

CHAPTER - 10

FORMATION

Purpose

1. Formation flying in L 410 UVP-E20 aircraft is to be carried out for the following purposes :
 - a. Training.
 - b. Demonstration/display.
 - c. Other operational requirements.

Crew Qualification

2. Formations are to be led by the captain detailed for the mission. For commitment/display all the pilots have to have valid operational starm as captain and as copilot from respective crew position.

Mission Planning

3. A detailed planning is to be made which should include following :
 - a. Crew details.
 - b. Training syllabus (Exercises).
 - c. Operations al requirements.
 - d. Mission fuel planning.
 - e. Navigation and weather factors.
 - f. Recovery.
 - g. Diversion.
 - h. Emergency.

Mission Briefing

4. A through pre-flight briefing is to be conducted by the formation leader. All maneuvers are to be executed as per the briefing.
5. The briefing shall include the following:
 - a. ATC/Met.
 - b. Nomination of leader and Deputy leader.
 - c. Call sign.
 - d. RIGHT procedure.
 - e. Start up.
 - f. Taxi.

- g. Line up.
- h. Take off.
- j. Climb and join up.
- k. Mission profile (Exercises).
- l. Periodic instrument checks.
- m. Loss of contact.
- n. Fuel.
- p. Rejoin.
- q. Recovery procedure and Landing procedure.
- r. Diversions procedures.
- s. Emergencies.

Radio Procedure

6. a. **Frequency**. Tower frequency in use is to be maintained in VHF-1. A predetermined suitable frequency is to be set in VHF-2 for inter aircraft communication. Both frequencies are to be checked on ground. A common frequency is to be tuned and kept on as a standby mode of communication.

b. **Calls**. R/T calls are to be given by the leader or the captain acting as the leader.

Start up

7. Formation leader is to obtain permission for start up and on monitoring the call other members are to start up.

Taxi

8. While taxiing stagger distance of 300' is to be maintained. Taxiing sequence will be in the order of take off sequence.

Line up (Fig-1)

9. Aircraft will line up in the alternate halves of the runway at a stagger distance of 300' depending on the cross wind components. The leader shall obtain clearance for line up and take off.

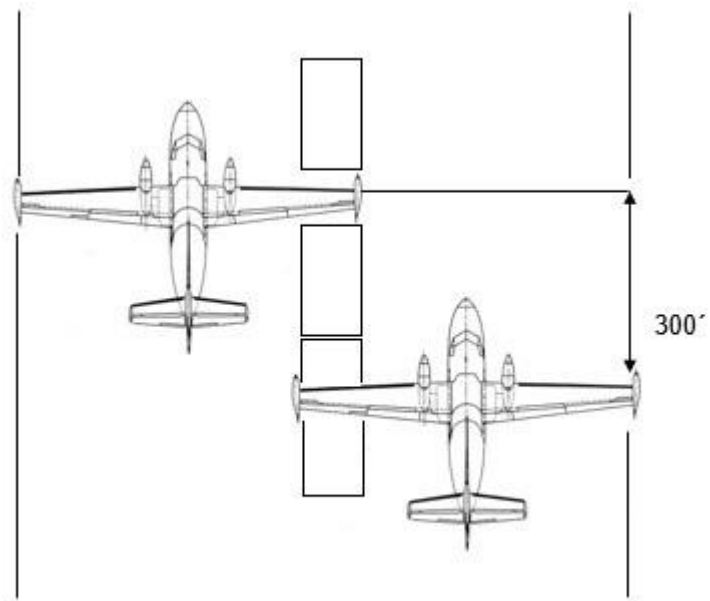


Fig 1

Pre Take Off and Take Off

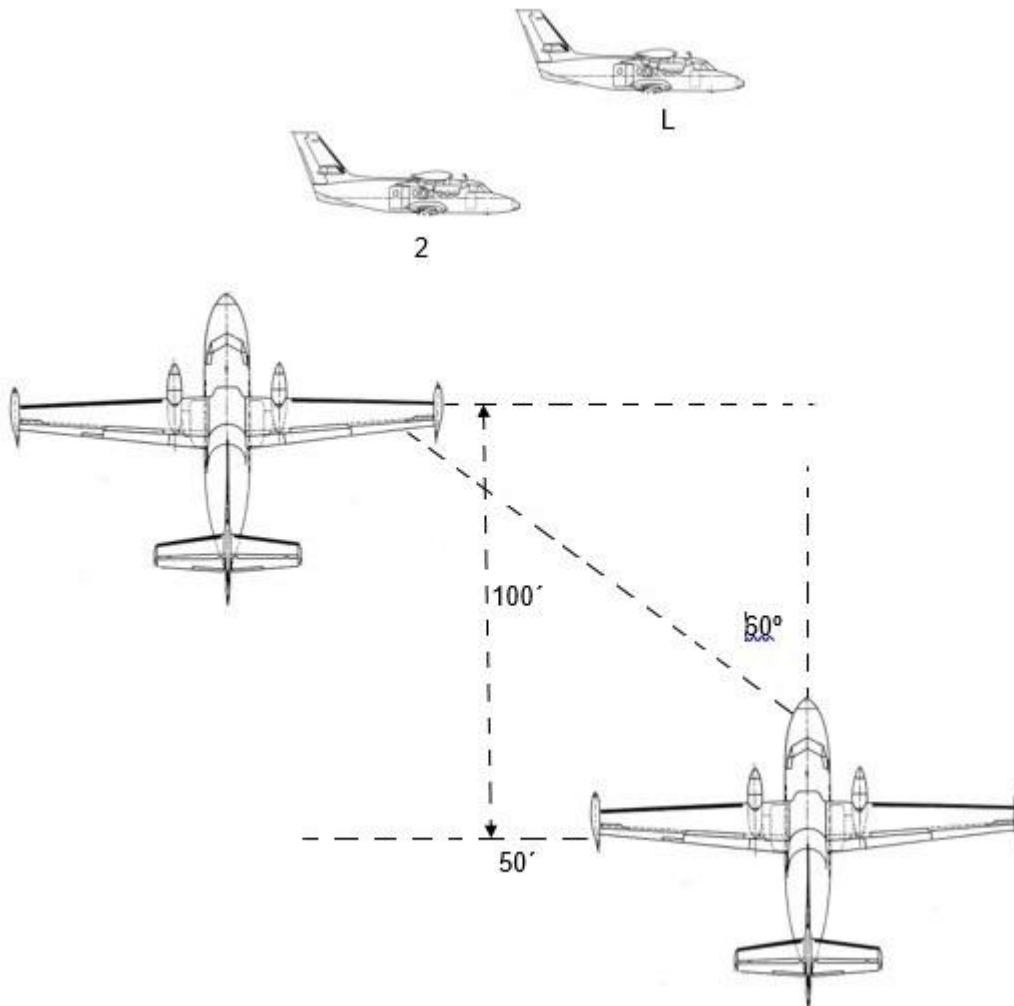
10. All aircraft are to complete the pre take off checks on the taxi way. All take offs are to be in stagger. The second aircraft will roll once the lead gets airborne or at least 10" stagger; subsequent aircraft will roll 10" after the aircraft ahead gets airborne. During take off roll lead aircraft will Open power to 90%. Others will initially Open recommended T/O power, later on as required.

Climb and Join Up

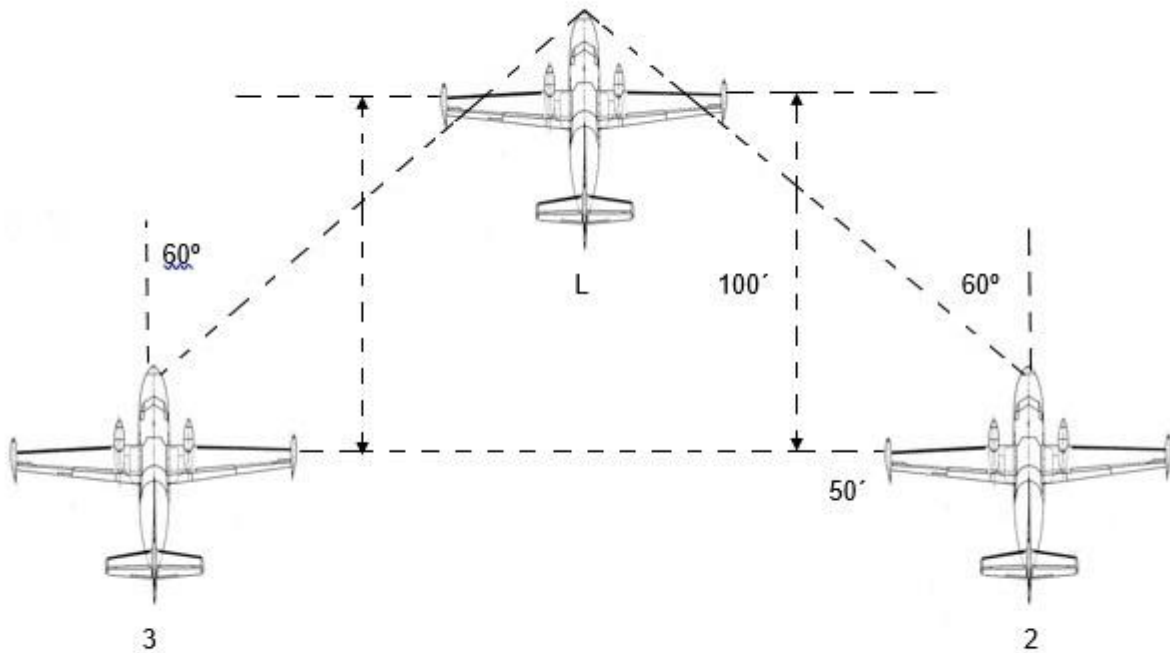
11. Once T/O checks are over, the lead aircraft will reduce power to 70%, rpm 1900 for steady climb.

Echelon (Fig-2)

12. In echelon, formation aircraft shall keep a lateral distance of 30' and longitudinal distance of 50' from wing tip to wing tip maintaining slightly lower so that both surface of the wing are visible.

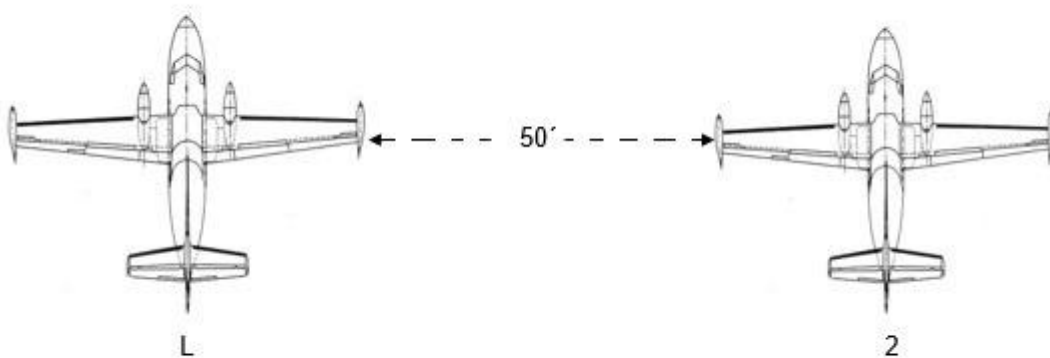
**VIC Formation (Fig-3)**

13. The VIC formation is carried out with 3 or 5 aircraft. In VIC formation the wing members are to maintain the position as of echelon. The right echelon member is to be termed as No-2 and left echelon member No-3; No-3 will action as deputy leader.



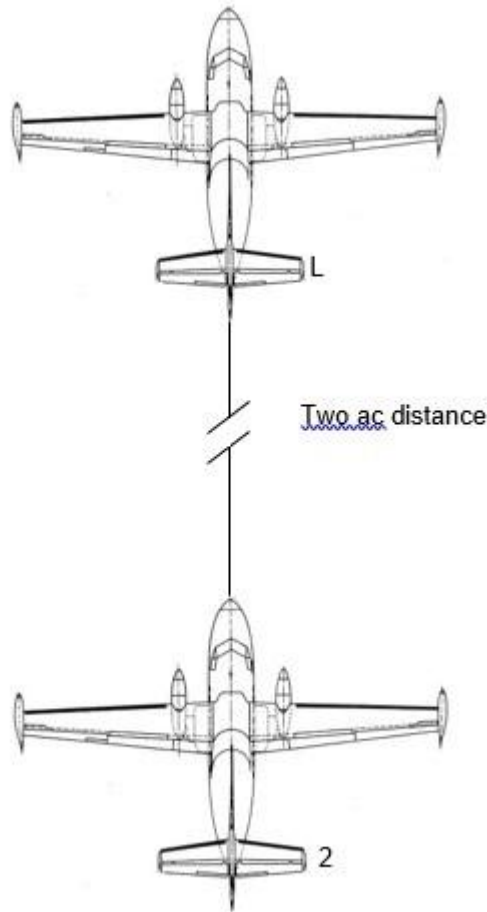
Line Abreast (Fig-4)

14. In line abreast, the formatting aircraft shall be positioned along the lateral axis of the lead aircraft at a distance of half wing span (30 ft) and slightly below.

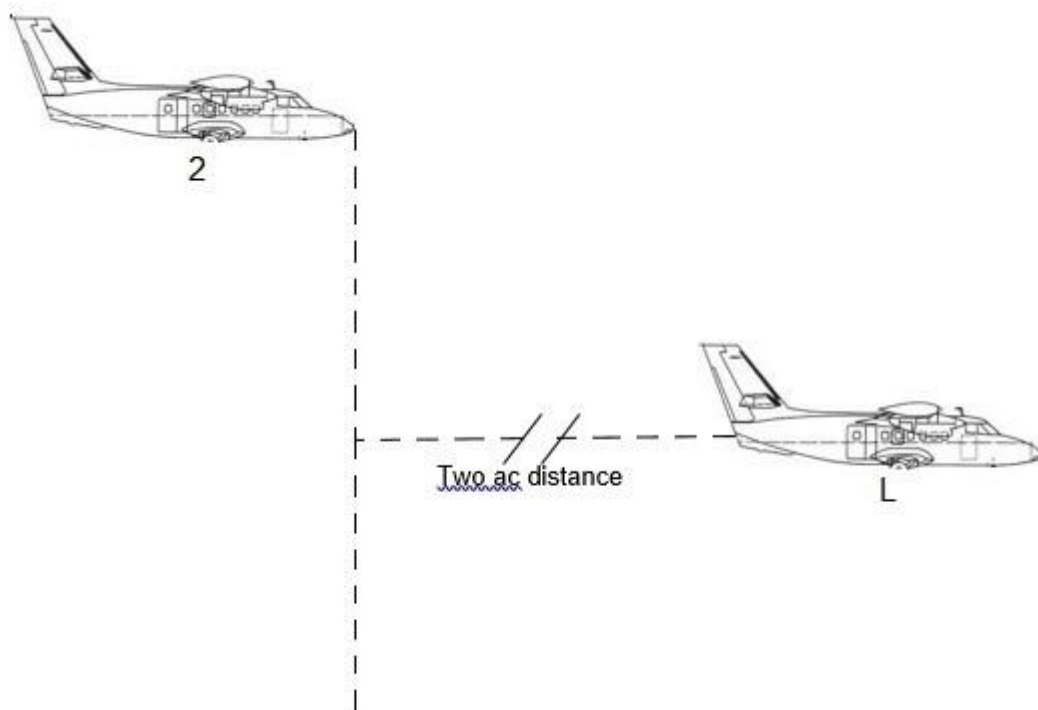


Line Astern (Fig-5)

15. In line astern, the formatting aircraft shall be positioned along the longitudinal axis at a distance of two aircraft length (100 ft) and slightly below to avoid slip stream.

**Trail Formation (Fig-6)**

16. The formatting aircraft shall be positioned along with the longitudinal axis of the lead aircraft like line astern. But slightly above the IBV leader keeping constant visual contact. (Only upper surface remains visible).



Pitching Out and Rejoin

17. Pitching out and rejoin are to be carried out at the leader's instruction at a stagger of 5 sec. The lead aircraft is to initiate a 30° level turn towards clear side and roll out 180° in the opposite direction. After counting, 5 sec No-2 is to follow. After roll out No-2 is to establish visual contact with the lead aircraft, and call "In contact". After that lead aircraft is to turn to the side No-2 is to join up. Joining is to be done always from below the leader's level.

Break Off and Rejoin

18. Once lead gives the signal/call to No-2 for break off, No-2 is to break off towards clear side putting 45° bank and about 15° pitch up with power 90°/100°; after 90° direction change (max) reverse bank to establish contact with the lead, call "In contact" and adjust power to join on the side the lead is turning. During break off and rejoin speed will be 150-165 kts. Joining is to be done from below the leader's level.

Looking Out Reporting

19. It is the responsibility of all the members to keep sharp look out for orientation, especially navigator is to keep orientation in training missions. In operational mission the area for look out may be disturbed among the crew members and should be reported to the leader.

Periodic Checks

20. Every after 15 min "Operations Normal" call is to be given.

Descent and Recovery

21. Descent is to be performed with min 30% power setting by lead aircraft and speed 150 kts.

22. Before calling initial at 1000' change formation to echelon. After crossing the threshold the lead will pitch out first and subsequent aircraft will pitch out at 5" stagger. Then onward, all actions are to be carried out individually for landing. Aircraft is to land on the alternate halves depending on cross wind components. In case runway width is less than 150', all aircraft are to land on the center line exercising caution for wake turbulence. For taxiing into dispersal, the taxi sequence is to be as of landing sequence except when back tracking is required. All aircraft are to be switched off together on call from leader.

Emergencies

23. During formation flying any member experiencing any emergency is to inform the leader and take the following actions as applicable:

- a. **Before T/O.** Inform the formation leader and return to dispersal.
- b. **During T/O.** If lead aborts, all other formation members are to abort. If No-2 aborts then No-3 may take off with the permission of formation leader provided No-2 to be cleared off the runway.
- c. **Bird Strike.** On suspected bird strike immediately break off maneuvering the aircraft gently, climb to safety alt and check the extent of damage. If required, take the help of

RESTRICTED

other formation member and carry out controllability check. If unable to continue with the formation, head for the base and land ASAP.

d. **R/T Failure.** If R/T fails on ground, discontinue the mission. If leader's R/T goes off in the air, No-3 will take over as a leader. After assessing the situation, the leader is to decide whether to continue or discontinue the mission. He may communicate on HF to the deputy leader if required. The aircraft having serviceable R/T will give all calls for aircraft with unserviceable R/T.

e. **Collision.** After collision both the aircraft will immediately break off and carry out controllability check. Both aircraft shall land back ASAP in loose formation (if possible).

f. **Any Other Emergency In Flight.** If any other emergency occurs in flight, inform the leader accordingly. Leader will decide either to continue or discontinue the mission.

Loss Of Contact

24. **Immediate Actions.** If in clear weather carry out standard break off and rejoin. If inside cloud immediately shift attention to instruments and take the following actions immediately

a. **Straight and Level Flight.** The lead will continue, No-2 is to transmit immediately "NO CONTACT". Then initiate a level turn towards clear side, roll out 45° off, resume original heading after 30" and maintain height and heading called out by the leader.

b. **Straight Climb.** Same as of st and level flight except that the lead will continue to climb and No-2 will level off immediately. Resume climb, maintain a vertical separation of 1000' min till visual contact is re-established.

c. **Straight Descent.** The lead will continue, No-2 is to transmit immediately "NO CONTACT, BREAKING OFF". No-2 is to then level off and resume original heading after 30". Resume descent maintaining 1000' of height difference till visual contact is re-established or min safety height is reached by the leader. In the later case individual recovery through instrument let down is to be carried out.

d. **During Turns.** During level, climbing or descending turn, the No-2 is to give "NO CONTACT" call immediately then take following actions:

(1) **Out Side Turn.** After informing the leader No-2 is to roll out and fly for 30" then resume turn on to heading and height the leader calls out on R/T. Both aircraft shall maintain same amount of bank.

(2) **In Side Turn.** After informing the leader No-2 is to Increase bank to 45°. The leader will straighten out for 30" and resume bank with climb/ descent/ level flight as before. No-2 will continue to turn and level off; resume level flight, climb or descent at leader's instruction and turn on to the heading the leader calls out. Both aircraft shall maintain same amount of bank.

25. **Subsequent Actions.** On failing to establish contact both aircraft will head for rendezvous point after taking immediate actions as mentioned above maintaining a height difference of 1000' min. On reaching rendezvous point, No-2 will make left hand orbit at

RESTRICTED

specified height as decided before the mission leader will also make left hand orbit at a height 1000' lower than that of No-2; on establishing contact , No-2 will join as per the instruction of the ldr. If no joy, determine ground position and carry out individual recovery.

NOTE:

1. While flying formation over mountain or sea, the formation must not operate below safety height (Radio altimeter is to be set to the safety height).
2. During formation briefing, the subsequent composition of the formation should be specified in case of any ground or air abort.
3. Rendezvous point is to be selected before flying the mission.
4. In side cloud no turning with more than rate one by the leader is to be carried out.