in an uncomfortable or unsafe location in the opinion of the lead. In this case, wing must do his best to correct his position, under the guidance/request of the lead, or else the formation just isn’t going to work for these pilots.

The key to holding station is aligning two points on the lead plane to set the desired “angle-off” (e.g., leading edge of the winglet with the front edge of the headrest). Focusing on the alignment of these two points will immediately show the direction and magnitude of any relative motion between the two planes. This technique will produce very accurate positioning! When adjusting spacing between the lead and wing, this angle should be maintained as accurately as possible, with the wing sliding “up and down the line.” I suggest you start with about a 45-degree angle-off; but find an angle that works for your flight. Lead should be able to see wing comfortably. For safety, the wing should always maintain nose-to-tail, wing-to-wing, and step-down clearance from the lead – no overlap allowed!

A typical error for the beginning pilot is to take up position well behind the lead (sucked) and/or many hundreds of feet away. These locations are very difficult to fly accurately because the wing will have great difficulty judging relative motion, his geometry is terrible for turns, and flying sucked, sucks for the lead (he can’t see his wingman)! Make your job a lot easier by flying reasonably close to the lead. Once you get really, really good you can fly out in the boondocks!

Please resist the temptation to yak on the radio! Other people need the frequency. For flight safety and power setting information – absolutely; but please, cut out the chatter! The military guys are very hard over on this point; but since we aren’t out to bomb North Korea, just use common sense.

**Landing in Trail**

I recommend landing in trail until you are very proficient with a standard 45-degree downwind pattern entry procedures:
- Flight lead:
  - Shift your flight to the outside during or before the 45-degree leg
  - Don’t forget your cockpit check and a gear-down call on downwind!
  - Carry a little extra speed on final to avoid bunch-up
  - Lead lands on the downwind side of the runway
  - Never cross the runway centerline until it’s safe
- Wing:
  - Wing turns base 3 to 5 seconds after the lead turns base
  - Avoid wake turbulence from the lead on final!
  - Maintain appropriate spacing on final
  - Land on the "open" (non-lead) side of the runway
  - As always, be prepared to make a safe and timely go-around
Lead needs to fly straight-in approaches with some extra speed to allow the wingman to drift back for spacing.

Landing in trail isn’t particularly difficult, but there are some significant differences from landing solo. One obvious difference is that you are going to be a whole lot closer to other traffic in the pattern than you have ever (intentionally) been before! A second difference is the ground roll phase where you can expect to be sharing the runway with the other members of your flight.

The essence of a safe formation arrival followed by an “in-trail” landing is to make a clean separation between the “formation” and the “solo” phases of flight. During the formation phase of landing, it is particularly critical to maintain a high level of flight discipline, especially because you are going to be very busy configuring the plane for landing (mixture, power, gear, etc.), and maintaining your awareness of other traffic in the pattern and all tower instructions. In this phase, lead’s primary job is to get his flight into the pattern safely and configured for a comfortable breakup for landing. Speed control and thinking ahead is critical! Things can deteriorate quickly if the lead does not carefully modulate his power changes and turns.

Typically, the first really big power reduction that the wing encounters on the flight is when the lead enters the pattern, and it can be a big surprise! Wing should be spring loaded to match lead’s power reduction, or an over-run situation is almost certain to develop. Thus, the lead has an obligation to make gradual power reductions, and he must maintain a comfortable flight speed. Over-running the lead with your throttle at idle and your airspeed as low as it can go is not fun!

Once you get really good, you can consider an overhead break. Until then, I would recommend that the break occur as the formation turns from downwind to base. Lead breaks first, followed by the rest of the flight at 3–5 seconds intervals each. Lead should avoid bunch-up by maintaining a little extra speed on final. This gives his flight some speed to “play with” to maintain proper spacing. The opposite condition, with the flight spread out all over the place on final is an even more common error. Remember, that as a flight, you are treated as a single plane. Tower is not expecting your flight to take 10 minutes to land! Lead can do the tower a favor by announcing, for example, “flight of three, landing in quarter mile trail.”

Wake turbulence is a significant hazard landing in-trail. Know where it is and then don’t go there!!

**Formation Landing (2-Ship)**

Be sure both flight members are proficient formation pilots

Don’t try this on narrow, high altitude, or gusty runways!

Smooth turns and power management by the lead are critical
- Initial power reduction tends to induce an overshoot by the wingman. Keep alert – Especially in turns!
- Always position the wingman on the outside of turns
- Keep your turns gentle
- Fly an aligned and stabilized approach with a little extra speed
The wingman needs proficient station holding skills and confidence in his abilities under dynamic conditions.
- Landing checklist complete and ready to land (where’s the gear?)
- Assume and maintain an acute "angle-off" position on final
- Maintain precise position control during rollout

Well, you’re finally ready for the big time – a 2-ship, formation landing. But are you really ready? Be sure you are, because this is the "real deal!" Need I say that you need to be completely in control of your plane at all times, and capable of holding tight formation? Well, absolutely for sure, you do!

It might seem like the wingman has to do all the work in a 2-ship landing. All the lead does is fly the pattern and land. Meanwhile, the wing has to demonstrate very precise station holding skills under dynamic conditions. But don’t underestimate the importance of having an experienced and precise pilot flying lead in a 2-ship landing! The lead must have an in-depth understanding of formation dynamics to avoid making a tough job a lot tougher for the wing. Smooth pitch, bank, and power changes are a must! Remember, the wing generally doesn’t know that the lead has made any changes until he notices some unexpected relative motion. Smooth power changes and gentle turns by the lead give the wingman a much better chance to adjust his power and flight path without moving noticeably out of formation – or worse!

Remember the acute position needed for take-off? This is also the appropriate angle-off geometry for a 2-ship landing for the same reason – namely, collision avoidance on the runway. Also, wing needs to eliminate any step-down prior to arrival over the runway since he certainly doesn’t want to be touching down short while lead is still in the air. Properly flown, the wing only needs an occasional glance at the runway to verify that lead is properly aligned and to estimate the time remaining to touchdown.

Maintaining an acute angle-off throughout the landing roll calls for a lot of concentration and skill! Beginners often tend to fall well behind the lead during final and/or rollout, exposing the flight to the potential for a collision if something goes wrong with the lead’s landing. It is also easy to overrun the lead on the ground due to different drag and rolling characteristics of the planes. The best prevention for this problem is for the lead to rollout with a touch of residual power and no brakes until his speed has dropped well below flight speed. Don’t be afraid to use plenty of runway, that’s why they make them so long. Did I mention that you both need your gears down? Check your buddy’s gear on final!

Lead should never, ever cross the runway centerline until he is down to taxi speed and has verified that his wing is in position and in full control of his rollout. (A quick call – "#2 clear" helps.)

**Essentials**

Get good ground and air instruction from a competent pilot
Know the skill level and limitations of your pilots and planes
Brief all aspects of the flight - aim for no surprises
Strive for early join-up following departure
Always maintain visual contact with your lead
Anticipate power changes – avoid overshoot!
Never go belly-up on your lead!
Pick a separation distance that is comfortable and safe
Strive to maintain a fixed angle-off and step-down position
Don’t show-off, especially with a passenger aboard!
Lead is responsible for flying an achievable flight profile
Wing must maintain station or communicate why he can’t

**Conclusion**

Poorly flown formation flight — Can scare you, or worse!

Properly flown formation flight:
- Involves minimal risk of a midair collision
- Reduces odds of having a midair with other aircraft
- You have more eyes and ears working for you
- You are easier for other planes to see
- Is far better than any other type of “flight following”
- Can be one of the most satisfying activities in flying
  - Camaraderie
  - Improved flight skills
  - Personal accomplishment

Life just doesn’t get much better than a good formation flight!