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21 JAN 80

70TH TACTICAL FIGHTER SQUADRON



LOW LEVEL TRAINING

7 JAN 80

70TFS

Low Level Training

INTRODUCTION:

We have prepared this document to help you fly tactical low levels (TLL) safely and realistically. It provides a common understanding for all aircrews flying tactical low levels with the 70TFS.

Procedures and techniques outlined in this guide, if properly practiced and employed, will help you to get to the target and return to fight another day. Tactical considerations such as weather, terrain type, friendly air support, etc., are not addressed in this document but should, of course, be primary considerations in your attack planning.

Due to the difficulty of navigating at altitudes below 300' AGL, we can expect to navigate at or above 300' AGL, and descend to the 100'-300' AGL block only as required to defeat surface and air threats. Procedures in this document pertain to flying low levels single ship down to 100' AGL. Formations will use these procedures for low levels down to 300'; procedures for formation flying in the 100'-300' block will be published as an appendix at a later date.

Ideas and suggestions concerning this 70TFS Low Level Training Guide should be brought to the attention of 70TFS/D Flt at ext 3775.


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SECTION I

DEFINITIONS

SECTION I

DEFINITIONS

- a. Low Level - flight at 500' and below.
- b. Comm Out Turn - an optimum turn using mil power and 12-14 units. G loading will depend on airspeed. Example - 540 KCAS/12 units/7.0G
 - 480 KCAS/12 units/5.75G
 - 420 KCAS/12 units/4.0G
- c. Hard Turn - 5 to 6 G turn above corner velocity; 18 to 20 units AOA below corner - provides a reasonable turn with consideration for aircraft energy.
- d. Break Turn - Pull to limit G, drag power and use speed brakes above corner (max power and retract brakes approaching corner); max power and max obtainable AOA (25 units or less) within G limits below corner - provides min turn radius and max turn rate without consideration for energy conservation.
- e. Rocks - the terrain.
- f. Directive Commentary - inter-flight communication requiring immediate response; i.e., "Rex 2 BREAK RIGHT" or "DALLAS 1 PUSH IT UP".
- g. Descriptive Commentary - inter-flight communication identifying the reason for directive commentary; i.e., "Rex 2 BREAK RIGHT/SA-7 RIGHT 5 O'CLOCK".
- h. Visual - Lead/wingmen in sight.
- i. Tally - Bogey/bandit in sight.

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SECTION II
CREW RESPONSIBILITIES
(LINE ABREAST)

SECTION II

CREW RESPONSIBILITIES (LINE ABREAST)

1. #1 AC

- a. Avoid the rocks.
- b. Visual Lookout for hazards from 10:00 to 2:00. Hazards are rocks, trees, towers, birds, light airplanes, guns, SAMS and MIGS (Note the number of peacetime hazards).
- c. Navigation - You are responsible for navigation. Extensive route/target study is required.
- d. Crew Coordination - Keep your pitter comfortable and informed so he can do his job (See intercockpit comm). Advise WSO whenever you come in to the cockpit or whenever visual is gained or lost during a turn.
- e. React to directive commentary.
- f. Maintain situational awareness - Keep "mentally aware" of element member's position.
- g. Pass visual to WSO when required (during turns).
- h. Don't exceed comfort level of anyone in flight.
- i. Do not become distracted from your primary task of avoiding the rocks.

2. #1 WSO

- a. Visual Lookout for threat. To inside of formation - from 3:00 to as far back as you can see. (5-7m line--abreast, pitter should be able to check back - 14m).
- b. Talk - Use the UHF for all directive commentary concerning threats, even if you are only talking to your AC. Keep cockpit comm to a min - don't comm jam yourself.
- c. Back up navigation - Extensive route/target study is required.
- d. RHAW - Monitor RHAW audio for threats.
- e. ECM - Ensure ECM ⁰pad is set up for optimum use.
- f. ALE 40 - Ensure optimum set up.

- g. MAINTAIN SITUATION AWARENESS.
 - h. DON'T EXCEED YOUR COMFORT LEVEL.
 - i. KEEP YOUR AIRCRAFT IN FORMATION - Comply with basic contract and ROE.
 - j. Advise AC when performing in-cockpit duties.
 - k. Pass visual to AC when required. And advise if visual is lost or gained.
 - l. Do not let your AC become distracted from his primary task of avoiding the rocks.
3. #2 AC - SAME AS #1 AC EXCEPT: NAVIGATION - You have back up nav responsibility. Extensive route and target study is required. Be ready to take over nav duties, if required.
4. #2 WSO - SAME AS #1 WSO EXCEPT: Keep your aircraft in formation. Since you are the only one in your aircraft who should be looking at lead it is your responsibility to maintain the formation. Direct check turns to keep briefed lateral separation (5-7m). Give power calls to adjust fore and aft or adjust the throttles yourself (must be thoroughly briefed prior to flight). Either method requires extensive practice and strong crew coordination.

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SECTION III
COMM-OUT TURNS

SECTION III

COMM-OUT TURNS

1. Turning Level: The following techniques are designed to provide constant awareness of the aircraft's nose track, relative to level flight. This is done in three distinct stages.

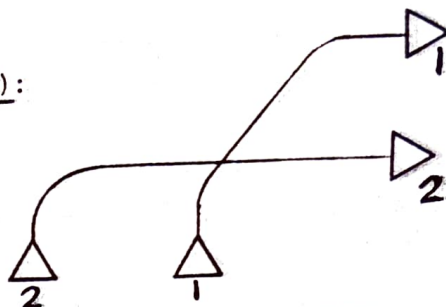
a. Roll In: When the turn is signalled or called, check for a visual reference 90 degrees to the flight path. This will preclude the distraction of checking the HSI, and the reference can be used for any delayed or in-place turn. The roll-in should be a rapid, unloaded roll to a bank angle which will allow the nose to track a straight line along the horizon. Obviously, you don't know what the bank angle will be until you are established in the turn and can identify trends in nose position.

b. Establishing the Turn: In order to monitor trends in the nose position, your eyes should be focused on the ground at the 10 or 2 o'clock position depending on the direction of turn, so that peripheral vision includes the nose of the aircraft at one extreme and a view of the terrain being turned into on the other. As the turn progresses, this eye position allows constant cross check at proximity to the ground vs any tendency the nose has to rise or fall. Corrections should be made by adjusting bank angle, use of rudders is not recommended once the turn is established since your inputs will disturb your interpretation of nose position. Once a smooth nose track is established, you can briefly afford to check the progress of the turn, position of lead, and area of look responsibility.

c. Roll Out: Just prior to roll-out make a final check of the nose position. If it's still good or slightly rising, roll unloaded to wings level. If slightly below the level reference roll out with a slight back stick pressure to break the descent. During roll-out your eyes should shift to focus attention directly over the nose. This will allow immediate corrections of any tendency to climb or descend.

2. Common Errors: The most common mistake in low altitude turning is the initial tendency to climb. This is usually caused by starting the turn lower than the comfort factor. Remember, the roll-in is critical. If a level nose track is not established rapidly, then there is no reference on which to base correction. If a climbing trend is evident from the roll-in, do not attempt to overbank down to the original altitude. If you are unable to start the turn properly, stop the climb and complete the turn at an altitude where you can be comfortable.

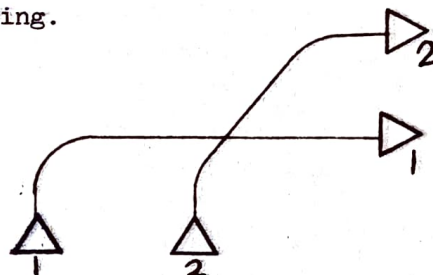
3. 90° Turn (AWAY FROM WINGMAN):



Lead turns 30° away from wingman and rolls out. #2 WSO sees turn and directs his AC "90° right/left". This informs #2 AC several things:

- Lead is on his right/left side.
- Lead is making a turn away from him.
- He needs to pick a 90° point on the horizon to turn to. As the turn progresses #2 AC picks up "VISUAL" as lead crosses his 10 - 2 O'clock position; #2 WSO calls roll out at 90° point. #1 WSO maintains visual on the wingman and when #2 crosses 6 O'clock (for 5-7m feel line abreast spacing) #1 WSO directs his AC to complete the turn. Both aircraft roll out line abreast 90° from original heading.

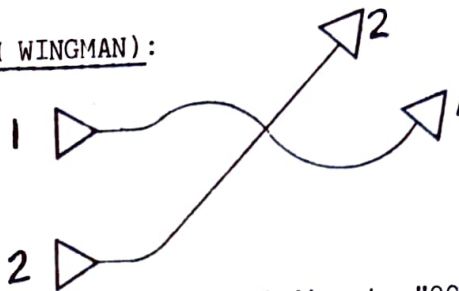
4. 90° Turn (INTO WINGMAN):



Lead starts a 90° turn into wingman. #2 WSO sees the turn and directs his AC to "30° left/right." This tells #2 AC several things:

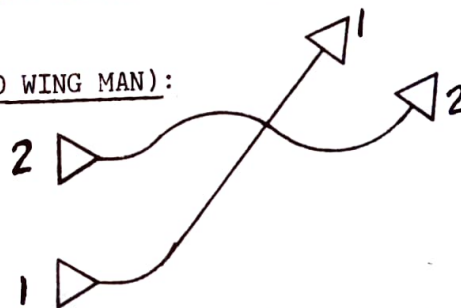
- Lead is on the right/left.
- He just made a turn into me.
- I need to pick a 90° point on the horizon that I will be turning to.
- Lead will be on my left/right at the completion of the turn.
- Lead will be passing behind us. When lead is directly at 6 O'clock (for 5-7m line abreast spacing), the #2 WSO directs: "60° left/right". When both aircraft are back line abreast, #2 WSO calls "ROLL OUT". Both aircraft will be line abreast 90° from the original heading.

5. Less than 90° Turn (AWAY FROM WINGMAN):



Lead turns 30° away from #2. #2 WSO sees turn and directs "90° right/left (This tells #2 AC the same thing as the 90° turn away from the wingman). During #2's turn, when #2 WSO sees lead roll into #2 he directs his AC "ROLL OUT". When #1 WSO sees #2 turn the desired number of degrees, he directs his AC "WEAVE LEFT/RIGHT". When #1 WSO sees approximately 60° HCA, he calls "ROLL OUT" to his AC. When #2 is at 6 o'clock (from 5-7m line abreast spacing) #1 WSO directs #1 AC to turn the required number of degrees to return to course and line abreast. When desired heading is reach #1 WSO directs #1 AC "ROLL OUT".

6. Less than 90° Turn (INTO WING MAN):



Lead turns hard into wingman to desired heading and rolls out. #2 WSO sees turn and directs #2 AC "30° left/right". (This tells #2 AC the same things as a 90° turn into him). When #2 WSO sees lead has rolled out, he directs #2 AC to "WEAVE RIGHT/LEFT". When #2 WSO sees approximately 60° HCA he directs #2 AC "ROLL OUT". When lead is at 6 o'clock (from 5-7m line abreast) #2 WSO directs #2 AC to turn the required number of degrees to return to course and line abreast. When line abreast with lead, #2 WSO directs #2 AC "ROLL OUT".

7. 180° turns will not be standard but prebriefed each time they are used.

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SECTION IV

COMMUNICATION

SECTION IV
COMMUNICATION

1. Inter-plane

- a. Radio calls should be directive, followed immediately by descriptive commentary.
- b. "Call sign, Push it up" - Select AB, spread formation and check six.
- c. "Call sign Spread" - Check a few degrees away from your wingman to commit a bandit or gain turning room.
- d. "Call sign HARD Right/Left" - See definitions.
- e. "Call sign BREAK Right/Left" - See definitions.
- f. "Visual" - Lead/wingman in sight.
- g. "Position" - Lead/wingman not in sight, need assistance to regain visual.
- h. "Unable" - Cannot provide assistance for lead/wingman to regain visual.
- i. "Tally" - Bogey or bandit in sight.
- j. "No Joy" - Bogey not in sight or, if not under attack, lead/wingman not in sight.
- k. "Knock it off" - Discontinue maneuvering, climb above 500' AGL and investigate.
- l. "Cease Maneuvering" - Pertains to simulating being attacked by a bandit. Once the call is made, flight returns to planned low level route.
- m. "Roll Out" - Set wings level.

2. Inter-Cockpit

- a. AC to WSO
 - (1) "Rocks right/left" - Expect to see terrain going by.
 - (2) "Bunt" - Expect a pushover.
 - (3) "Birds" - Usually said after the fact. Be alert for increased bird strike hazard and expect abrupt maneuver.
 - (4) "Rolling Right/Left" - Self explanatory.
 - (5) "Visual" - Same as lf.
 - (6) "Tally" - Same as li.

- (7) "No Joy" - Same as lj.
- (8) "Knock it off" - Same as lk.

b. WSO to AC

- (1) 5 Right/Left - Check turn to get formation line abreast.
- (2) 30 Right/Left - Optimum turn in specified direction of approximately 30° . The formation is in a comm out 90° turn and the other aircraft is turning into us.
- (3) " 90° Right/Left" - Turn 90° right/left (mil PWR plus G/AOA).
- (4) "Hard Right/Left" - See definitions.
- (5) "Break Right/Left" - See definitions.
- (6) "Weave Right/Left" - Optimum turn, approximately 60° HCA. Wings level cross in front of other aircraft, then back to course on WSO's call.
- (7) "Visual" - Same as lf.
- (8) "Tally" - Same as li.
- (9) "No Joy" - Same as lj.
- (10) "Push it up 10/20/pull it back 10/20" - Increase/decrease power to catch up/fall back with lead.
- (11) "Knock it off" - Same as lk.
- (12) "Roll Out" - Same as lm.
- (13) "Up 100" - Climb 100' (Crew comfort level is exceeded, or if a wingman, AGL altitude is below lead's).
- (14) "Down 100" - Descend 100' (Formation is not level).
- (15) "Six is clear" - Advises AC that six o'clock is being checked (indication of comfort level).
- (16) "Level off" - Self explanatory.

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SECTION V
TERRAIN FLYING

SECTION V

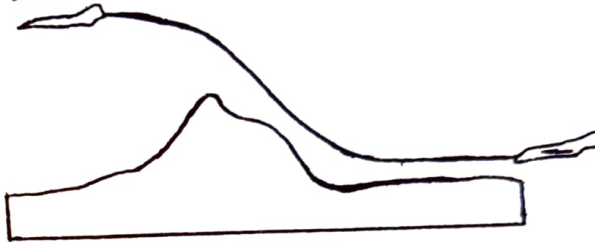
TERRAIN FLYING

Ridge crossing:

- a. How to cross ridges:



- b. Not what you would like!



- c. This is better!



- d. How do you cross a ridge line:

(1) Approach: Probably the most important phase. Prior to reaching the ridgeline, begin a climb to enable yourself to crest the top with a level flight path. If the maneuver is performed correctly, you should be able to use the ridgeline for direct terrain masking against an AI missile threat. Once you top the crest, you have two options available to get back into the low altitude regime on the other side.

- (a) Bunt accomplished by applying a negative "G" pushover.

1. Advantages: Can maintain sight of lead/wingman.

Don't flash white belly.

2. Disadvantages: Takes a longer time.

Uncomfortable for crewmembers.

- (b) Rollover: Accomplished by rolling inverted and applying positive "G".

1. Advantage: Doesn't take as long.

2. Disadvantages: - Lose visual on leader/wingman.

- Can get yourself disoriented easily.

(Variation of rollover is slice which blends rudder and rollover in approximately a 135° slice).

e. Generally speaking, small ridgelines require only a bunt whereas with large ridgelines a rollover/slice is generally best. CAUTION: In either option, the pilot must be aware of the possibility of committing his nose too low when transitioning from the top of the ridgeline back down into a low altitude posture.



... prior to reaching the top of the ridge, the pilot should be aware of the possibility of committing his nose too low when transitioning from the top of the ridgeline back down into a low altitude posture.

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SECTION VI

THREAT CONSIDERATIONS

SECTION VI

THREAT CONSIDERATIONS

1. Air to Ground

a. How to avoid:

- (1) Don't fly near threat.
- (2) Avoid LOC's.
- (3) Fly in rough terrain.
- (4) Avoid terrain that will hi-light (dry lakes, light areas, etc.)

b. If engaged (threat radar):

- (1) Stay fast.
- (2) Get lower.
- (3) Chaff (with a maneuver).
- (4) Terrain between you and threat.

c. If engaged (missile):

- (1) Put on beam.
- (2) Drop chaff.
- (3) SAM evasive maneuver.

2. Air to Air.

a. How to avoid:

- (1) Avoid terrain that will hi-light (radar or visual)
- (2) Avoid LOC's.
- (3) Don't fly near threat.

b. If engaged:

- (1) Push it up.
- (2) Spread the formation.
- (3) Get lower.

c. If threat is stagnated or starts to fall back, continue low level to target, but monitor threat's position as necessary.

d. If threat is within weapon's parameters: (Essentially the gun - must be in close).

(1) Engaged fighter - deny a gun or missile shot ("S" Turn, remain as low as possible, BREAK TURN).

(2) Free fighter - roll slide attack on bandit.

e. Remember:

(1) Threat ordnance limited.

(2) At low level your vulnerable cone is reduced.

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SECTION VII

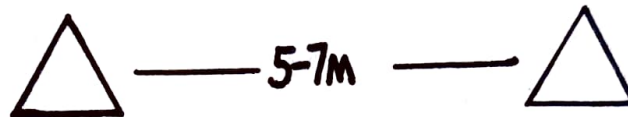
FORMATION OPTIONS

SECTION VII

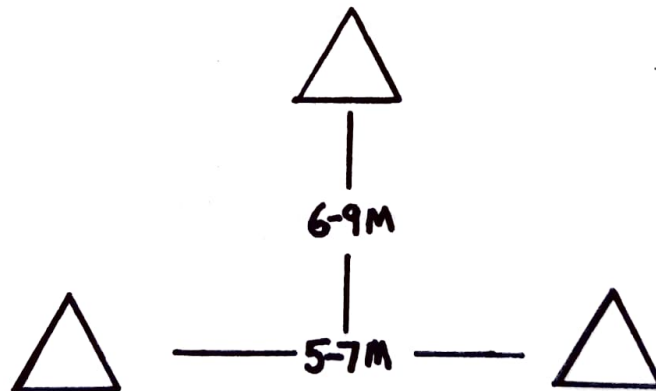
FORMATION OPTIONS

The following formation options are not all inclusive. Variations of each type are numerous. Additional information concerning formations may be found in TACM 3-1 and selected Fighter Weapons Review articles.

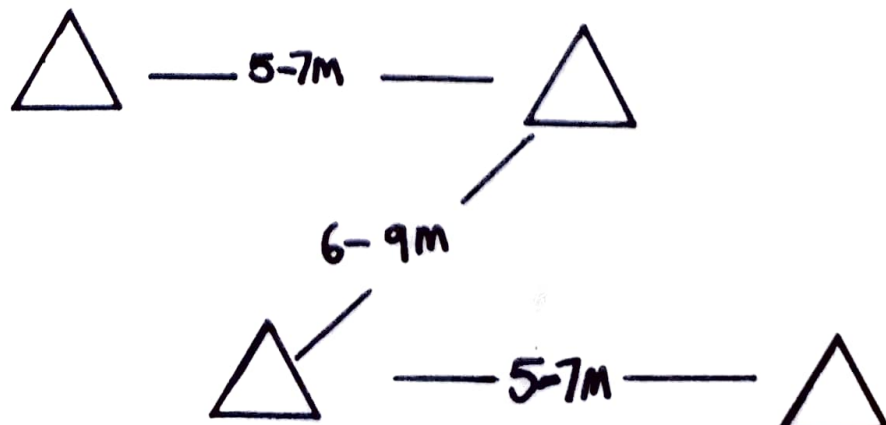
1) TWO SHIP



2) THREE SHIP:



3) FOUR SHIP:



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SECTION VIII
CONTRACT

SECTION VIII

CONTRACT

1. Aircraft Commanders will maintain positive control of the aircraft and ensure terrain clearance at all times.
2. Aircraft Commanders will maintain lookout from 10 o'clock to 2 o'clock.
3. Weapon System Officers will maintain tactical formation and direct turns through concise and timely directive commentary to aircraft commanders.
4. WSO's may adjust formation position fore and aft through use of the throttles providing this technique is thoroughly briefed.
5. Weapon System Officers will maintain lookout through the formation to deep 6 o'clock.
6. Elements will fly in the same training altitude blocks.
7. Elements will maintain 400 KIAS minimum during low level training.
8. Wingman will not fly lower (AGL) than their leader (exception-noise abatement).
9. Minimum altitude will be consistent with training block, crew comfort level and altitude at which a level turn may be accomplished.
10. Use of the UHF will be minimized except to ensure mutual support, elimination of confusion or safety of flight.
11. The wingman will always strive for line abreast.
12. The wingman will always remain within 90° of leads' heading.
13. The aircraft in front is responsible for getting back to line abreast.
14. Each crewmember will progress at his own rate. (TACM 51-50)
15. Progression to lower altitude blocks will not be accomplished until comfort level and level turn criteria are met. (TACM 51-50)
16. The term "KNOCK-IT-OFF" will be used to terminate low altitude operations and may be called by any flight member. All aircraft will acknowledge "KNOCK-IT-OFF" with call sign, roll wings level and initiate a climb above 500' or the next higher altitude block. (TACM 51-50)
17. Following "KNOCK-IT-OFF", low altitude flight will not be resumed without verbal coordination with and specific permission from the supervisor. (TACM 51-50)

18. "KNOCK-IT-OFF" will be called when an aircraft is observed descending during a turn and bank is not decreasing. Response will be a wings level roll for recovery. (TACM 51-50)

19. Lost comm, loss of situational awareness or diversion of the aircrew attention (i.e., an emergency, etc.) will require a "KNOCK-IT-OFF" and immediate climb above 500 feet AGI, the next higher altitude block, or climb as required to cope with the situation. (TACM 51-50)

20. Formation training below 500' AGL is limited to two-ship tasks. (TACM 51-50)

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SECTION IX

ROUTE ABORT

SECTION IX

ROUTE ABORT

a. Primary considerations:

- (1) Avoid the ground.
- (2) Avoid a mid-air.

b. VFR Low Level Route Abort:

(1) For emergencies, contingencies, unable to maintain VMC: Slow to 350 KIAS, maintain VMC and climb to a safe altitude. Contact appropriate ATC facility if IFR clearance is required (Consult low altitude enroute charts and IFR supplement for center frequencies. This information should be researched PRIOR to briefing).

(2) Inadvertant entry into IMC:

(a) Climb to briefed IMC route abort altitude, slow to 350 KIAS, contact ATC ASAP and obtain IFR clearance. Compute IMC route abort altitude as follows: 1000' above highest obstacle on the route, rounded up to the nearest thousand +500' MSL altitude, EXAMPLE: Highest 731' MSL; $731' + 1000' = 1731'$; round up to 2500' MSL.

(b) Lost Wingman (from tactical formation): Insure altitude separation and ground clearance - flight leader comply with above; wingman climb to 1000' above briefed route abort altitude and obtain separate IFR clearance.

c. IFR Low Level Route Abort:

(1) Abort from IMC:

(a) For emergencies and other contingencies (severe weather ahead, etc.): Maintain IMC MEA (IAW TACR 55-4, Chapter 9); if top of assigned altitude is higher than MEA, climb to the top of the block. Contact appropriate ATC facility and request clearance as required.

(b) For lost wingman (from close formation): Comply with standard lost wingman procedures. Flight leader, maintain IMC MEA. Wingman obtain altitude clearance ABOVE leader; remain within assigned block if possible. Obtain separate clearances.

(2) Abort from VMC:

(a) For emergencies and other contingencies (to avoid IMC, severe weather, etc.): Maintain VMC, contact appropriate ATC facility, and request clearance required.

(b) Inadvertent entry into IMC (route abort not mandatory):
Climb to precomputed MEA's in accordance with TACR 55-4, Chapter 9. If route abort is necessary, comply with outlined procedures.

(c) Lost wingman (from tactical formation): Insure ground clearance and altitude separation. Flight leader, climb to precompute MEA. Wingman, obtain altitude clearance above leader; remain within assigned block if possible. Obtain separate clearance.