

operating limitations, cross-wind limits, and setting fuel "bingo" level.

ESTABLISHING THE WING POSITION

The field of view may vary substantially from one aircraft to another, because of aircraft configuration, cockpit location on the aircraft, aircraft size and obstructions to vision such as engine nacelles. For example, a Skyraider pilot with the same sight picture of a leader's aircraft, would be in an entirely different position from a Corsair pilot with the same sight picture, because of cockpit location on the aircraft. Establishing the proper position for a "parade" formation is the responsibility of the flight leader, and he should move the wingmen into a proper line of bearing, where the wingmen will pickup visual cues on the leader's aircraft to maintain the established position. It is imperative that the leader be able to maintain visual contact with wingmen, and wingmen must always remember that if the leader's head is not visible, than the leader cannot see the wingman. Under some circumstances, this may require wingmen to fly with more or less stepdown than a similar position flown with two similar aircraft. For example, if a mid-wing, twin engine F7F Tigercat is the lead aircraft, a low-wing aircraft in the same formation will need a position slightly higher than normal, with less stepdown, in order to see the Tigercat's pilot's head over the wing and engine nacelle.

PRACTICE BEFORE PERFORMANCE

Many airshow organizers will attempt to encourage pilots to fly dissimilar formation in the airshow environment who have never flown together. The low altitude airshow environment, combined with flight lines, spectators, and other geographical limitations, is the least desirable place to make a "first flight" in dissimilar formation. Dissimilar formation flights should be carefully briefed and practiced at altitude with wingmen becoming comfortable in their positions before the dissimilar formation is flown in the airshow environment. The same good judgement and discipline required to perform as a flight leader or a wingman must be

exercised in the choice of pilots, aircraft, and when and where to fly. As in any phase of flight, it must be remembered that "the superior pilot is the one who uses superior judgement to avoid the use of superior skill."

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The Kalamazoo "Air Zoo" Museum flies the "Cat Flight" at many airshows. It consists of, from left to right: F-6F Hellcat, F-14A Tomcat, F-7F Tigercat, F-9F Pather, F-8F Bearcat, and F-4F Wildcat. (Lou Drendel)

QUALIFICATION PROGRAMS

The "Wingman" patch which has been awarded by the T-34 Association to qualified members since 1982, is evidence that the wearer has passed a check ride by an Association approved check pilot. The Association will not allow any pilot who has not been awarded the patch to fly in Association-sanctioned air shows or other events. Many other war bird organizations have adopted this manual and use very similar wingman qualification checks. The following procedure is used during the T-34 Association Wingman patch qualification check, and is illustrative.

T-34 Association Wingman Qualification: During the briefing phase, the qualification check pilot will conduct a normal formation briefing. During the briefing, he will ask the candidate questions to ensure that the candidate has a basic understanding of what will be covered in the check ride.

During the flight phase the check pilot will ride in the rear seat of the candidate's aircraft. This position provides the check pilot with the optimum view and control during the check flight. It will be up to the candidate to arrange for the lead aircraft in the flight. The candidates aircraft must be equipped with parachutes for both seats and operable VHF radio and Intercom.

No formation flight or exercise is ever conducted or executed at 100% by either wingmen or the leader. The debriefing offers an opportunity to discuss the flight, and to rectify any misunderstandings. It is important to adopt a positive attitude about debriefing a formation exercise. One should be prepared to both offer and receive constructive criticism. Any aviator not willing to accept such criticism should not be engaged in the very exact and demanding art of formation flight. Constantly striving for better performance, both in flying technique and discipline can make the difference between success or failure.....or even tragedy.

The final evaluation of the candidate requires that he/she meets minimum standards, which include demonstration of understanding of all signals and performance of all of the above

Name: _____		T-34 Association, Inc. Wingman Qualification Report		Date: _____	
Aircraft No.: _____				Location: _____	
				Flight Duration: _____	
Oral Phase (Briefing)	S	U	Flight Phase	S	U
Standard Hand Signals: Run-up, frequency changes, number signals, head nod, wingman cross, element cross, break-up and rejoin, gear and flap cycling, power addition & reduction, level off, climb, descent, fuel state inquiry, inflight emergency, can't hear, can't transmit, lead change, stack up, stack down, #4 to slot			Start time, start, taxi, response to signals		
			Radio discipline: check-in, frequency changes		
			Run-up: check list and standard procedures		
			Section take-off: position and power management		
Standard formation configurations: trail, echelon, fingertip, enroute, diamond			Climbing turns 90° and 180°, level off and power reduction		
Cross unders, rejoins, aircraft configuration changes			Cross unders: power management smoothness - proper nose/tail clearance		
Break-up and rejoin, radius of turn cut-off, overshoot energy management			Break-up and rejoin: signal recognition, proper interval, radio call, cut-off angle, 45° line, overshoot energy management		
Turns in fingertip, echelon, trail, enroute, terminal maneuvering					
Lead change, emergency signals, HEFOE system			Landing gear and flap cycling, turns in "dirty" configuration, power and position management, signal recognition		
360° overhead approach, breaks, intervals, section landings			Aircraft recognition signals: yaw, porpoise, wing rock		
Taxi-in, shut down procedures			Lazy eights left and right and 45° bank plus or minus 20° pitch		
Radio discipline: check-in, frequency changes, traffic calls			Terminal maneuvers: overhead approach, break and landing or section landing at check pilot's discretion		
Comments:			Runway clearing, taxi-in, shutdown, and debriefing		
			Flight Evaluation:		
			Patch Issued (Date): _____		
			Check Pilot: _____		
			Recommended Further Training and		
			Recheck: _____		
			Check Pilot Signature: _____		
Pilot Signature: _____					

maneuvers to a level acceptable to the check pilot.

We don't believe that formation flying is any more dangerous than IFR flying.....if you are properly trained and follow the correct procedures. In fact, the parallels between the two are striking. When the FAA issues you an instrument rating, it is after you have passed a written test and a check ride. They are certifying that you are instrument-rated and qualified to use that rating at that time. It is your responsibility to remain current. If you

don't, you are not legally able to use your rating. Worse still, you may be endangering yourself and others.

When we issue you a wingman patch, it will be because you have passed an oral exam and a check ride, demonstrating that you are familiar with the procedures and are capable of station keeping in a formation at the time of the check ride. If you do not utilize your newly acquired skills for months at a time, you will likely lose them. IFR flying demands more head work than pure physical skill, and is therefore subject to rapid deterioration of competence. Formation flying procedures are the equivalent of IFR "head work". The physical aspect of both may return quickly with a little practice, but the mental aspects must be practiced regularly to remain sharp. One thing we all agree on.....most accidents are caused by lapses in judgment. The FAA assumes no liability for lapses in judgment after issuing you a rating, and the T-34 Association assumes no liability for lapses in judgment after issuing you a wingman patch. Individual responsibility applies in both cases. The T-34 Association, North American Trainer Association, and other organizations require a "formation annual" flight check. This may be accomplished by flying in an EAA show, in formation (Oshkosh or Sun & Fun), or by sign-off by a qualified flight lead or check pilot.

F.A.S.T. (Formation And Safety Training): In response to airshow sponsors and FAA plans to regulate formation flying in waived airspace during air shows, the warbird groups have formed three self-regulating organizations. The L-Bird organization will deal with liaison and cabin configured aircraft, a multi-engine transport/bomber organization will handle formation qualifications for these types, and the F.A.S.T. organization will deal with our type of aircraft -- low wing, single engine, glass canopied, tandem, fighter trainer type. At some point, the FAA will require that anyone performing formation maneuvers carry credentials from the appropriate organization. F.A.S.T. is currently working out the details of qualification, currency, and record keeping. At the same time, it is attempting to determine what degree of regulations are necessary to satisfy the FAA, while still being tolerable and without being overly restrictive and bureaucratic. Note that F.A.S.T., and these other organizations, deal only with air show waived airspace.

T-34 ASSOCIATION FLIGHT LEADER QUALIFICATION

1. Must be a fully qualified and experienced T-34 Wingman.
2. Must demonstrate the following to a lead check pilot:
 - A. Organize and brief a flight or mission of at least four aircraft.
 - B. Demonstrate competence in smooth and deliberate manipulation of flight controls, including constant roll rates into and out of turns.
 - C. Proper management of power so that wingmen always have an energy advantage.
 - D. Avoidance of unbriefed maneuvers.
 - E. Ability to position wingmen in all standard formations through the use of hand and aircraft signals.
 - F. Demonstrate flight entry into an airport traffic control zone, including changing flight to the proper frequencies, frequency check-in power reductions and additions, maneuvering the flight for; a.) 360 overhead break b.) formation landings.
 - G. Demonstrate situational awareness at all times, including spotting and calling any possible conflicting traffic, and in maintaining up-to-date position information.
 - H. Demonstrate forceful and positive leadership in use of the radio. Since most civilian controllers will be unfamiliar with controlling formations of aircraft, it is most important for the leader to be in control of his formation, and to convey that sense of control to any air traffic controllers the formation works with.

FORMATION DOS AND DON'TS

DO:

- * Know your mission, your airplane, and yourself.
- * Brief every mission thoroughly
- * Wear parachutes on all formation missions.
- * Use an instructor or safety pilot on all training missions.
- * Learn and practice the maneuvers that are easiest first, then proceed to the more difficult maneuvers.
- * Know your aircraft emergency procedures thoroughly.
- * Plan well ahead if you are leading a formation.
- * Be extra smooth on the controls if you are leading a flight.
- * Know the hand and aircraft signals used in formation.
- * Keep alert for and acknowledge and relay all signals in formation.
- * Work constantly to achieve and maintain the ideal formation position.
- * Insure adequate clearance before starting cross-overs.
- * Know switch locations and proper directions to move switches by feel alone.
- * Keep the windscreen and canopy clean at all times.
- * Use the clock code when calling traffic.
- * Know the egress procedures for your aircraft and practice them occasionally on the ground.
- * Stay loose and flexible!

DON'T:

- # Go below the minimum altitude established for the mission.
- # Fly a mission if there are restrictions to visibility in the working area.
- # Continue the mission below bingo fuel.
- # Talk unnecessarily on the radio.
- # Fly with known or suspected malfunctions.
- # Leave the briefing with questions unanswered.
- # Attempt any maneuvers that were not briefed for that mission.
- # Forget to plan ahead when leading a flight.
- # Check in on radio frequency out of turn.
- # Attempt to join up with excessive overtake or rate of closure.
- # Take your eyes off the airplane you are flying formation on, except for the **briefest** of instants to make necessary cockpit checks.
- # Try to impress everyone by flying too close.
- # Change sides in the formation without permission of the leader.
- # Anticipate a leader's moves and react prematurely.
- # Turn into an echelon
- # Bunch up in the traffic pattern, especially on final.
- # Give a frequency change to the formation in a turn.

POWER SETTINGS

One of the most important aspects of smooth formation flight is the relative power settings used by lead and his wingmen. Since there are several different versions of many of the types likely to use this manual as a reference, we will not attempt to put numbers in the blanks. Suffice to say, it is important to develop a standard through trial and error, and to stick to that during formation operations. The leader always wants to allow his wingman/men adequate margin to maintain position, so it is the lead airplane power settings that we are concerned with here. These will change according to circumstance. (Big engine T-28 leading small engine or vice-versa would result in radical differences in power settings) so we have provided several blanks under each category.

TAKEOFF

RPM _____
RPM _____
RPM _____

MANIFOLD PRESSURE _____
MANIFOLD PRESSURE _____
MANIFOLD PRESSURE _____

CLIMB

RPM _____
RPM _____
RPM _____

MANIFOLD PRESSURE _____
MANIFOLD PRESSURE _____
MANIFOLD PRESSURE _____

CRUISE

RPM _____
RPM _____
RPM _____

MANIFOLD PRESSURE _____
MANIFOLD PRESSURE _____
MANIFOLD PRESSURE _____

DESCENT

RPM _____
RPM _____
RPM _____

MANIFOLD PRESSURE _____
MANIFOLD PRESSURE _____
MANIFOLD PRESSURE _____

FORMATION BRIEFING GUIDE

- PURPOSE OF MISSION
- WEATHER (location current and forecast, destination or working area)
- FLIGHT CALL SIGN
- FLIGHT LINE-UP BY POSITION AND PILOT
- ALTERNATE LEAD
- TIME HACK (Everyone synchronizes their watch with that of the leader. Especially important in the case of large formations which must start engines at the same time in order to keep an orderly flow of events.)
- RADIO FREQUENCIES (to include ATIS, ground, tower, departure, enroute, and working. May include prearranged hand signals for these frequencies.) Radio check-in procedures should stress the need for a minimum of dialogue.
- TAXI (if possible, taxi as a flight in sequence. Taxi on leader's signal. At run-up area, if space permits, line up in echelon. If unable, attempt to position yourself so that all flight members can see each other.)
- RUN UP (On lead's signal, accomplish run up and finish pre-takeoff check list. Signal ready to wingman or lead. When ready, thumbs up signal should be passed from 4 to 3 to 2 to lead. Thumbs up by 2 indicates 3 and 4 are ready.)
- LINE UP FOR TAKEOFF (Check wind direction, No. 1 on downwind side of runway, proper spacing between aircraft and elements, lineup in center of your half of runway, last man call in position, use appropriate hand signals, review rejected takeoff procedures, wing tip clearance, etc., and time intervals between elements.)
- TAKEOFF (Formation takeoff if crosswind is less than 10 knots, power settings, hand signals for run-up, brake release, gear/flaps up, power reductions.)
- JOIN-UP (Airspeed, join-up configuration at lead's discretion, overshoots remain clear of flight until speed has stabilized, ease into position when airspeed is under control, never go belly-up to lead or lose sight of the lead, cross under flight and keep them in view, brief frequency changes if join-up is protracted.)
- ENROUTE (Formation to be used, check points, frequency changes, hand and aircraft signals, level off altitude and airspeed.)
- WORKING AREA (Frequency change, boundaries of area, prominent check points and obstructions, sequence of maneuvers to be performed, rendezvous point for lost wingman or late arrivals with orbit altitude and airspeed, review of formation details and techniques, set bingo fuel.)
- RETURN TO BASE OR DESTINATION ARRIVAL (Descent checklist, lead calls for spread formation and flight members perform descent checklist to include fuel selectors, radio frequency selection, transponder off (only lead squawks), mixture position, altimeter setting, check-in of flight when check-list is complete.)
- APPROACH AND LANDING (Approach frequencies, formation to be used, pitchout interval, hand and aircraft signals, pattern, airspeeds, spacing – No.2 determines interval, pattern altitude.)
- LANDING (Alternate side of runway, with lead taking downwind side and landing long, stay in center of your half of the runway, be prepared for turbulence and prop wash, passing on runway, call when aircraft in front of you is clear to turn off runway, taxi to parking area as a flight, monitor appropriate frequency.)
- DEBRIEFING (problem areas, timing, communication, lead signals, basic flying.)

FORMATION BRIEFING

FLIGHT CALL SIGN: _____

WEATHER: Wind _____ Alt. Setting _____

POSITIONS: Lead _____ #2 _____

#3 _____ #4 _____

Alternate Lead _____

FREQUENCIES: Atis _____ Ground _____ Tower _____

Departure _____ Enroute _____

Airshow Control _____

Atis _____ Approach _____

Tower _____ Ground _____

TIME HACK: Start _____ Takeoff _____

Rendezvous _____

Overhead (Parade Display) _____

Other: _____

ENROUTE: Altitude _____ Airspeed _____

RENDEZVOUS: Point _____ Orbit Alt/Speed _____

PLANNED MANEUVER SEQUENCE: _____

LANDING: Pattern _____ Alt. _____

Formation _____ Pitchout Interval _____

Airspeeds _____

BINGO FUEL: _____ NOTES: _____