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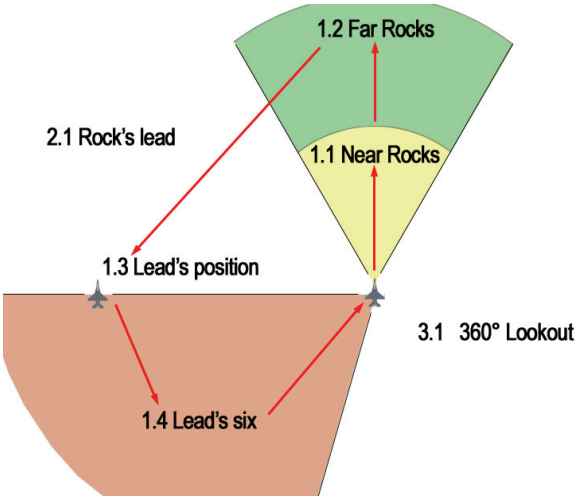
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Note :

6000 feet = 1 Nautical Mile

Use Air to AIR Tacan to gauge visual separation in the sim.

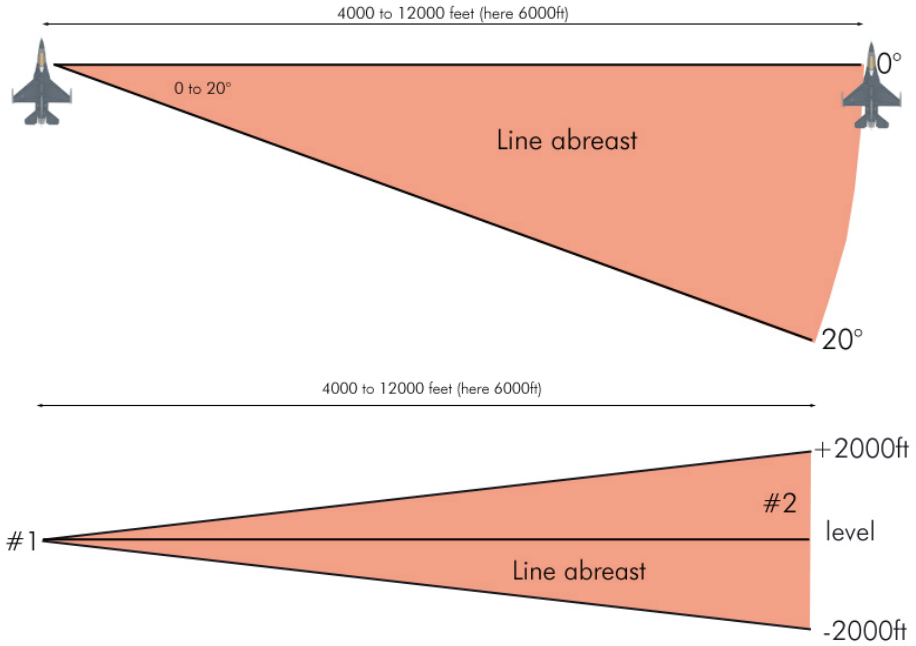
RESPONSABILITIES & TIME SHARING



Within a formation, tasks as radar search, nav and visual lookout are shared. The image on the left illustrates the low level visual lookout the wingman maintains. The scan is always made between near rocks (area that will affect the flight path in the next 10-15 seconds) far rocks (area that will affect future manoeuvring) lead's position & check lead's six. If time remains, sector 2 and 3 can be checked

Responsibilities 2 ship:
Lead: Navigate – Radar – Check 6 and Visual lookout
Wingman: Check six & Visual lookout– Backup Nav – Backup Radar
Responsibilities 4 ship:
Lead: Navigate – Radar – Check 6 and Visual lookout
Wingman : Backup Nav – Check 6 and Visual lookout – Backup Radar
Element Lead: Backup Radar – Check 6 & Visual lookout – Backup Nav
Wing #4: Check Six & Visual Lookout

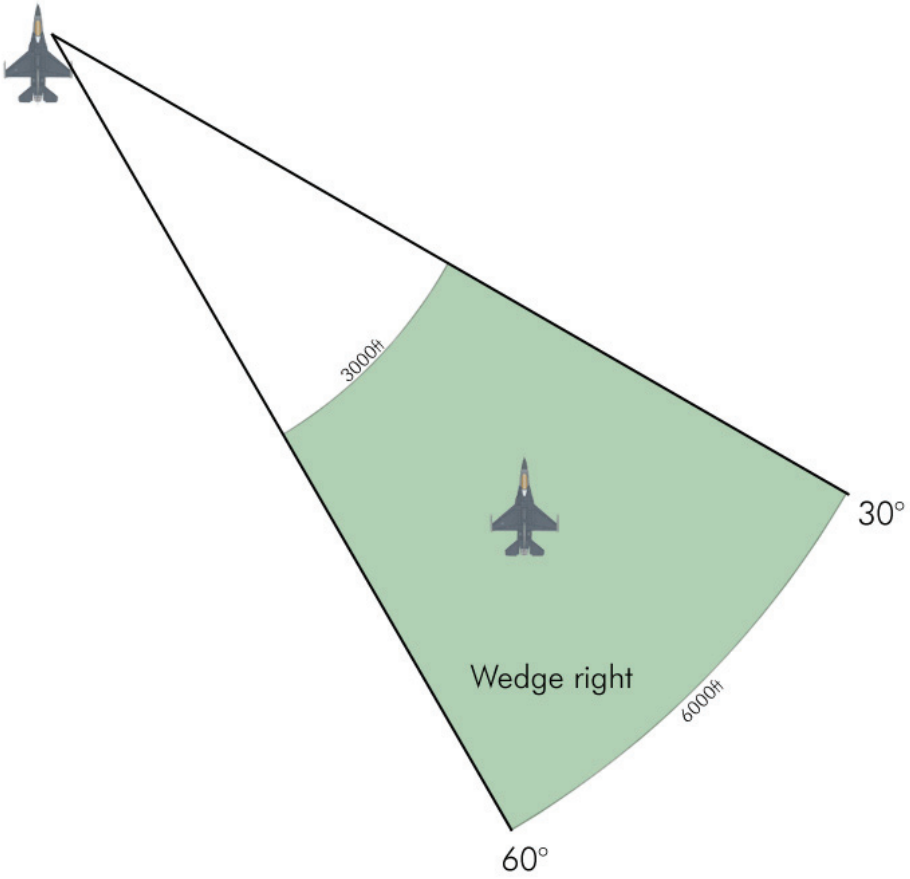
TWO-SHIP FORMATION: LINE ABREAST (SPREAD)



Line abreast formation is a position 0 to 20° aft: 4000 to 12000 feet spacing. Wingman can be 2000ft higher or lower than lead on the max spacing. Ideally, wingman will aim for the 0° line and 6000 to 9000 ft spacing for optimum visual mutual support. At low level the wingman can not fly below lead.
This formation is commonly referenced as SPREAD with a spacing of 6000 to 9000 feet (1 to 1.5 Nm)

Pros: Very good mutual support, mostly used in Air to Air mission. Each flight member can easily check the deep sic of his mate.
Cons: hard to maintain formation and route for #2

TWO-SHIP FORMATION: WEDGE

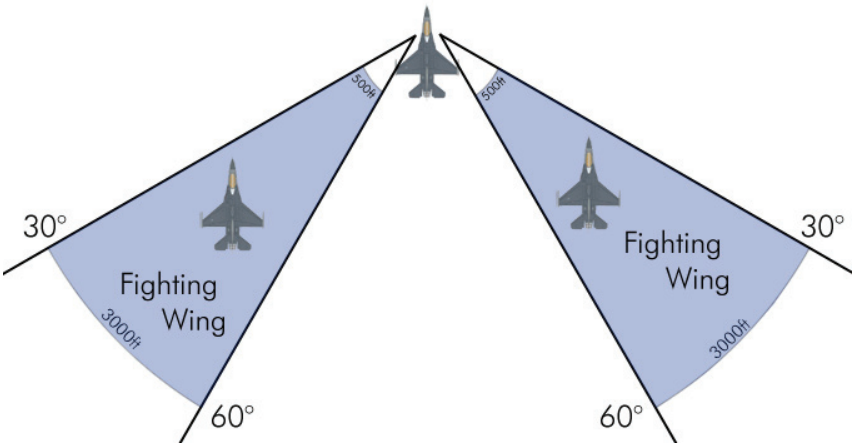


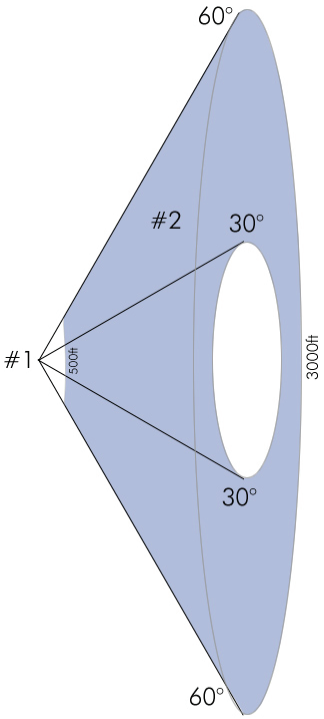
In Wedge, #2 has to stay within 30 to 60° of line abreast and between 3000 and 6000 feet spacing. And level with his flight lead. The wingman may switch side as required during turns or to avoid terrain, obstacles and weather but must return to original side unless cleared by lead.

Pros: Lead is well protected in the 6 o'clock area and is free to manoeuvre aggressively

Cons: No 6 o'clock protection for the wingman. Lead changes are also hard to make.

TWO-SHIP FORMATION: FIGHTING WING



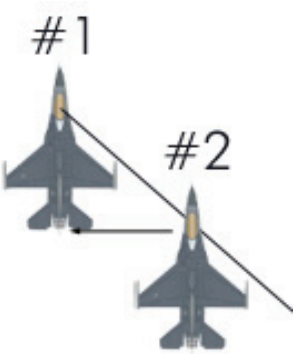


Fighting Wing gives the wingman a manoeuvring cone from 30 to 60° aft of line abreast and lateral spacing between 500 to 3000 feet.
#2 is free to move anywhere within that cone: (any side, above or below lead) as long as he can maintain his responsibilities.

Pros: Very easy to fly for #2. Allow cockpit heads down while maintaining formation, allows flight integrity under marginal weather conditions or in rough terrain.

Cons: No mutual 6 o'clock coverage. Easy detection of formation by single threat.

TWO-SHIP FORMATION: FINGERTIPS



Fingertip is a very close formation where the wingman aligns the head of his lead with his wingtip missile rail and the horizon. And aligns the trailing edge of the nozzle of his lead
Flying so, the wingman constantly needs to keep fixated on his lead and doing anything else might be too demanding.

Pros: Allow to keep the lead visual in dense weather and the formation flown when doing overhead recoveries
Cons: Very demanding on wingman and lead is restricted to smooth manoeuvring only.

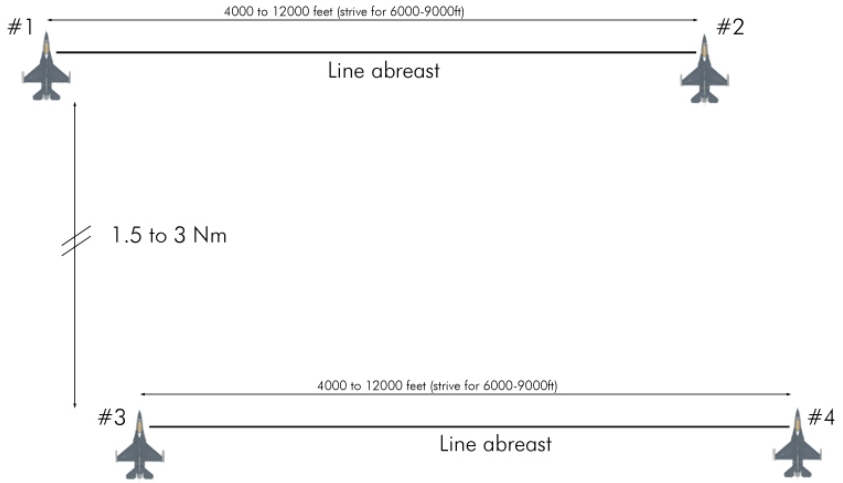
TWO-SHIP FORMATION: TRAIL

Trail formation is quite self explanatory with the wingman going behind the leader.

Close trail is defined as one to two ship lengths behind the lead's aircraft and below his jet wash.

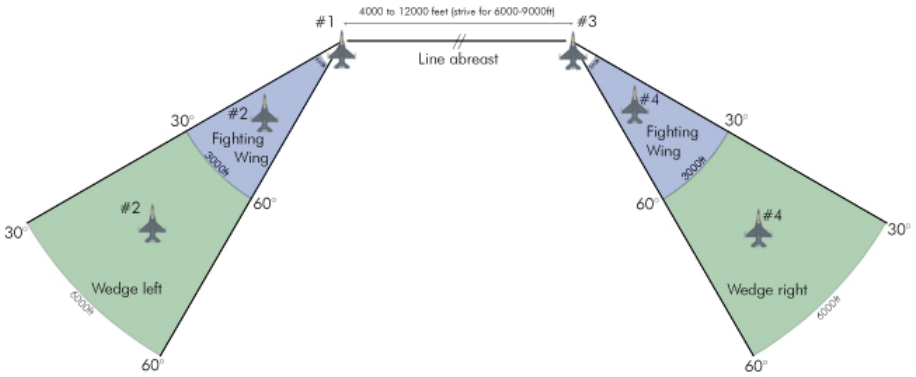
Trail formation is flown in a cone aft of lead at a prebriefed distance. Avoid flying too high in lead's 6 o'clock to avoid loosing sight. Air to Air tacan can be used to maintain briefed spacing.

FOUR-SHIP FORMATION: BOX



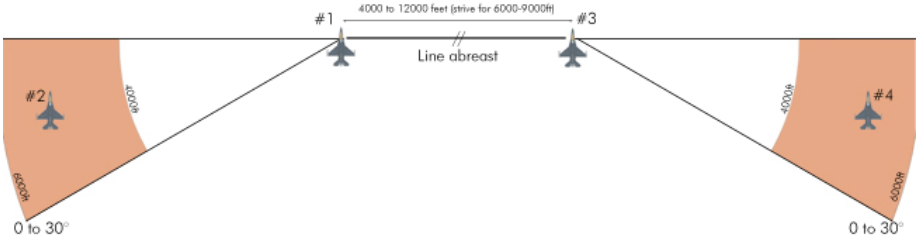
In Box, the 2 elements fly line abreast. The trailing element maintains a spacing of 1.5 to 3 Nm. A slight offset might be used because the F-16 is hard to see from behind. Use of Air to Air tacan and radar is advised
Pros: Box provides excellent mutual support and lookout. It is difficult to spot the whole formation visually. **Cons**: Hard to fly in hi terrain or in poor weather.

FOUR-SHIP FORMATION: FLUID FOUR



Element leads fly line abreast with their wingman in wedge or in fighting wing as briefed on the outside as the formation.
Pros: Good manoeuvrability, wingmen are kept close, concentration of force.
Cons: Easy to acquire the whole formation visually. Defensive action might be a problem because of the proximity of aircraft.

FOUR-SHIP FORMATION: VIPER FOUR

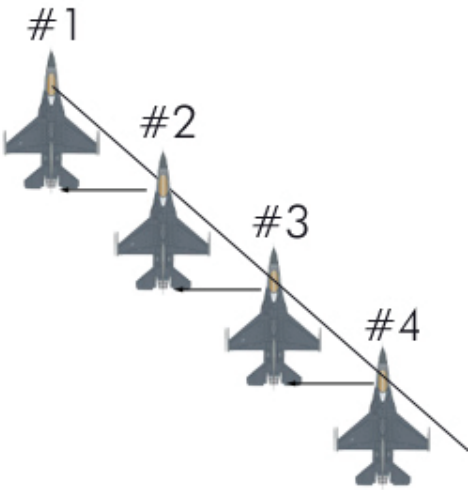


Element leads fly line abreast. Wingmen position themselves 0 to 30° back from their element leads and 4000 to 6000 ft spread.
Pros: Very good firepower for BVR, hard for an adversary to spot the whole formation. **Cons**: Manoeuvring is difficult in the line abreast, and hard to fly at low altitude.

FOUR-SHIP FORMATION: SPREAD FOUR

Spread four is the same as Viper four but the wingman are spread a bit further. Instead of 4000 to 6000 feet spacing on their leader, they maintain a spread of 6000 to 9000 feet. It makes it even harder for adversaries to spot the full flight.

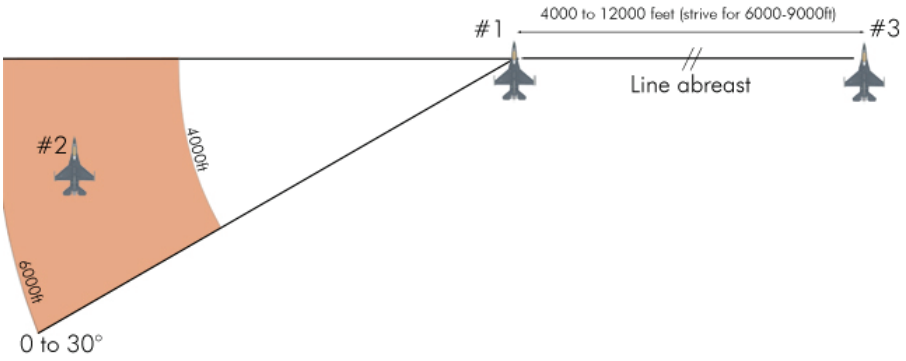
FOUR-SHIP FORMATION: ECHELON



Echelon is fingertip for a multiple ship formation (usually four) a very close formation flown where the wingmen aligns the head of his lead with his wingtip missile rail and the horizon. And aligns the trailing edge of the nozzle of his lead

Pros: Allow to keep the lead visual in dense weather and the formation flown when doing overhead recoveries
Cons: Very demanding on wingmen and lead is restricted to smooth manoeuvring only.

THREE-SHIP FORMATION: VIPER THREE

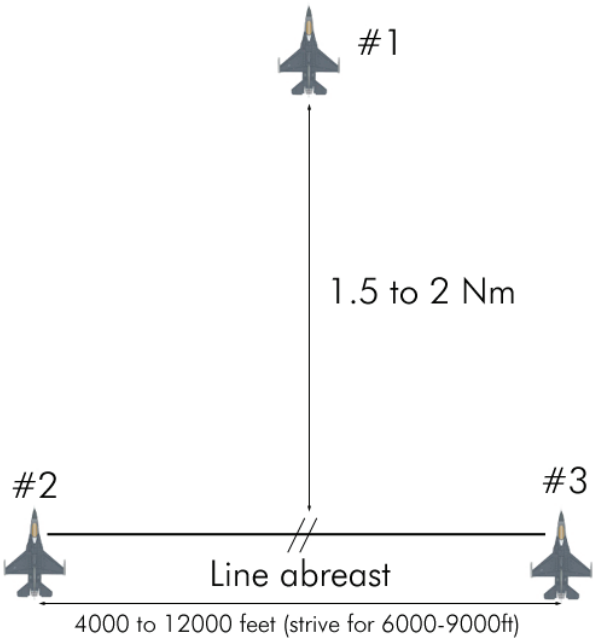


As with most of three ship formation, they are actually four ship with one aircraft missing. In the case of Viper three, one wingman is amiss and #3 maintains Line abreast on #1 without a wingman.
It will be the same for Spread three, Fluid three, …

THREE-SHIP FORMATION: VIC

Lead flies 1.5 to 2 NM in front of the trailing element. The lead aircraft manoeuvres as desired. The trailing element uses line abreast manoeuvring to follow.

Pros: Medium to good coverage for Lead.
Cons: Not easy to maintain for wingmen.



TACTICAL TURNS

When flying spread formation (line abreast) manoeuvring needs to be standardized and prebriefed. Flight members need to know the type of turn, the parameters at which the turns will be made and the method these turns are initiated. As such we have tactical turns contracts as part of SOP:

In case of no contract briefing by lead, use SOP contracts:

Under 10.000ft: all turns level made at BUSTER power – 400kts.

Above FL100: all turns level at BUSTER power to maintain 0.8 Mach

In both cases, you pull G to maintain the contract speed

Turns are initiated on radio by lead, and must be acknowledged by wingman. Radio silent manoeuvring must be prebriefed – especially the cue for the turn to start.

Tactical turn's types are:

- HOOK turns / CROSS turns
- Delayed 90° Left or Right
- Delayed 45° Left or Right

ALL TACTICAL TURNS ON CONTRACT SPEED !

Note :

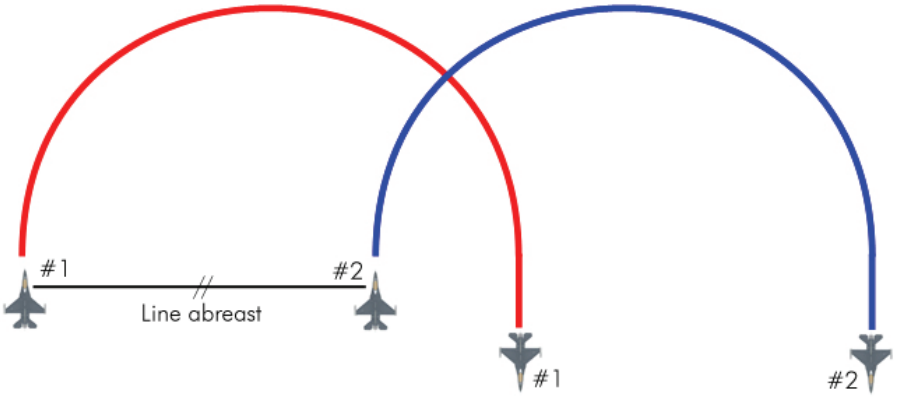
It is extremely important that wingmen maintain good initial SPREAD formation on leads. Any formation error before the turn will result in a biggest error after the turn most of the time. An inexperienced wingman SPREAD aft of leads before a cross turn into a CAP will end up in SPREAD forward after the turn!!!

Wingmen should strive to get back to a perfect SPREAD formation outside of the turns. DO NOT OVERCORRECT during the turns by varying your speed. STAY on contract and alter formation in time (when turn is initiated) or on straight legs

(v)Pilots should be aware of their final heading before initiating the turn.

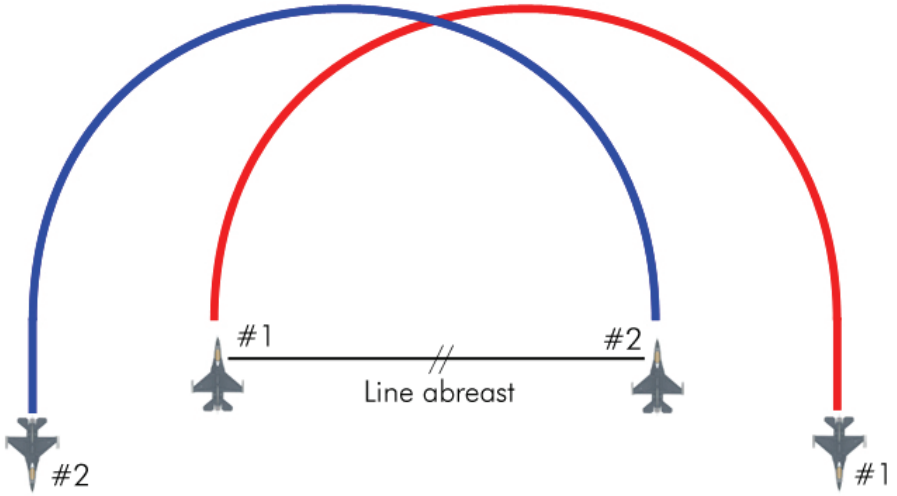
TACTICAL TURNS: HOOK

HOOK turns are 180° synchronized level turns on contract speed. Depending on initial formation, the turn may be done away of into the wingman. In any way, wingman stays responsible for deconfliction and visual lookout unless he calls blind. After the turn the SPREAD is inversed in side

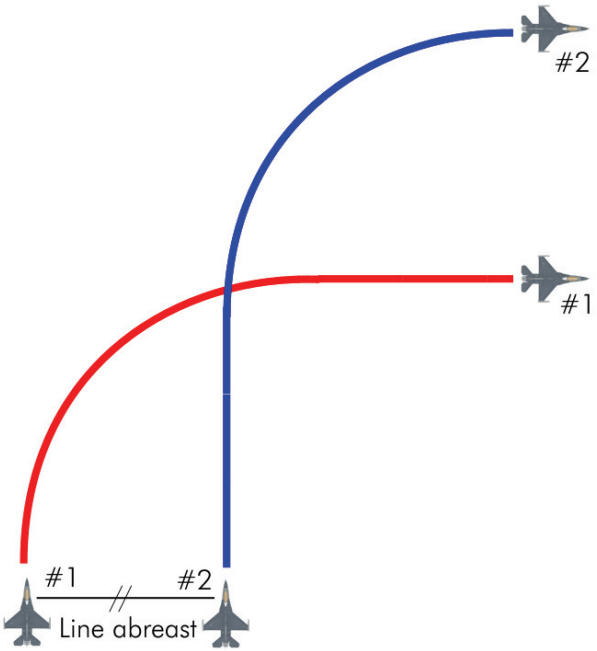


TACTICAL TURNS: CROSS TURN

CROSS turns are 180° level turns on contract speed one into the other. Wingmen remain responsible for deconfliction and visual lookout throughout the turn. Cross may be close! Ideal to check each aircraft 6 o'clock

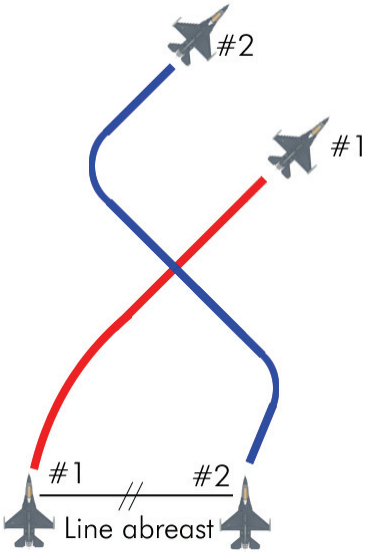


TACTICAL TURNS: DELAYED 90°



DELAYED 90° can be made into or away from the wingman, who is responsible for deconfliction.
Into the wingman, leads initiate the turn, but away from the wingman, must be initiated by the wingman by turning into his lead. Turns are 90° level on contract speed.
After the turn, the wingman is on the opposite side of the SPREAD formation.

TACTICAL TURNS: DELAYED 45°



DELAYED 45° can be made into or away from the wingman, who is always responsible for deconfliction.
As for 90° delayed, the initial turn depends on the direction of the turn. (into or away from the wingman.)

Turns can be delayed until the other aircraft crosses the trajectory or can be made with a 30° cross turn followed by a S turn to get back in formation. The S turn can be vertical of powered. The cross turn is illustrated here.

The SPREAD is inversed after the turn.

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USE FOR NOTES