CHAPTER FOUR
Extended Trail and Tail Chase

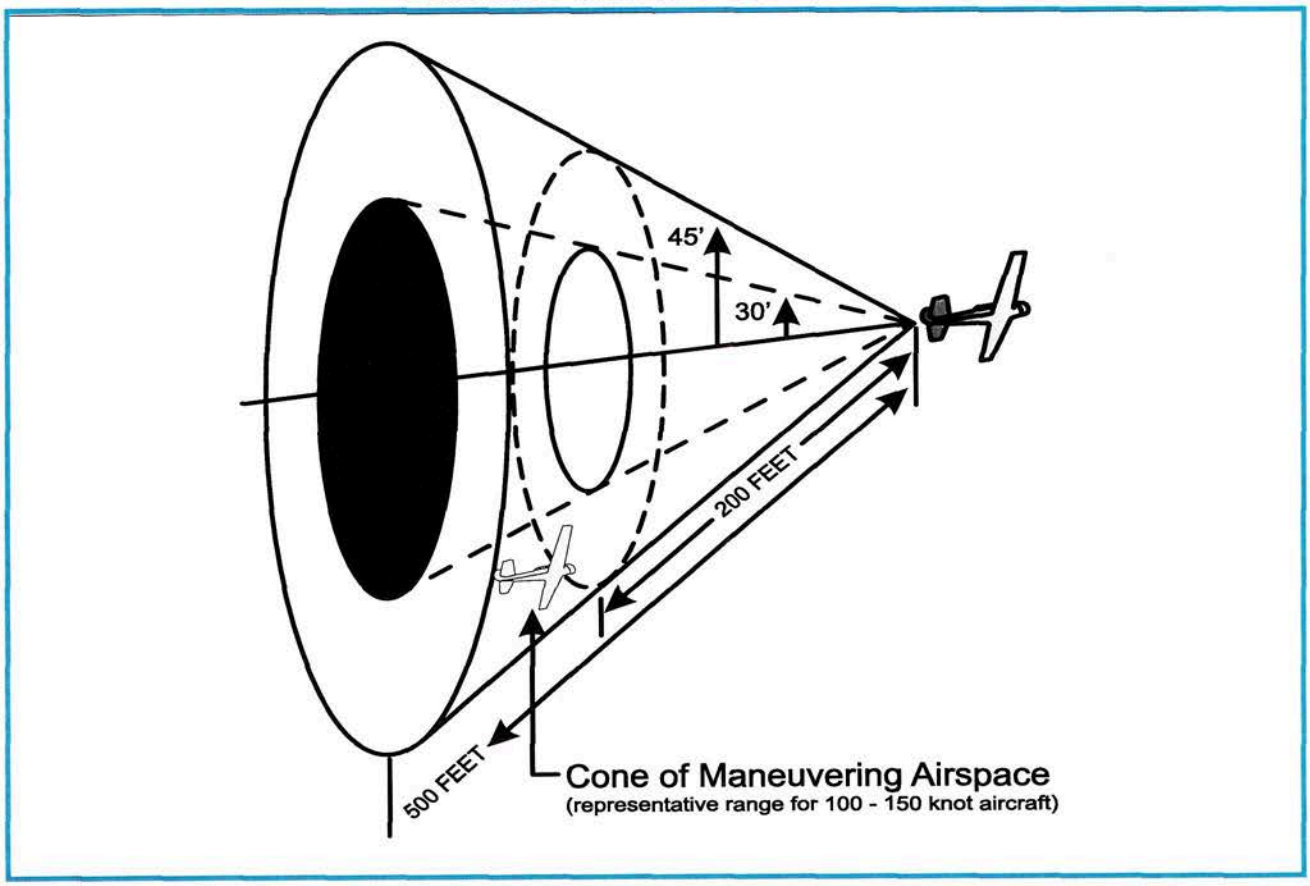

Figure 4.1 Two Ship Extended Trail

4.1 Fluid Trail Formations

Unlike parade or "close" formation that comprises the majority of this guide, this chapter deals with "fluid" formation positions and exercises for the wingman. In fluid maneuvering, the wingman is not required or expected to maintain a stationary or "welded wing" position on lead at all times, but attempts to maintain a relative position within the parameters briefed by the Flight Leader. In the warbird community Extended Trail and Tail Chase are terms often used interchangeably and considered the same event; however, they are not, and we have tried to provide the historical definitions and protocols of Extended Trail and Tail Chase here.

In the early 1990's, the "Darton" T-28 formation instructional videos used for FAST training providing an example of a two ship exercise in teaching closure control called "Extended Trail". This exercise has a long history of utilization by the by the USAF under the same title during primary formation training (and in a modified form and title by the US Navy), and strives to teach wingmen relative position and closure control through application of pursuit curves (lead, lag and pure pursuit) within a three dimensional "cone of maneuvering airspace" aft of lead (see fig. 4.1). While taught in the USAF and displayed in the Darton T-28 Video as a two ship exercise, with the application of lessons and procedures contained in this chapter, extended trail may be safely flown in three and four ship. However, the inherent risks (lost sight, mid-air collision, loss of control) increase during multi-ship extended trail with the introduction of aerobatics maneuvers such as barrel rolls, loops and the half cuban eight. Such maneuvers are not required for a basic FAST wingman or flight lead qualification.

A somewhat similar multi-ship trail formation is popularly described as "Tail Chase". While still somewhat of a fluid position for the wingmen, Tail Chase is best described as two or more aircraft striving to maintain a pre-briefed nose to tail interval during fluid maneuvering using power, pursuit curves and other thrust/drag devices available to the pilot based on aircraft type. The objective of tail chase (or any trail formation) is to maintain briefed nose to tail interval between aircraft.

Many of the safety parameters, procedures, warnings and cautions presented in this chapter apply to both extended trail and tail chase formations. In recent years the warbird community has experienced fatal mishaps while aggressively maneuvering during tail chase. This chapter will assist both

flight leaders and wingmen in avoiding such outcomes.

> WARNING
> Recent warbird accidents, involving "Tail Chasing" involving up to four aircraft, provides a stark example of the hazards of fluid maneuvering exercises when basic limitations involving altitude, airspeed and G load are not well understood or respected. Procedural guidelines and suggested limitations in chapter 4 are generally applicable to both Extended Trail and Tail Chasing and should be well understood by all wingmen and flight leaders.

4.2 Concepts and Terminology

From chapter three, you should familiar with the following concepts and terms:

- Aspect Angle (AA)
- Heading Crossing Angle (HCA)
- 3/9 Line
- Pure/Lag/Lead Pursuit
- Line Of Site (LOS)
- LOS Rate
- Turn Circle (Tc)
- Closure (Vc)
- Plane Of Motion (POM)

In addition to these, we will now add a few more that will be needed flying the exercises presented here.

4.2.1 Turning Room

The airspace between the wingman and leader that can be used to turn and maneuver. See Out Of Plane Maneuvering for additional information.

4.2.2 Out Of Plane Maneuvering (OOP)

Maneuvering out of the lead's Plane Of Motion (POM). When there is insufficient turning room between the wingman and lead's aircraft for in-plane turns, the wingman may choose to maneuver out of plane. Out of plane maneuvers often result in a longer flight path to the desired position, thus controlling closure. See High and Low Yo Yo's.

4.2.3 Lift Vector (LV)

A line perpendicular to the longitudinal and lateral axes, extending vertically through the top of the aircraft (90 degrees to the wings). The lift vector may approximate the POM of the aircraft with sufficiently applied load factor (G), see figure 4.1.

4.2.4 Hard Deck

An imaginary terrain floor or minimum altitude for maneuvering. The hard deck altitude, in MSL, should be presented in the mission briefing. The hard deck is determined by the highest derived altitude above terrain and/or obstacles in the working, and the minimum altitude needed for recovery from an unusual attitude and/or bailout/ejection requirements. Any pilot detecting a flight member has or will penetrate the hard deck while maneuvering should call KIO.

4.2.5 Corner Velocity

The minimum speed at which an aircraft can obtain maximum allowable G. Corner velocity provides minimum turn radius and maximum turn rate, and is differant for each aircraft model/type.

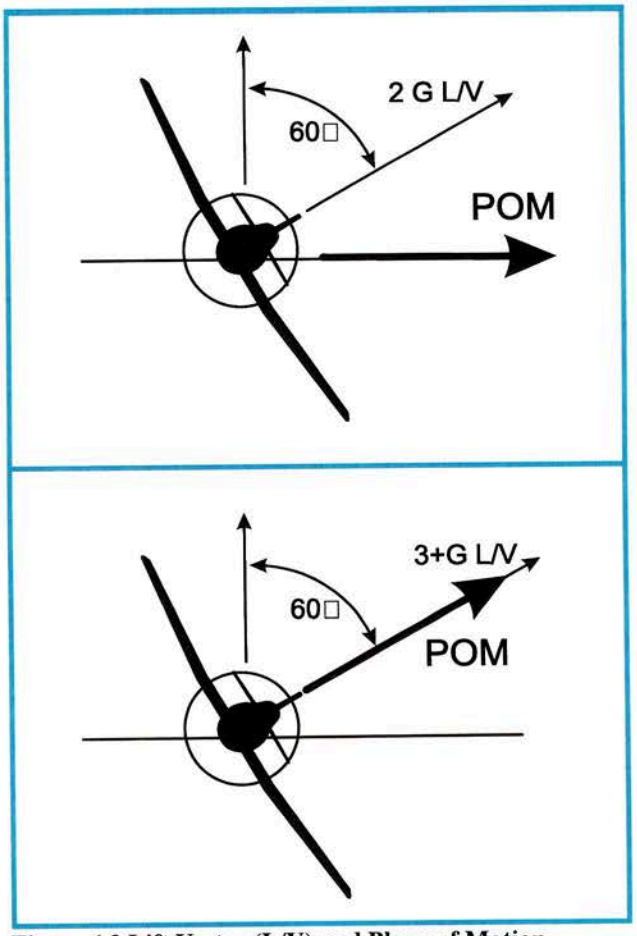

Figure 4.2 Lift Vector (L/V) and Plane of Motion

4.2.6 Perch

Often used to set up an FME exercise, the perch is a position left or right of lead, generally at a 30 or 45 degree aspect with range and vertical displacement as briefed by lead for that particular exercise. (see Offset Trail Exercise, chapter 3)

4.2.7 High Yo Yo

An out of plane maneuver to control excessive closure and/or aspect, using a combination of power, G and lag pursuit. The High Yo Yo is so named because the maneuver is execute above lead's POM. See section 4.5.1

4.2.8 Low Yo Yo
An out of plane maneuver to reduce excessive range and/or increase aspect, using a combination of power, G and lead pursuit. The Low Yo Yo is so named because the maneuver is generally executed below lead's POM. See section 4.5.2.

4.2.9 QuarterPlane
An out of plane maneuver to prevent a 3/9 line or flight path overshoot at close ranges and high line of sight (LOS) rates. A quarterplane is similar to a high yo-yo, but more aggressive. See section 4.5.3.

4.2.10 Energy (E)
Energy is the potential to maneuver, which equates to the capability to climb, increase turn rate and decrease turn radius. It is the sum total of an aircraft's potential and kinetic energy. Potential energy is derived from altitude, while kinetic energy is a function of velocity. The importance of E in flying either the Lead or Wing position during FM is the awareness of the energy state of your aircraft, and how, and when, to transfer potential for kinetic and visa versa. Flying too fast will cause excessive closure resulting in reliance on out of plane maneuvering and/or a flight path overshoot. Additionally, flying low and with inadequate speed may leave you incapable of maneuvering in FM and result in a termination call to regain position, energy or both.

4.2.11 Asymmetrical or Rolling G
The G limitations for most aircraft are specified in the Pilot Operating Handbook or Manual, at least for the symmetrical case, that is, where both wings are producing an equal amount of lift (straight pull in the vertical for example). Rolling motion is normally imparted by increasing the lift on one wing relative to the other. This asymmetrical lift results in an asymmetrical G loading which is termed 'rolling G'. The effect of rolling G is cumulative with the normal G forces and if rapid rolling motion is imparted during a maneuver already involving a high load factor, then aircraft structural limitations could be exceeded. Caution needs to be exercised in rolling maneuvers because the accelerometer does not indicate rolling G. If a rolling G limitation is not given, a good rule of thumb is to use 2/3 of the symmetrical G limitation as the limit for rolling maneuvers.

4.2.12 Padlock
The term "padlock" is used when one pilot has visual on another aircraft with the intent of not looking away/losing sight. During extended trail, there is an increased hazard of a mid air collision if visual is lost between maneuvering aircraft. To avoid such hazards, the wingman during two ship extended trail should padlock on the maneuvering leader.

4.3 Tail Chase Described
Tail Chase is a common warbird term for two or more aircraft flying line astern using an interval briefed by the flight leader. Each aircraft maintains their relative distance from the aircraft in front using power and minor lead and lag based on the level of maneuvering.

4.4 Extended Trail Described
Unlike line astern Tail Chasing, Extended Trail comprises a cone shaped envelope of maneuvering airspace that can be utilized by the wingman using lead, lag and pure pursuit. See figure 4.1.

4.4.1 The Cone Range and Aspect Exercise:
Accurately estimating range and aspect is fundamental to safely flying extended trail formation. This is a simple and quick exercise that may be performed with new formation pilots in preparation for extended trail and Rejoin training. Because FAST represents a multitude of aircraft types, the purpose of this exercise is to provide an initial picture for accurate range and aspect angle assessment, and to standardize pilot visual references used to estimate range between any two aircraft(see table 4.1). Figure 4.3 provides a graphical depiction of the exercise.

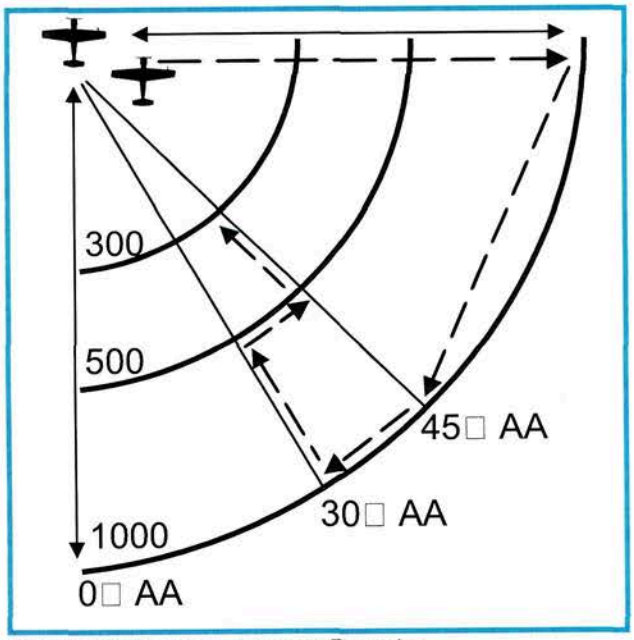

Figure 4.3 Range and Aspect Exercise

INSTRUCTORS' NOTE
Instructor's may find this exercise runs more efficiently if they initially fly and demonstrate all range and aspect points to the student, as well as handle all communications required to coordinate the effort. Allowing the student to remain focused on visual references for range and aspect.

4.4.1.1 Set Up and Execution
Number 1 prepares the formation for the exercise with a preparatory radio call, "Raven 2, standby range/aspect exercise.". Number 2 will acknowledge with full call sign.

Number 1 then gives a command of execution, "Raven 2 cleared to maneuver". Lead should provide the wingman with a power/airspeed advantage to facilitate maneuvering.

The range and aspect set may be conducted on either the left or right side of Number 1. After acknowledging lead's clearance to maneuver, number 2 moves out to 200 feet line abreast position and momentarily stabilizes. Number 2 calls "Raven 2, 300 feet, 90 aspect" on interplane frequency, and pauses momentarily before continuing out to 500 and 1000 feet line abreast, repeating the call.

Number 2 will then maintain this spacing and move aft, stabilizing momentarily at 45 degrees aspect angle (AA). Number 2 should then continue to 30 degrees AA. Once stabilized at 1000 feet number 2 will close to 500 feet while maintaining 30 degrees aspect. Next, number 2 will maneuver to 45 AA at 500 feet and move to 300 feet, stabilize in position, and request terminate. The flight leader may be called upon to validate estimated range as desired via radio call.

INSTRUCTORS' NOTE

Judging pure pursuit range is a critical skill for pilots participating in mass formations. Instructor's may find this exercise useful in teaching proper in-trail ranging at typical intervals (100, 200, 500 ft.). Use of canopy marks to judge relative aircraft size may be helpful in this process (see table 4.1).

If the student can accurately estimate the approximate range and aspect between aircraft, the desired learning objectives have been met. The Flight Lead will then direct a rejoin or proceed with the next FME exercise or profile event.

Range:	Size:	Visual References:
300 Feet	2.1 Inches	Detail visible (canopy details, pilots).Tail star easily recognizable.
500 Feet	1.2 Inches	Canopy detail discernible. Star visible, but not clear.
1000 feet	.06 Inches (20 Inches From Eye)	Aircraft detail lost, tail star not discernable.

Table 4.1 Ranging For Typical 30X30' RPA Aircraft

4.4.2 Extended Trail

The objective of this fluid maneuvering exercise is to develop the skills to recognize and solve range, closure, aspect, angle off and turning room problems in *all dimensions* to regain and/or maintain a position of mutual support. More advanced Extended Trail involves out of plane maneuvering; thus, students should first demonstrate their mastery of in-plane closure control before moving on to more aggressive maneuvering (see level two extended trail).

Both aircraft will initially use a fixed power setting and this will generally remain constant throughout the exercise. This forces the wingman to use the concepts of lead, lag and pure pursuit to maintain the extended trail parameters.

However, during out of plane maneuvering or anytime safety demands, power, may be used as required. The wingman has principal responsibility for collision avoidance while conducting extended trail.

4.4.2.1 Extended Trail Parameters

This exercise is comprised of a cone, aft of lead's extended six o'clock position. For both props and jets, the cone limits are bounded by 30° aspect on the inside and 45° on the outside. The suggested in-trail distances for most propeller aircraft with maneuvering speeds between 100-150 knots is recommended no less than 200, feet, but may adjusted as needed for safety. For turbine powered or faster propeller aircraft (maneuvering speeds above 150 knots), use no less than 500 feet or more. The minimum distances are provided for reaction time and safety of flight. Brief a maximum, visually identifiable, distance to set the cone parameters. The wingman is expected to utilize all maneuvering airspace as needed during maneuvering.

In all cases, the inner range limit should be considered as a bubble from the lead aircraft in all dimensions. ***This bubble is a safety-of-flight limit.*** If a wingman penetrates the minimum range bubble, a KIO call is required.

WARNING

Because of its dynamic nature, flying Extended Trail requires uncompromising flight discipline. Any pilot in either aircraft will call "knock it off" if safety is ever in question.

4.4.2.2 Momentary Blind In Extended Trail

Unlike parade formation, when range or closure does not pose an immediate collision hazard, momentarily losing sight of Lead during maneuvering may not require an immediate blind call or break out - if Lead reappears immediately as predicted. However, even if range is not an issue, if the other aircraft does not reappear where anticipated, the pilot flying the aircraft that loses sight will call "blind" and the altitude. The visual aircraft will assume formation deconfliction and execute the following:

- If the lead aircraft is blind, transmit "Raven 1 is blind, X,XXX feet" and maintain a predictable flight path. The wingman will either call "continue" and state his or her position relative to Lead, or call "knock-it-off", indicating both aircraft are blind and establish a minimum of 500 feet of altitude separation.

- If the wingman is blind, he/she will transmit "Raven 2 is blind, X,XXX feet" and maneuver away from

lead's last known position. If Lead is visual, he/she will respond with "continue" and provide his/her clock position relative to the wingman, or call "KIO" and execute deconfliction procedures to insure at least 500 feet minimum altitude separation.

4.4.2.3 Extended Trail Entry and set up

Enter Extended Trail from fingertip, route or close trail; direct the entry using a radio call.

"Raven 2, go extended trail"

The Wingman will acknowledge with full call sign and position number. There is no visual signal for extended trail. Lead will then turn away from the flight using up to 60 degrees of bank. The wingman will maintain straight and level just long enough to achieve the desired interval, then turn to maneuver into position on Lead with the designated parameters for his/her aircraft. The turn away by Lead to set range and aspect need not be level—if beginning the exercise below desired maneuvering airspeed, you can use a slightly oblique, descending turn to gain speed.

Based on the level of maneuver, if the wingman finds the initial delay has caused excessive range, he/she should enter the exercise with a low yo yo as required (see section 4.4).

Both aircraft will set the briefed power and maintain it throughout the exercise except as required for safety. Wait for the Wingman to call in position before initiating maneuvering.

4.4.2.4 Flight Lead Maneuver Guidelines

The following guidelines should be considered when leading Extended Trail [ET] or Trail Chase [TC] exercises as applicable;

- [ET/TC] At all times, you are providing a safe platform for the wingman to fly off—it is incumbent upon you to maneuver commensurate with your wingman's experience and ability. To prevent exceeding the wingman's capabilities, pre-brief maneuvers and monitor his/her progress in flight as able.

- [ET/TC] During training, use predictable roll rates while presenting reasonable problems to solve in range, aspect and heading crossing angle. Do not execute unpredictable roll reversals that may force the wingman in to a 3-9 line overshoot.

- [ET] To aid the wingman in maneuvering, limit straight and level flight while leading extended trail. Vary the attitudes and airspeeds using climbing and descending turns and modified lazy eight/wing-over maneuvers as applicable to the desired training objective.

- [ET/TC] Be constantly aware of your energy state (altitude, airspeed and G), for the wingman is often exceeding one or more of these parameters to regain or maintain position. If you are pulling 3 Gs, your wingman may likely be pulling 4 or more to stay in position.

- [ET/TC] Brief and remain aware of the hard deck (minimum maneuvering altitude) at all times; again, the wingman may be lower than your altitude during maneuvering.

- [ET] You MUST monitor your wingmans' performance. Look over your shoulder to assess where the wingman is positioned. If range or aspect is approaching the limits without apparent correction, back off the aggressiveness of the maneuvering.

Level	Maneuvers	Bank	G Loading	Restriction
I	Turns, Lazy Eights:	Up to 90°	As briefed	2 - 4 ship
II	Wingovers, Barrell rolls	unrestricted	POH Limitation	2 - 4 ship
III	Loop, Half Cuban 8, Cloverleaf	unrestricted	POH Limitation	2 ship only

Table 4.2 Extended Trail Maneuvering Levels

- [ET/TC] Don't rely on wingman to call out of position; they may not recognize when limits are exceeded or be unwilling to call it because of misplaced pride. If you observe your wingman is out of position and not correcting, reduce the complexity of maneuvering to allow for him/her to correct position or call for a rejoin as applicable.

- [ET/TC] Aerobatics maneuvering in trail formations are not required for a FAST qualification. Review table 4.2 and only brief maneuvers your flight members are trained and prepared for.

WARNING

Be cognizant of the hard deck in Extended Trail or Tail Chase. Your wingman may have very little hard deck awareness as he/she focuses on your aircraft. Call KIO if you perceive either aircraft is or will be below the hard deck.

Image 4.1 Leading Two Ship Extended Trail

> WARNING
> Flying level three extended trail in more than two ship during selected maneuvers such as the loop and cuban eight, may reverse the direction and energy of the flight back in to the wingmen, resulting in a mid air collision and loss of life.

4.4.2.5 Wingman Maneuver Guidelines

When Lead makes the directive call to go to Extended Trail, acknowledge with your full call sign: "Raven 2." Lead will begin a turn away to allow you to maneuver in to position. Delay for an appropriate interval and then turn to establish your aircraft within the range and aspect parameters required of your aircraft (radial/turbine). When in position with power set, notify Lead with the radio call: "Raven 2's in."

As Lead maneuvers, you will be constantly adjusting your nose position and lift vector orientation to modify your turn circle and plane-of-motion relative to Lead. Recall from chapter three the basic inter-relationship between pursuit curves, range, and aspect angle.

The following guidelines should be followed during Extended Trail [ET] and/or Tail Chase [TC] exercises as applicable:

- [ET] During Extended Trail, when lead is not maneuvering, or maneuvering in plane, favor the 7-8 or 4-5 o'clock positions with some step down for low wing bubble-canopy aircraft. This allows the flight leader to remain visual with you and prepares you for further maneuvering.

- [ET] The Lead's six o'clock position - inside 30 degrees aspect - is a transition area only. Lead can not see you in this position; always strive to remain at 30-45 AA. Fly in a donut around Lead's six o'clock position as depicted in figure 4.1.

- [ET] Similar to above, during maneuvering, try to position yourself so you can always see Lead's head/helmet through the side of his/her canopy. This reference will help place you in the 30° to 45° aspect parameters. This oblique view of Lead will also make it easier to judge closure. If you are directly astern, you will not be able to see lead's helmet.

- [ET] Avoid the high and low six o'clock position as able. If you must cross the upper (Lead's six- o'clock high) portion of the cone, do so expeditiously because you and the instructor may momentarily lose sight of Lead.

- [ET/TC] Always cross above or below Lead's prop/jet wash and relax back pressure if encountering wash to prevent an over-G. Based on the level of maneuvering, use caution during ET/TC so as to not exceed your aircraft's normal or asymmetrical G limits.

- [ET] Since you are not directly in trail with Lead's turn circle/flight path, as long as Lead is turning you will not be able to maintain a fixed position within the extended trail parameters. Do not attempt to stabilize at minimum range, but explore the entire envelope.

- [ET/TC] Be cognizant of the briefed hard deck (minimum altitude for maneuvering). Lead is tasked with monitoring your progress and may accidentally penetrate the minimum altitude. Should you recognize this situation, call KIO immediately.

- [ET/TC] Be cognizant of your airpeed and load factor during maneuvering, you often will exceed your flight leader's flight parameters during aggressive maneuvering.

4.4.2.6 Not used

4.4.2.7 Terminating Extended Trail

The Flight Lead will rejoin the wingman to fingertip when training is complete with a wing rock or radio call.

Lead

Do not signal for a rejoin while the wingman is maneuvering significantly out of plane. Instead, establish a level turn of up to 45° bank and maintain it until you see the wingman has stabilized near in-plane. At that time, signal for the rejoin, establishing either a turning or straight ahead rejoin, and adjust power and airspeed to the briefed values. Monitor the wingman closely during the rejoin.

Wing

When you see Lead stop maneuvering and roll into a level, steady-state turn, you can anticipate that he/she is terminating the exercise and will rejoin the flight. Use lead/lag to establish a relatively stabilized energy state. When Lead signals for rejoin, use standard procedures to rejoin to fingertip.

4.5 Out Of Plane Maneuvering

Out of plane maneuvers such as the High and Low Yo-Yo may be called upon during extended trail to control aspect and/or closure. All maneuvers described here utilize the vertical to create, or reduce, turning room when in-plane techniques will not suffice. Your instructor will demo all maneuvers.

Out of plane maneuvering draws on many of the concepts presented in chapter three. To help your understanding of this material, feel free to review the relationship between aspect angle, heading crossing angle, closure and pursuit curves. Many pilots find using their hands, or aircraft models, to replicate the scenarios contained under each maneuver provided below to be helpful in understanding the concepts presented.

4.5.1 The High Yo-Yo

The high yo-yo uses the vertical to control overtake, decrease excessive aspect and/or prevent an overshoot by building vertical turning room that would otherwise not exist if maneuvering in-plane with the lead aircraft. The high yo-yo can be a minor reposition or a quarterplane.

4.5.1.1 The High Yo-Yo Scenario

In this scenario, you are inside lead's turn near the forward range limits of extended trail as he/she further increases bank angle into you. In this position, you recognize rapidly increasing aspect, while your range is decreasing and closure is increasing. Lacking adequate in-plane turning room between your aircraft and lead, you choose to employ the high yo-yo to prevent exceeding the minimum range and aspect limits. (Fig. 4.4)

- Roll wings level to position your lift vector out of lead's flight path and climb out of plane with lead. Normally, the lift vector is positioned up to 90 degrees to lead's flight path. This climb out of plane slows your forward velocity, controlling closure and provides turning room in the vertical. The degree of climb (vertical pull) is based on range and closure. Maneuvering airpseed must be maintained to use this turning room.

- This initial near-wings level climb out of plane is a lag maneuver, and aspect will decrease. However, as covered previously, lag pursuit results in an increase in heading crossing angle as your heading now diverges from Lead's. If your lift vector was positioned more than 90 degrees to lead's flight path, toward lag pursuit, the resulting rapidly increasing HCA must be corrected by the wingman or excessive range will develop.

- Roll in the direction of lead to maintain visual while positioning your lift vector back in the direction of lead's turn. In this step you are attempting to align fuselages and reduce your heading crossing angle that developed from the initial climb out of plane. Pull toward lead pursuit based on range and closure. During this entire maneuver, keep the lead in site.

- Analyze the effectiveness of the maneuver. If you detect closure is still not resolved, a second high

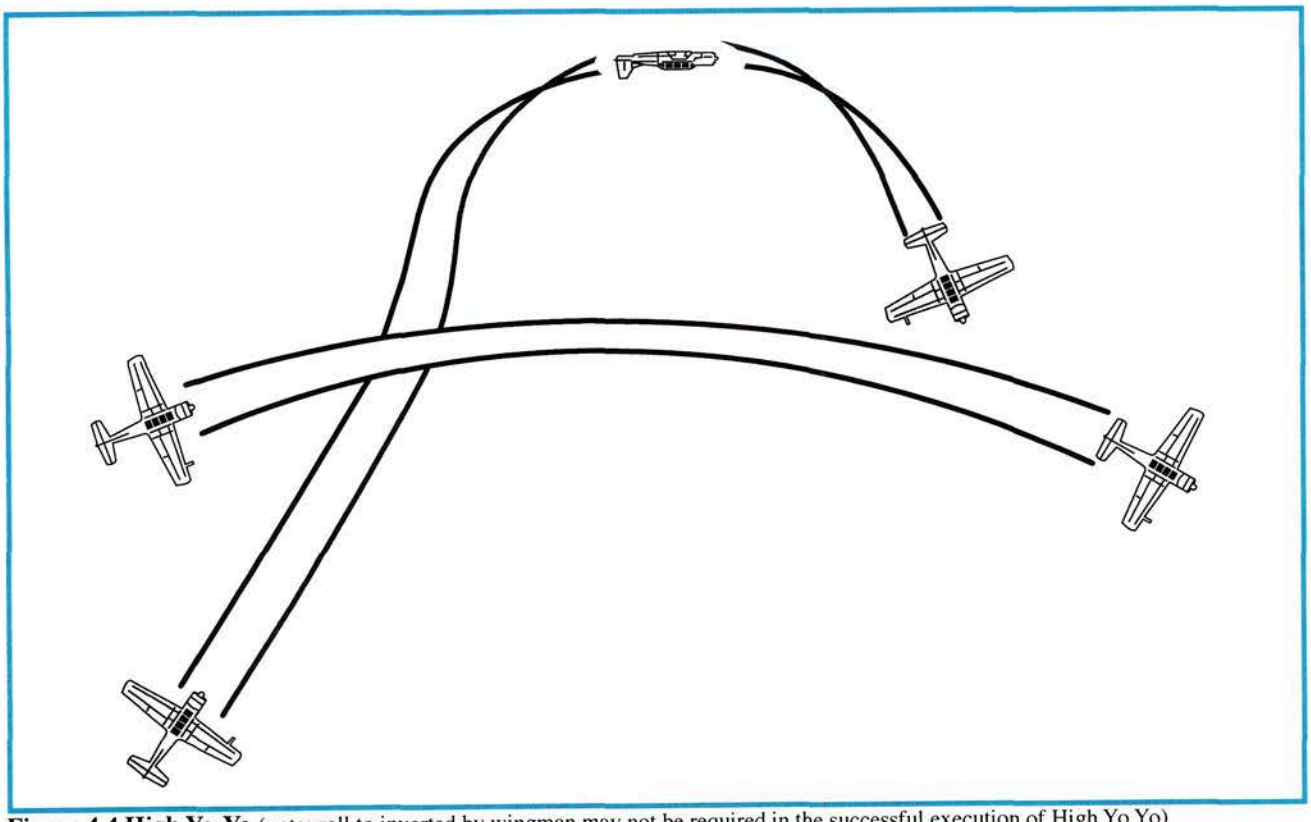

Figure 4.4 High Yo-Yo (note: roll to inverted by wingman may not be required in the successful execution of High Yo Yo)

yo-yo may be called for. If the range to lead has grown excessive as a result of the maneuver, a low yo-yo may be called for. If closure and aspect were adequately solved by the high yo-yo, reposition your lift vector in lead pursuit as required.

4.5.1.2 High Yo Yo Common Errors:

- Late or no recognition of the need for the high yo-yo. This may lead to excessive aspect, closure and an overshoot situation.
- Allowing angle off (HCA) to become excessive. This results from pulling too far in the vertical (as a function of time) or relaxing G during the roll to align fuselages with lead. These errors generally result in excessive range developing between the wingman and leader.
- Poor airspeed awareness. This can result in low airspeed developing in the maneuver, preventing the wingman from aligning his/her fuselage or pulling lead pursuit. During out of plane maneuvering, a power increase/decrease may be called for to insure safe maneuvering airpeeds are maintained.

4.5.2 The Low Yo-Yo

This maneuver is designed to reduce excessive range or negative closure using vertical turning room, below lead's plane of motion. See figure 4.5.

4.5.2.1 The Low Yo-Yo Scenario

In this scenario, your range to lead is approaching the aft limit for extended trail as you find yourself outside lead's turn circle in a lag position. You must rapidly resolve this range and closure problem to prevent exceeding the extended trail range limits.

- Over bank and set your lift vector in lead pursuit, below lead's plane of motion. This maneuver utilizes turning room below lead's aircraft and preserves/increases forward velocity. In effect, you are cutting across lead's turn circle. How much lead you pull depends on range, closure and the lead's LOS rate.
- As you pull to lead pursuit, analyze lead's movement in your canopy. If the lead aircraft is tracking forward (forward LOS), you probably have to pull more lead. However, if you recognize closure and /or aspect is increasing excessively, reduce your lead pursuit, move to lag pursuit or execute a hi yo-yo as required. The picture in the low yo-yo is similar to a rejoin.
- When the desired range and closure is achieved, terminate the low yo-yo as required.

4.5.2.2 Common Errors

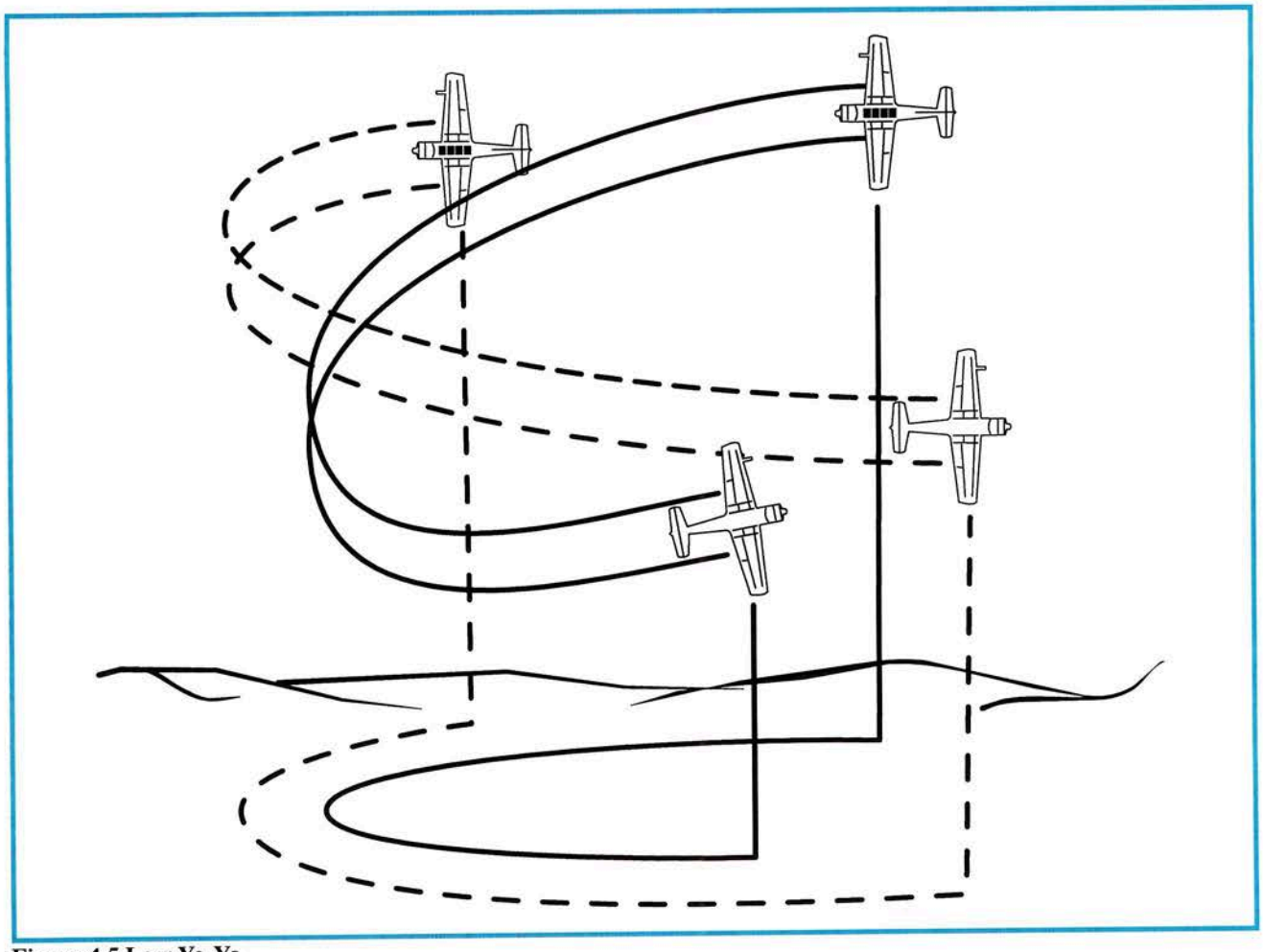

Figure 4.5 Low Yo-Yo

- Placing the lift vector too low/excessive dive. This can cause excessive airspeed with a resultant large turn circle and/or excessive energy bleed off when pulling your nose up.

- Not establishing sufficient lead pursuit. Failure to pull lead will result in less than desired closure rates.

4.5.3 Quarter Plane

This maneuver is generally a last ditch maneuver to preserve the 3/9 line from a possible overshoot. A quarterplane is similar to a high yo-yo, but more aggressive, see figure 4.6.

4.5.3.1 The Quarter Plane Scenario

In this scenario, you find yourself on the inside of lead's turn with minimal range, excessive aspect and significant aft LOS rate. Taking no action, your aircraft will exceed the 45 degree extended trail aspect limit and quite possibly experience a 3/9 line overshoot and KIO situation.

- Roll out of plane and pull to lead's high six o'clock. The roll and pull out of plane may be more than 90 degrees from lead's plane, but the amount is dependant on range, closure and aspect. This pull to the lead's high six rapidly reduces closure and aspect, preventing a 3/9 overshoot.

- Unload to near 1 G and roll in the direction of lead's turn and regain/maintain visual while analyzing lead's LOS rate on your canopy. If this LOS rate is aft, the closure problem is probably not solved and a second quarterplane or hi yo-yo may be needed.

- If closure is under control, orientate your lift vector to align fuselages as required. Often with the quarterplane, a low yo-yo is required to correct the increasing range.

4.5.3.2 Common Errors:

- Executed too late or not at all. Failure to quarter plane when needed may result in a 3/9 overshoot.

- Not pulling aggressively to lead's high six. Again, an overshoot may occur.

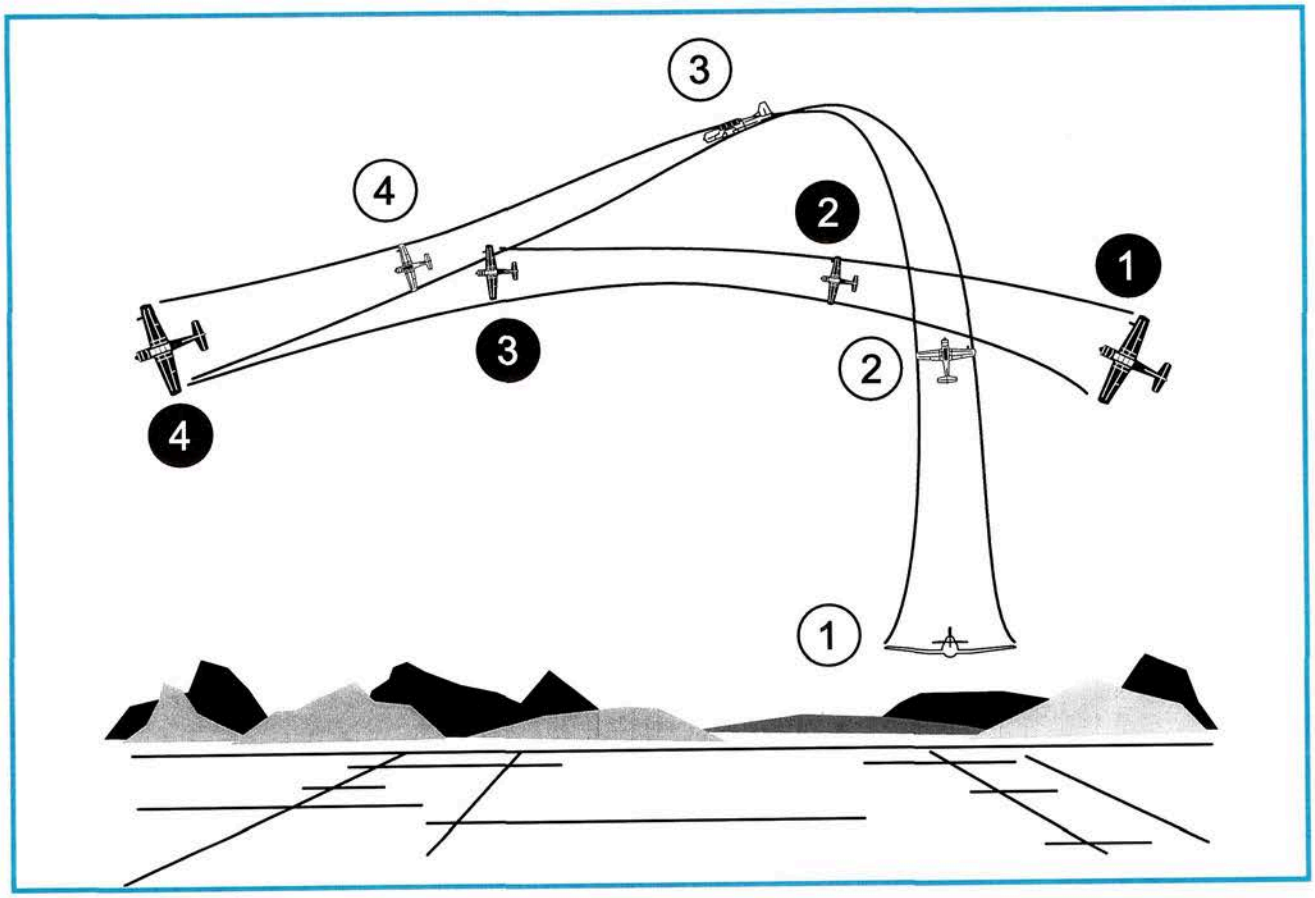

Figure 4.6 Quarterplane

- Late to asses the situation after executing. Excessive delay to recommit after the lag maneuver. may cause enough angle off (HCA) and range from lead to exceed extended trail parameters.

4.6 Summary

Extended Trail is an exercise designed to help produce a safe formation pilot that can recognize, react, and control, varying situations of range, closure and aspect on a constantly maneuvering aircraft. Tail Chase is a maneuver formation challenging the wingman to precisely maintain a line astern interval with his/her leader. Both maneuvering skills are crucial to a safe formation pilot.