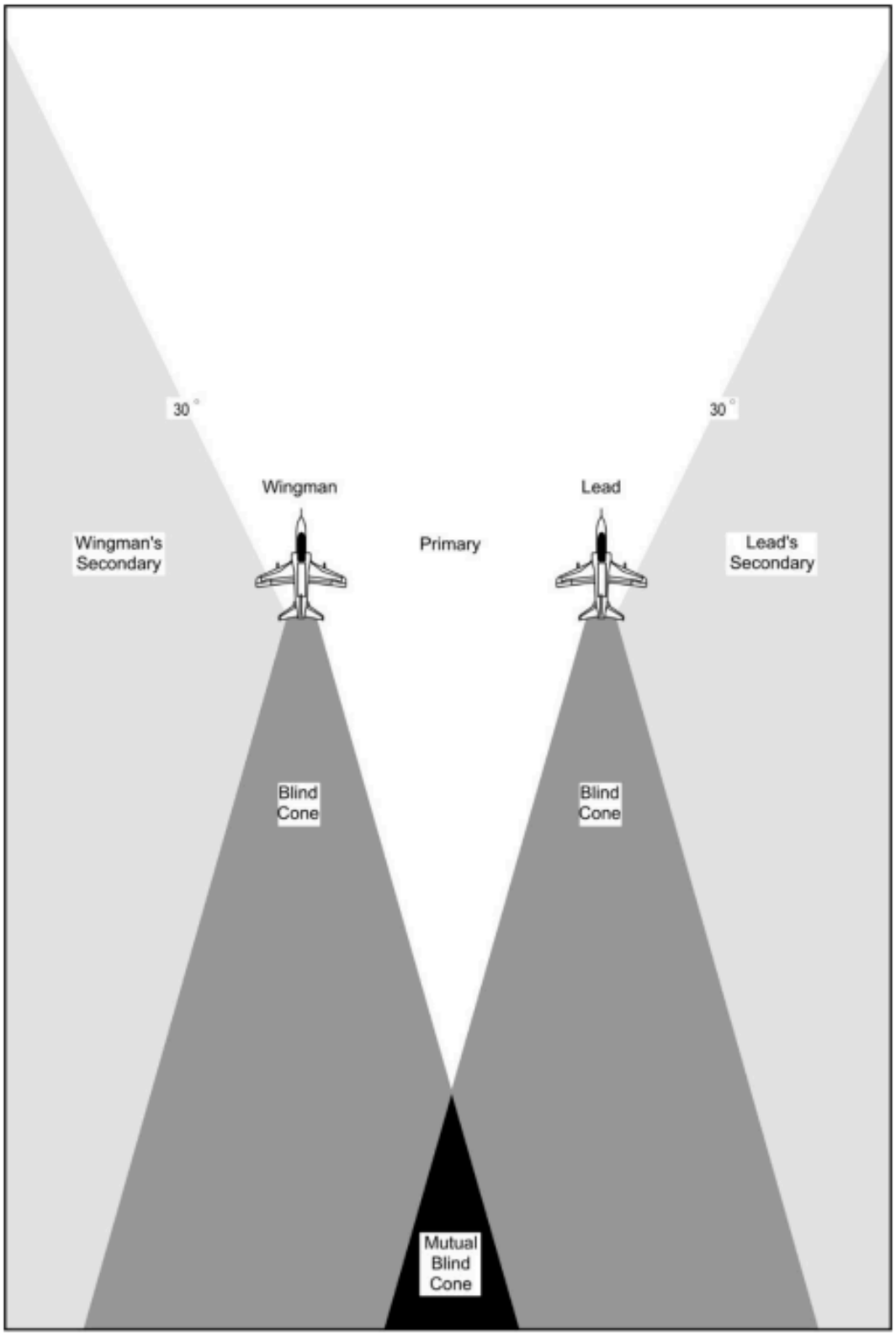
Coletrain’s Guide to Tactical Formations



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Introduction to Tactical Formation

Basic concept

Tactical formation or “tacform” allows multiple aircraft to mutually support each other while simultaneously providing ample heads down time, and maneuvering room. This is normally used when flying in a combat area.

Positioning

There are two kinds of Tacform, offensive and defensive. Both formations have advantages and disadvantages. It is up to the flight lead to decide which formation is correct for the situation.

Offensive

Offensive tacform is used when the flight lead is not anticipating an attack on a single aircraft and wants the two aircraft to be hard to spot together. Normally this is flown line abreast with 1.0-1.5nm spacing and 1000-3000ft of vertical separation.

Defensive

Defensive tacform allows the flight to be slightly closer together. Doing so allows for more mutual support in case a singular aircraft in the formation is attacked. This is flown line abreast with .8nm to 1.0nm spacing and 500-1000ft of vertical separation.

Roles/Responsibility

During tacform both parties share and/or assign roles and responsibilities. The flight lead sets all the flight parameters not covered in the contract along with calling or signaling all turns. The wingman is expected to follow all of the flight leads instructions along with formation maintenance. Both pilots are responsible for looking out in all quadrants but focus on the quadrant across the formation and the rear quadrant.

Contract

To allow for less radio communication and more understood flight parameters a contract is useful for tacform. Contracts should cover at a minimum, airspeed/mach and turn parameters but can also include things like yardstick. This document will refer to contract turns being: military power and G to maintain airspeed.

Push Into/Out of tacform

Into Tacform

To enter tacform, the flight lead may use a radio call (e.g., “Viper 3, cleared tactical”) this call can also include other information like: heading, altitude, or a specified side. Lead could also porpoise their aircraft, in this case the wingman the flight lead is indicating that the parameters for tacform are already set and the pilot can reference their own instruments to get the reference heading and altitude.

Once the wingman receives the signal to go to tacform they should slide out along the bearing line adding one knot per degree cut away from Lead. The wingman is expected to get in formation expeditiously but not use too much to be aggressive on the controls.

Using A/A TACAN can be a very useful tool for allowing the wingman to calibrate their eyes to the correct spacing required.

Out of Tacform

Lead can tell the wingman to come back into a close formation with a “Tuck it in” call or with several high angle of bank wing rocks. The wingman should expeditiously but safely bring themselves back into cruise.

Basic position maintenance

The primary order for maintaining position in tacform is: line, spacing, stack. The wingman is expected to deviate from a lower priority position if by doing so they can achieve a higher priority position.

Stripped position correction

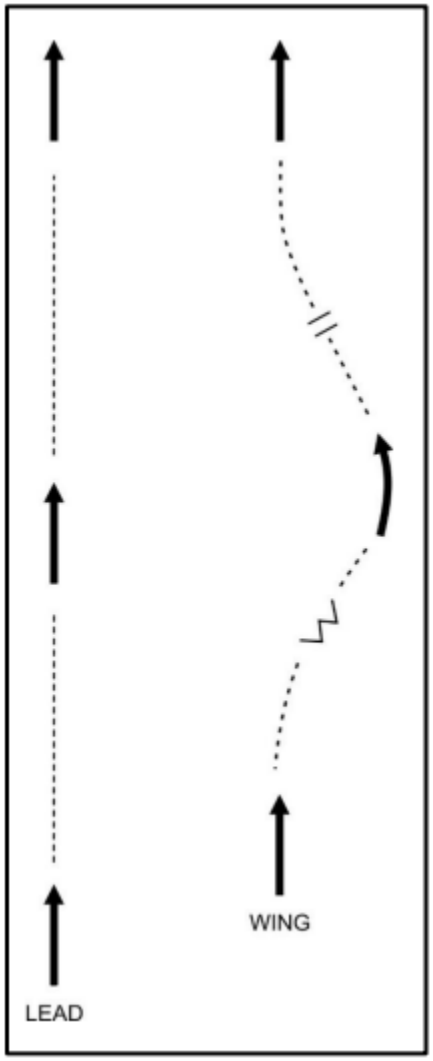
Correcting for a stripped position is done by exchanging altitude for airspeed. To start, begin a shallow descent and gain airspeed going down hill. Then, when aligned with the bearing line smoothly and aggressively pull 2 or 3 Gs until the nose is up and climb back to the correct altitude. This can be done with little to no throttle usage.

Acute position correction

Being acute can be corrected in several ways. Slight corrections can be corrected by using a level turn away from the flight lead and slowing, once half of the error has been resolved turn back, speed up, and rejoin alongside.

Climbing and slowing down would be more fuel efficient. Simply climb and trade airspeed for altitude and start to drift aft towards the bearing line. Before arriving on the bearing push the nose down and descend back to altitude using throttle to fine tune the position.

When the wingman is moderately acute, the above methods can be combined to expedite the process. Although it is important to make smooth and precise corrections. Abrupt and erratic turns will only result in a loss of SA.



Abeam distance correction

Correcting for abeam distance is done by taking a cut into or away from Lead. As a rule of thumb, add a knot of airspeed for every degree of heading change.

Altitude corrections

When the other variables are solved, set the power to climb or descend at the contract speed to get to the desired altitude.

2 Ship Turns

Due to the increased separation of tacform, turns need to be done with pre briefed maneuvers. These maneuvers will (more or less) keep the amount of distance traveled between the two aircraft the same. All turns are initiated by the flight lead and are broadcasted over the radio including the kind of turn and the heading that turn will be to. The wingman is expected to take the time they need to look at their instruments and understand what they need to do then respond with “Two”. Once the wingman makes that call both pilots will start the turn.

Check turns

A check turn is used to turn the section 30° or less. Lead will roll into a 30° angle of bank turn and roll out on the stated heading. If the wingman simply turns with Lead they will roll out acute or stripped and have to correct for that. Therefore, think of these turns as instantly putting the wingman in that position and correct during the turn. For a check away the wingman can accelerate and descend to roll out abeam. While a check into the wingman will require them to climb and slow down to maintain position.

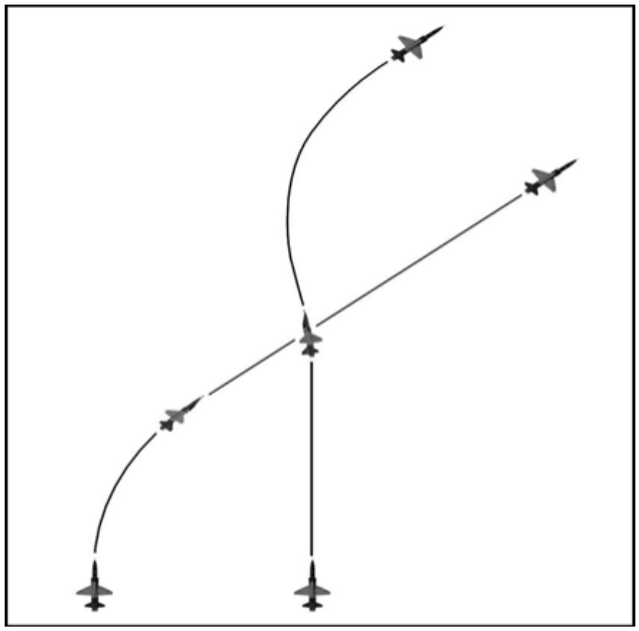
While check turns can push the wingman out of position they can also be used to quickly get them into line abreast. For example, checking into a stripped wingman can instantly bring them back into position.

Delay 45

When the flight needs to turn from 30° to 90° a delay turn may be used. They are most commonly used for turns that are around 45° due to them working the best in that amount of turn (hence the delay 45). The fighters will swap sides by the end of the maneuver.

When the turn starts the airplane outside of the turn will begin a contract turn to the stated heading. The aircraft inside of the turn continues straight until the other aircraft points at them, then begins their own contract turn to the assigned heading.

Another option for the inside fighter is to take a cut into the outside aircraft before the turn onto the assigned heading. This is used when the formation is wider to get the required line and spacing.

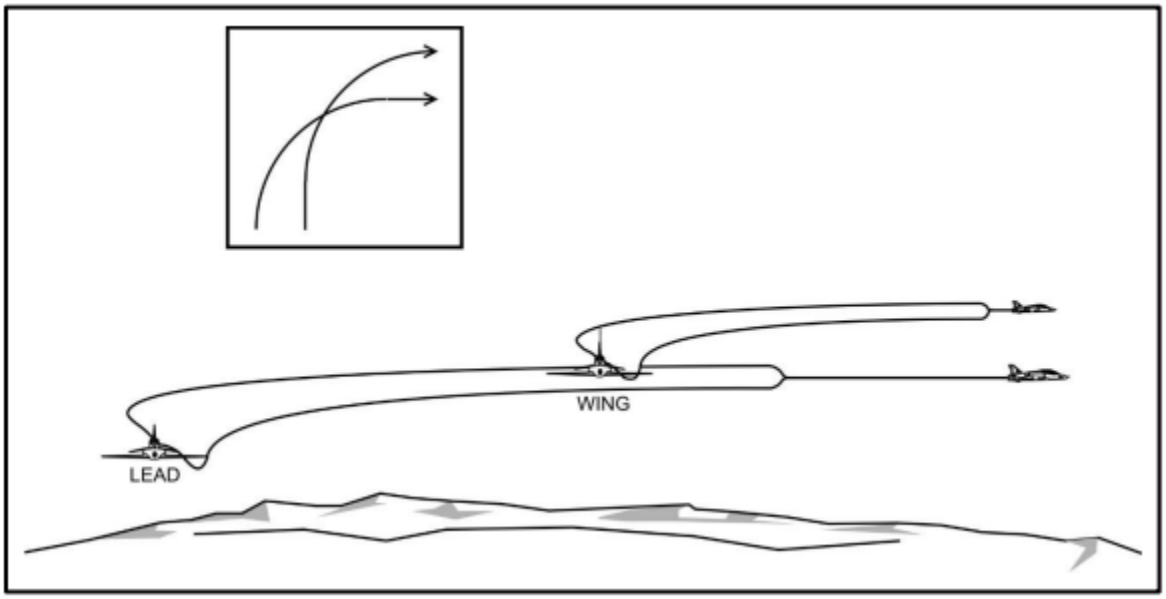


Tac turns

Tac turns are used when around 90° of heading change are required.

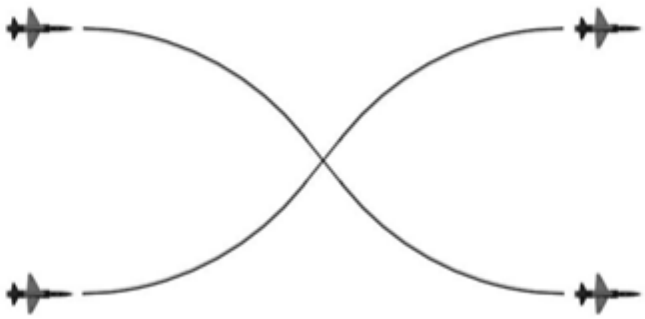
During a tac turn both fighters will start turning at the same time, however the fighter outside of the turn performs a contract turn while the inside fighter performs a normal turn (30° of bank power to maintain airspeed). When the outside fighter points at the inside fighter, the inside fighter performs a contract turn to the assigned heading.

The wingman can use a tac turn into them to correct for line deviations. If the fighter is stripped they will need to turn early, this will convert being stripped to being tight. (I can't say that with a straight face.)



Shackle

A shackle is used to put the wingman on the opposite side of the formation. They can be performed either straight ahead or to an "off heading". Either way the wingman will swap sides by the end of the maneuver. Regardless of the end heading this maneuver can be flown more or less to the following instructions to allow for maintenance of the formation.

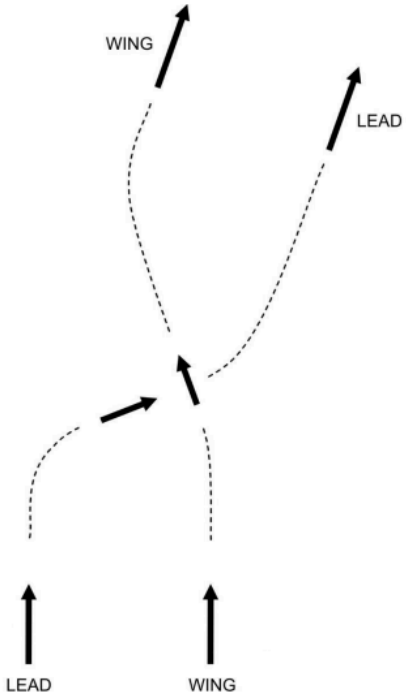


On heading

Each aircraft will turn 45° into their wingman and hold that heading until they cross, -2 is responsible for vertical separation. When the two fighters cross they will both return to the assigned heading.

Off heading

For an off heading shackle both fighters turn to a heading 45° off the stated heading into their wingman. This will require one fighter to turn a little and one to turn a lot. The fighters won't cross on top of each other so they both turn to the assigned heading when the fighter that has turned a lot passes behind the aircraft that has turned a little.



In place

An in place turn is when both aircraft turn at the same time and in the same direction. This is done with a contract turn and is understood that the flight may be out of position by the end of the turn. Therefore the -2 does not need to call "Blind" if the turn is into them. These are usually done as part of a G warm which will be covered later.

Hook

A hook turn is an in place turn but to 180°. During the turn the outside fighter should watch the inside fighter and deviate from the contract to point at the inside fighter at the 90° point, then return to a contract turn.

Cross turn

Just don't

Zip-lip turns 2 ship

Zip-lip tacform can be used on its own or in combination with normal tacform.

Contract-
-The wingman will always strive for the briefed position
-The aircraft caught in front after a turn is responsible for returning to position
-The wingman will not exceed 90° off of Lead's heading
-All turns except for check turns are done as contract turns
-Lead initiates all turns
-Lead will signal all turns away from the wingman with a high angle of bank 30° degree turn.
-The wingman will not stack below lead at low altitude.

Tips-

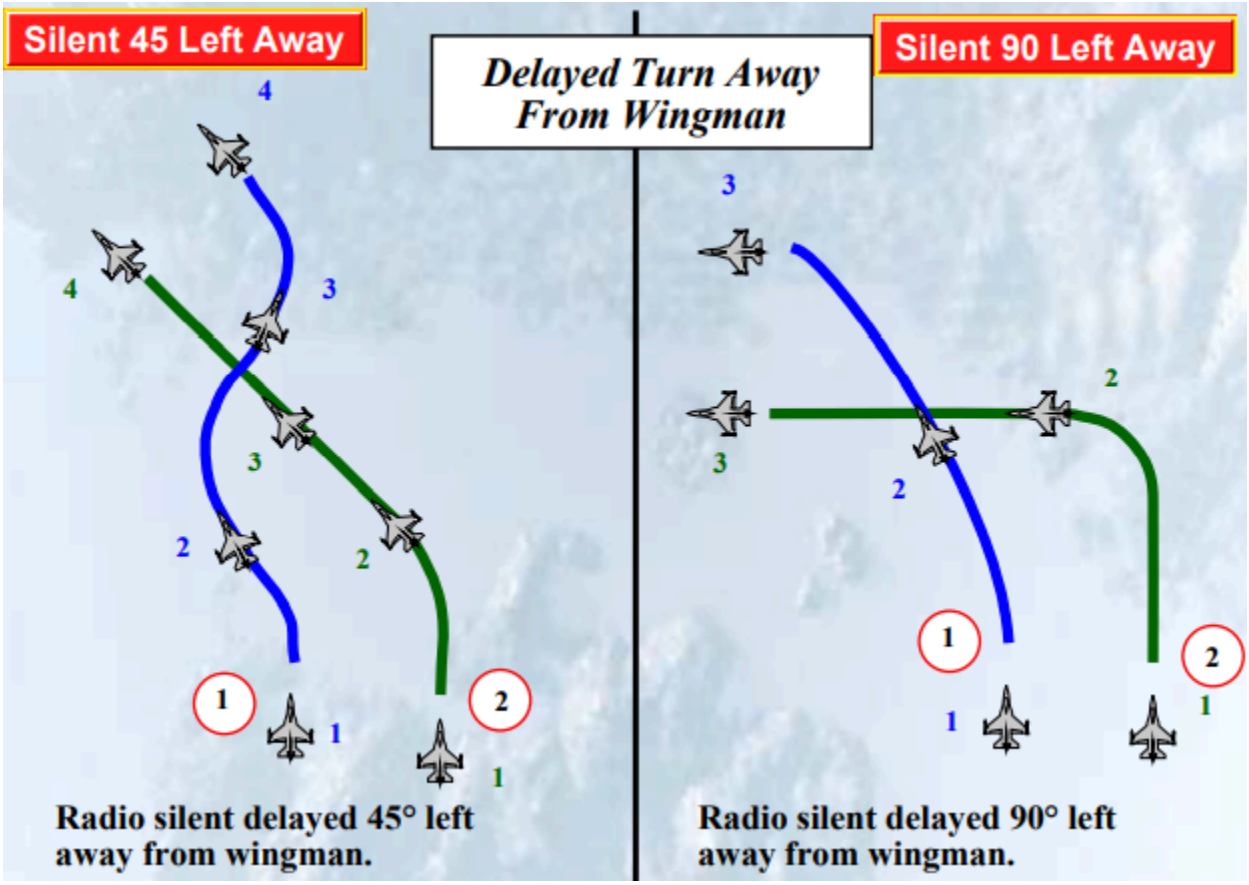
-If the wingman is unsure of which way Lead is turning, assume it is away because if Lead is turning into the wingman it will become obvious very fast.

-The wingman will always assume a contract will be a 90° turn until Lead shows otherwise.

Check turns

Check turns can be done zip-lip however it adds a lot of extra workload on the wingman. If the flight lead decides a check turn is needed they will limit the turn to a maximum of 30° of bank.

Turns away from the wingman



Lead will signal the turn with a high angle of bank turn with a heading change of around 30° away from the wingman. Lead can increase the amount of time they are showing the signal with a brief pitch up and low G loading during the turn. When the wingman sees this signal they start a contract turn into Lead.

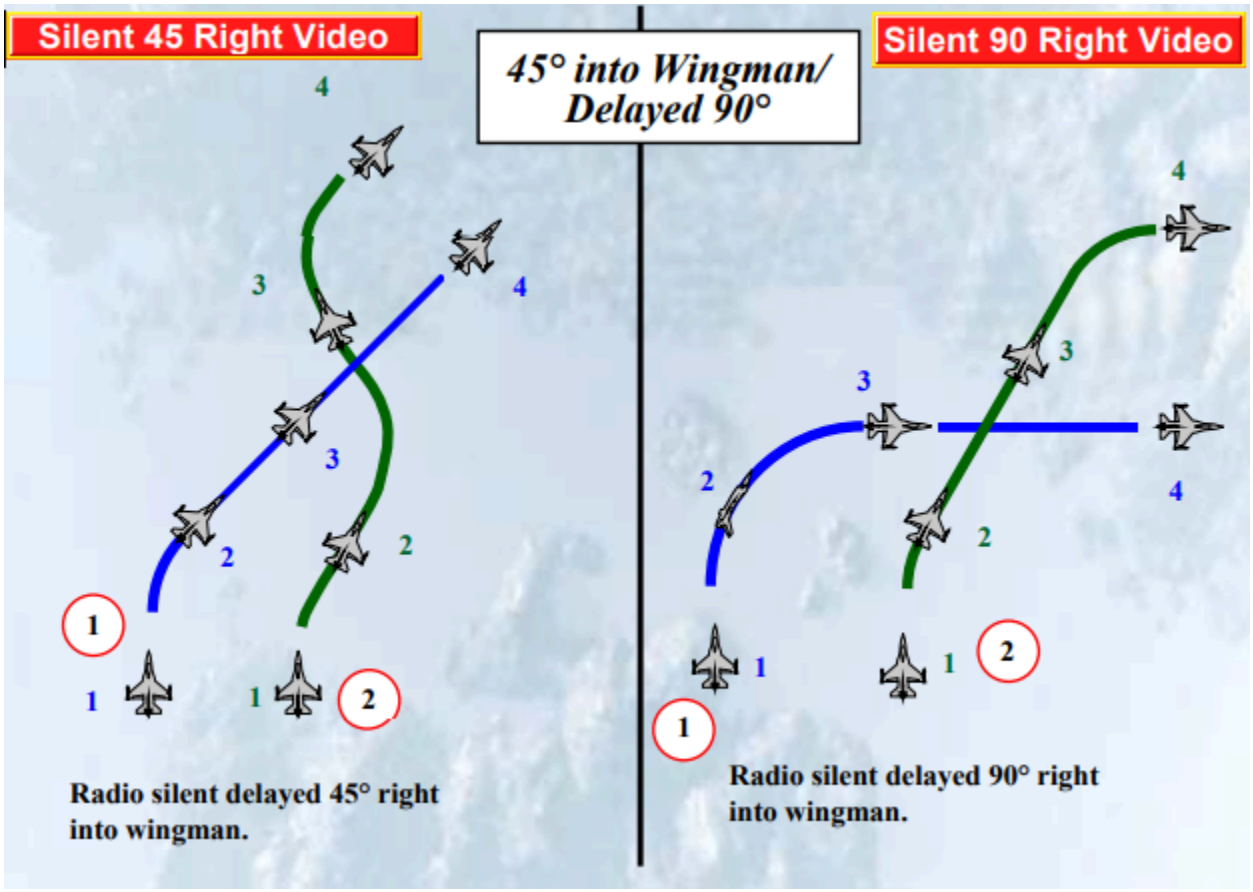
-If Lead wants a 90° turn they will allow the wingman to perform their turn and will line up on the opposite side.

-If Lead wants a 45° turn they will watch the wingman start the turn and as they pass through 45° of turn the flight lead will turn back across the wingman's flight path. This is the signal for the wingman to roll wings level. Lead will then turn onto the heading on the opposite side.

-If Lead wants a 180° turn they will continue a contract turn away from the wingman after checking to see if the wingman is starting their turn.

Lead should always check to see if the wingman saw the signal turn. If the wingman continues to fly straight, Lead should make a shallow banked turn to the original heading and allow the wingman to correct for distance (eventually).

Turns into the wingman



Lead will signal turns by simply turning onto the new heading with a contract turn. The wingman will immediately turn 30° away from Lead (this does not need to be a contract turn, just get the plane to roughly the new heading fast) then watch Lead's turn.

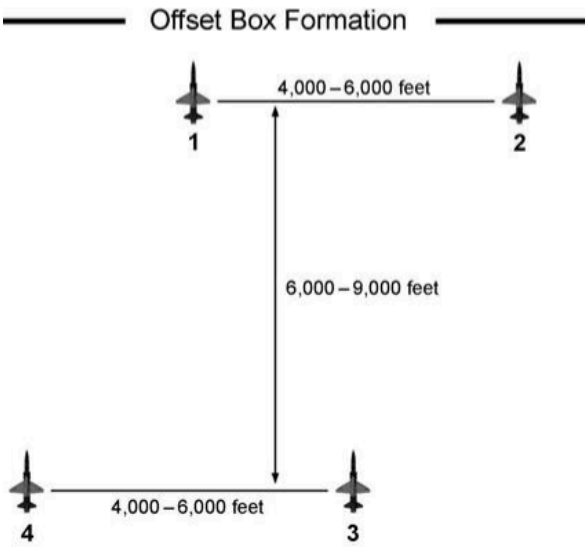
-If Lead continues to turn through the wingman's 6, the wingman will start a contract turn to 90° from the original heading.

-If Lead rolls out before passing through the wingman's 6, the wingman will turn into Lead to line up on the opposite side. This turn will vary with distance and TAS so the wingman will need to learn how to make the turn work in various conditions.

4 Ship Tacform

4 ship tacform is performed by flying two sections of aircraft in relation to each other. Each element performs all tasks required while mutually supporting each other so that they can split if necessary. With the increase in aircraft each individual aircraft needs to have SA on the flight as a whole to ensure deconfliction. This is also done by adhering to contract turns and aggressively maintaining position. Each wingman is primarily responsible for maintaining position with their section lead. -3's priority is to maintain visual or sensor contact with -1 and fulfill their section lead responsibilities.

4 Ship Container/Offset Container



4 Ship box is flown by having two sections flying in tacform separated in trail by 1-1.5nm. Unless previously briefed -2 and -4 can go on either side and don't have to be in reference to each other. -3 can opt to fly an offset box by placing themselves or -4 in the slot between -1 and -2. This would be done to increase their visibility over the entire flight. The rear element should stack themselves vertically if conditions allow.

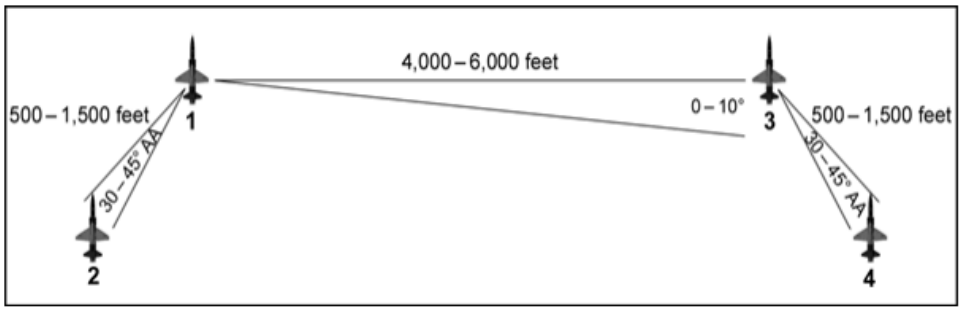
Turns are done as separate sections with -3 simply copying what -1 called with some delay to maintain the formation. All turns are expected to have a delay, including hook turns. If Lead wants to do an in-place they will specifically call for it.

This formation can be entered quickly by turning 90° in one direction, pushing -3 and -4 to fluid four on the same side as the turn was performed, then turning in-place 90° back to the original heading and pushing -2 and -4 to tacform.

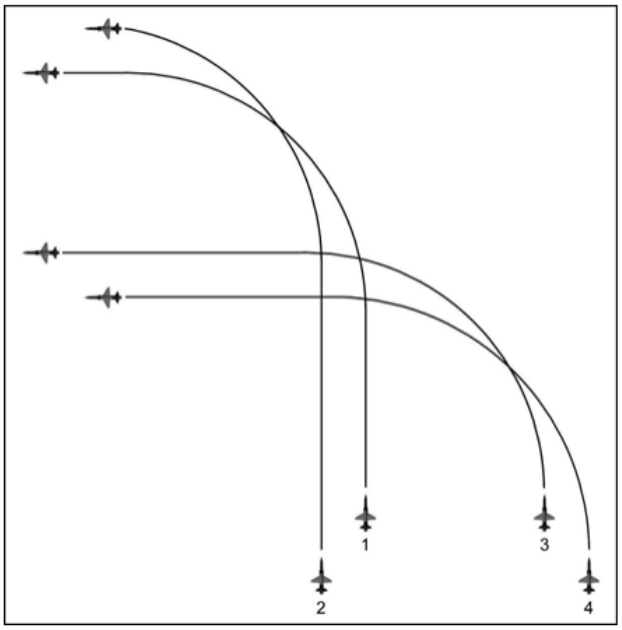
Advantages:
-The formation provides great mutual support and lookout
-The rear element is positioned to engage an adversary making a stern conversion on the lead element
-It is difficult to visually acquire the entire flight
-Element spacing for an attack is built into the formation.

Disadvantages:
-The formation is difficult to fly in poor visibility and/or rugged terrain

Fluid/Spread Four



Fluid four is flown by having -1 and -3 fly tacform in reference to each other, while -2 and -4 fly off of their section lead in fighting wing or wedge. The difference between the two formations is how far the wingmen fly off of their section lead. When the wingmen are flying in fighting wing, the formation is called fluid four, when they are in wedge it is called spread four. It is important for the wingmen to remember about the other members of the flight when in this formation and provide vertical separation during turns.

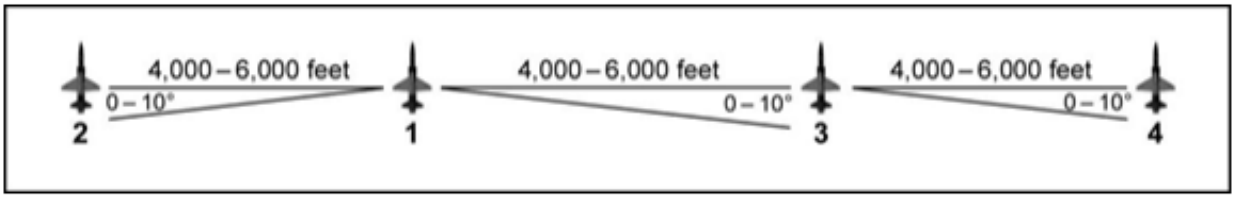


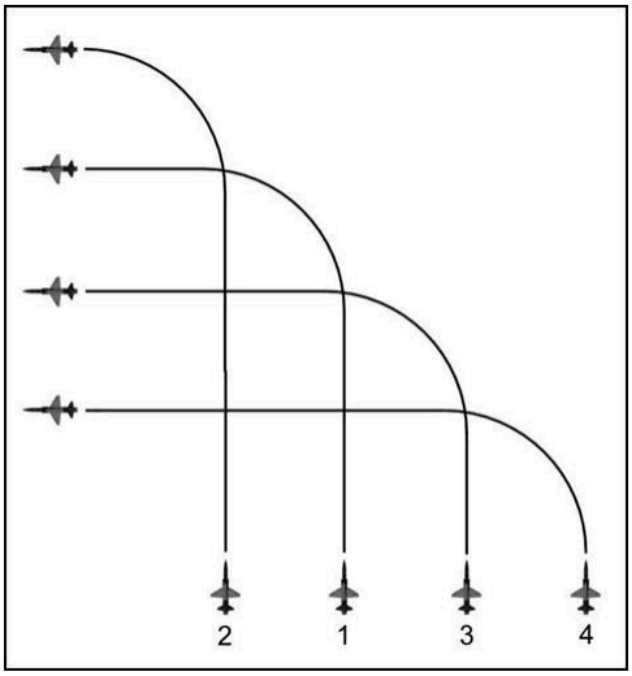
Turns are done by Lead calling for a turn with -3 as normal while -2 and -4 hold on for dear life. It is preferable for the wingmen to remain outside of the formation to allow for more visibility.

Advantages:
-Inexperienced wingmen can be kept close for ease of maneuvering.
-4 ship maneuverability is good.
-Provides a concentration of force.
-Easily converts to 3 ship if one aircraft falls out.

Disadvantages:
-Adversaries can more easily acquire all four aircraft.
-Defensive maneuvering creates deconfliction challenges due to the proximity of aircraft.
-Cumbersome to maneuver at low altitude in rough terrain.

4 Ship Wall





To establish 4 ship wall, each flight member flies in line abreast usually with -2 on the opposite side of -3 and -4. Stack is up to Lead however it is usual for each member to stack according to their flight number.

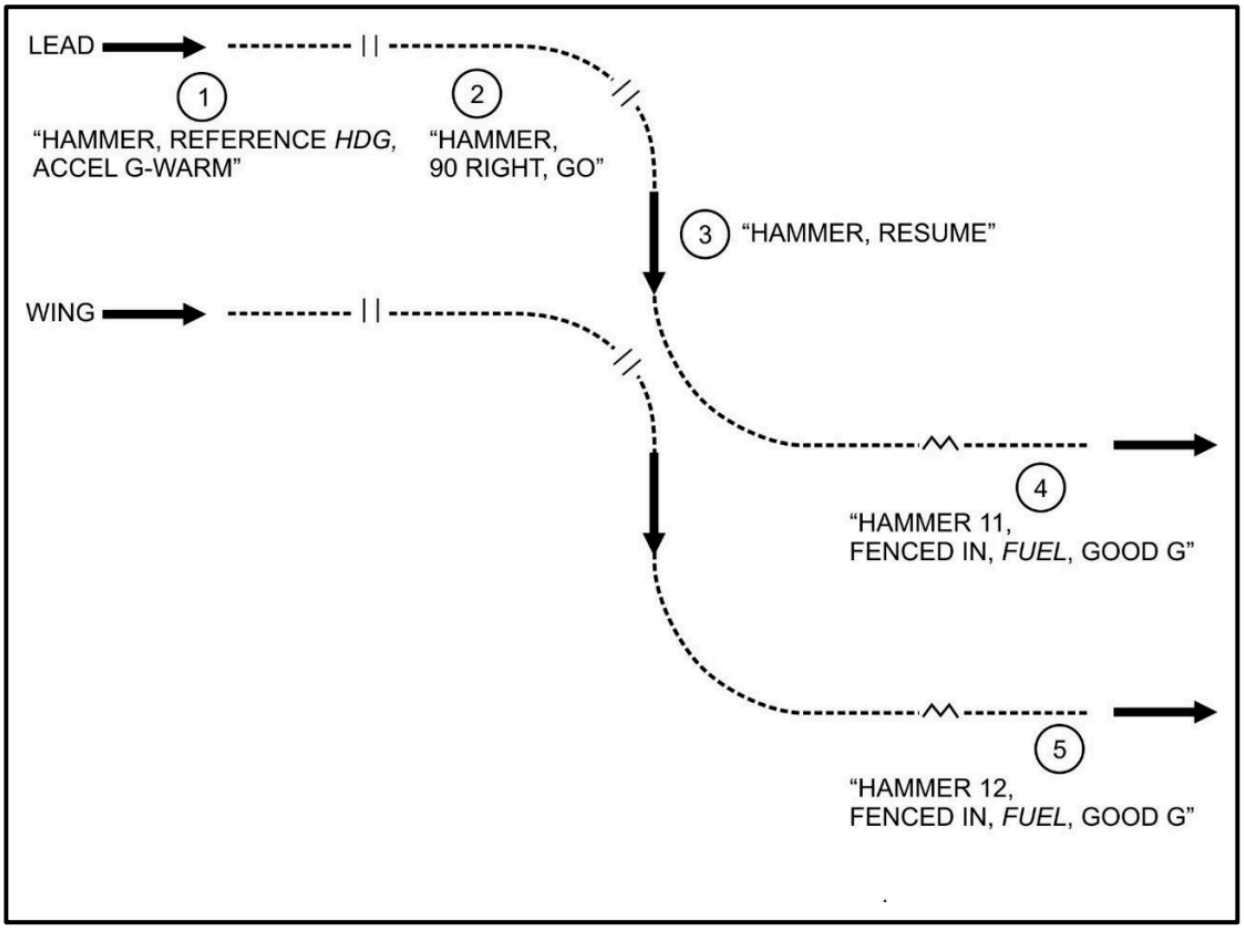
The formation is restricted to delay turns and hooks. When a turn is called the outside wingman begins a contract turn while each inside wingman uses normal tacform references for their own turn. When Lead rolls out of the turn the flight references them for positioning.

Advantages:
-Firepower is maximized for BVR weapons employment.

Disadvantages:
-Maintaining the formation during maneuvers can be difficult.
-Very difficult for wingmen to fly at low altitude.

G exercise/warm

After the flight has been pushed out to tacform a G-warm can be done to prepare the flight for combat. A G-warm includes a minimum of 180° of turn, normally through two 90° turns will be conducted, however a 90° then 180° is also common. Normally this will follow a separate contract for power/G-loading, with the second turn having a peak G easing to a sustained G.



Position maintenance via maneuvers

Check

As stated previously check turns can immediately correct for longitudinal positional errors at the cost of heading. Lead simply needs to see how many degrees the wingman is acute or stripped and call for a check of that many degrees into or away from the wingman. The wingman should be brought into the correct position without having to correct anything.

Shackle for line

If a member of the flight is caught out in front (around 1nm or so) a shackel can be called. The pilot caught in front will perform the shackle while the pilot in back will drive straight forward. When the pilot that is stripped gets abeam they will turn to complete the shackle as necessary.

Shackle for spacing

When the flight is separated laterally a shackle can be called to correct this quickly. Both pilots simply fly a standard shackle with more time until they cross. This is a very simple and fast way to correct for gross spacing errors.

Shackle for rejoin

If the flight needs to rejoin to tacform quickly, Lead can use a shackle. This is done with three steps. First Lead needs to know the direct bearing between them and their wingman. This can be gathered several ways but the easiest is to have the wingman lock Lead, point at them and say what heading they are on. Second Lead needs to call to fly a heading 90° off of the previously called heading. Once both of the aircraft are flying this heading they should more or less be line abreast with a large amount of spacing. Then all Lead needs to do is call for a shackle, this will be exactly like a shackle for spacing but may take a while to cross. Both pilots should watch the other aircraft and try to null out any relative movement while they are flying towards each other.

Weave for rejoin

If Lead wants to rejoin while the flight flies in a specific direction they can call for a weave. This call will usually include a cardinal direction for the side to do the maneuver to. The aircraft in front will turn 60° off of the stated heading and fly that direction until the aircraft in trail gets to their 6. Then they will turn 60° off of the stated heading (120° of turn in total) towards their wingman. This will put them on a collision course if done correctly. This maneuver requires both members to maintain the same airspeed for it to work, and is most useful when the flight is separated by more than 5nm.

Amplifying strength

When fighting along a known axis, the flight lead can greatly increase the flight's punching power by pushing the flight to a distance greater than a mile. For example, if the flight is conducting a fighter sweep they can push to 10 nm lateral separation to allow for an immediate delouse.