

FORMATION MANUAL

### INTRODUCTION

This is the official formation manual of "Gaggle Flight" a highly disciplined group of aviators from Spruce Creek Fly-In community, Daytona Beach, Florida. We own various sport airplanes including biplanes and monoplanes of varying vintage. We meet periodically (primarily Saturday mornings) to fly to some far away place (usually Pierson) for fun and excitement!

The flights are arranged by aircraft speed and are generally dispatched in flights of four. The slower (subsonic) flight(s) normally depart(s) first so as to arrive at the chosen location on the same day as the "fast" flight(s). For long range, oceanic, polar and yearly migration we sometime acquiesce to a "spam-can" flying with us which occasionally helps with the navigation and provides a dry place to carry our bags.

Most flights are flown VFR at low altitude (1,000 feet or below) and subsonic speeds (68.26 knots or about .104 mach). Therefore this manual only covers that part of "Gaggle Flight" formation. This manual is unclassified but is restricted for official use only by members of "Gaggle Flight". The classified supplement covering high altitude, supersonic cruise, and all weather operations is available on a need to know basis.



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### BASIC TWO SHIP FORMATION

LEAD



NO 2



**RESPONSIBILITY**: In any formation the leader is charged with the responsibility of maintaining visual lookout for his flight, flying his aircraft as smoothly as possible, and keeping power changes and control inputs to a minimum. He should brief the flight and then execute the profile as closely as possible. If changes are required he should inform his wingmen accordingly.

WINGMEN RESPONSIBILITY: The wingman is always flying off the leader. As a wingman you should position yourself so that you are in a comfortable position keeping in mind what has been briefed as the ideal wing position. Normally Gaggle Flight will fly with the wingmen stacked slightly low with nose tail separation and wing tip separation. This is a reasonably comfortable position for most flights that have four aircraft. Remember when flying in the number 2 position you set the spacing for the rest of the formation.

# BASIC FOUR SHIP FORMATION (Fingertip)

LEAD



In the basic four ship formation No. 2 normally flies the left wing of lead. This allows the element, No. 3 and No. 4, to fly on the right wing. This is called the basic fingertip right formation and is the normal four-ship formation flow by Gaggle Flight.

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**DIAMOND FORMATION** 







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In the diamond formation No. 4 moves in the slot position. Flying in the slot position requires flying just below the leader's prop wash, and maintaining a nose tail separation distance on No. 2 and 3 that is the same as the nose tail separation they are maintaining on the leader. This will create a symmetrical "box" formation.

# **ECHELON FORMATION**



Echelon formation (right) requires the element to move out sufficiently while No. 2 moves from the left wing to the right wing. Again No. 2 sets the spacing for the rest of the flight. The echelon formation is used primarily to facilitate landing out of formation. When using left hand traffic (left break) the flight is in right echelon. When using right hand traffic the flight is configured in left echelon.

#### WINGMAN CROSS OVER -

When a wingman moves from one wing to another he should drop down slightly, ensure that he has adequate nose tail clearance and then move to the other side of the leader passing under the prop wash. When safely clear to the other side, then move up into the normal wing position.





#### **FORMATION TURNS** –

In all formation, except echelon, the wingmen should maintain the same relative position with the leader. This requires the wingman on the inside of the turn to lose altitude and reduce power slightly to maintain position. The wingman on the outside of the turn will have to increase altitude slightly and increase power to maintain position.



In an echelon turn the wingmen stack level.



Large formation: For formation larger than the basic four, the wingmen are added as required. As an example a flight of five would place the No. 5 man flying off of No. 2 on the left wing.....this would provide for a symmetrical "V" formation. As additional wingmen are added they align themselves to the appropriate side of the formation to keep it symmetrical. If an odd man exists he can be placed in the slot.

### TRAIL FORMATION -

LEAD



Trail formation is just as the name implies. Again No. 2 sets the spacing when moving in trail with lead. The prop wash of each aircraft necessitates that each flight member fly below the wash of the aircraft in front of him.

#### - JOIN-UPS -

Normally the leader will make a turn after take off or when calling for a formation rejoin. In this case always cut to the inside of the leader's turn and slide up along the extended wing position until in formation. If you arrive on the left wing and your position is on the right then execute a crossover to the right wing. Remember if you move to the outside of the turn early it will delay getting into formation.

On a straight-ahead join-up move to your appropriate side and establish a reasonable over take speed on the leader. Smoothly reduce power as you approach your assigned position. Remember if you have someone flying off you, his problem will be accentuated by any unnecessary control inputs.

#### FORMATION TECHNIQUES -

Pick out a strut or other part of the lead aircraft and align it with some point on the fuselage. Attempt to maintain your aircraft on this extended line, then establish the appropriate nose tail position (fore and aft with relation to the leader). This will give you a triangulated position in relation to the leader.

Attempt to keep your aircraft as close to this position as possible. This basically places your aircraft in a 45° position from the lead aircraft longitudinal axis.

LEAD



- Remember the secret to good formation is keeping your fuselage aligned with the leaders.
- Try to keep control input to minimum, remember the leader is not moving his controls (hopefully) except for normal turns, climbs, descents, etc. Ideally he is maintaining a constant airspeed altitude, and power setting.
- When in close formation try not to use any more ailerons than necessary. A little rudder is usually much more effective in keeping your fuselage aligned, also it will prevent a ripple effect from wingmen flying off you.

# VISUAL SIGNALS

Flight commands such as radio frequency changes, echelon right/left, etc. are generally passed via the radio. However, it is incumbent on each Gaggle member to understand the various visual signals as listed below.

- Go to pre-briefed frequency: Tap ear with index finger and then extend finger. (Variations on this are permissible, and have been seen with middle finger employed to indicate the common frequency!)
- Can't hear: Move open palm of hand past ear back and forth.
- Can't transmit: Move open palm of hand past mouth back and forth.
- Reduce power: With palm open and facing rearward, motion to rear.
- Add power: Clenched fist, arm in forward motion.
- In flight emergency: First use the radio, if unable, use HEFOE-Clenched fist up to forehead.
- Emergency by category: 1 Hydraulic 2 Electrical 3 Fuel 4 Oxygen
  5 Engine Indicate with clenched fist and finger extended to indicate which number defines your emergency.

## VISUAL SIGNALS (cont'd)

In the interest of standardization, the Gaggle Flight has adopted visual signals from the T-34 FAST manual. However, these do not replace radio calls if deemed necessary. For example, high wing aircraft and Bi-planes may cause difficulty seeing each pilot.



Gear down: To be executed on head nod



Cross under: Clenched fist held up = Move one aircraft (# 2) Fist/double pump = Move the element – 2 aircraft (# 3 & 4)



Station Keeping: Line up flap aileron junction with cowl line or check distance between main and nose wheel. You should see more of the bottom of the wing than the top. Maintain nose, tail and wingtip clearance. For proper position maintain a line 45° off the nose.



Takeoff or pitchout interval in seconds



Stop Squawk









Numbering system



In flight problem, followed by HEFOE

H	=	HYDRAULIC
Ε	=	ELECTRIC
F	=	FUEL
0	=	OXYGEN
Е	=	ENGINE



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