COMMAND AND STAFF TRAINING INSTITUTE

BANGLADESH AIR FORCE

Individual Staff Studies Programme (ISSP)

PROFESSIONAL SUBJECT-1 : AIR TRAFFIC CONTROL
PHASE-8 : PART-I

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PHASE-8 : PART-I

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Revised by : Gp Capt Md Shafiqul Alam, psc, GD(N)
Sqn Ldr SK Abdullah Alamgir, psc, ATC

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CONDUCT OF THE PHASE
Course Duration: 8 Wks (75 Periods)

Sl No	Topic		Period Distr	Total Period
1.	**Principles and Organization of ATC**			
	Sub Topic	Air Traffic Control Policy	1	2
		Policy in National Emergency		
		BAF ATC Instruction	1	
		Civil Air Traffic Control Instructions		
		Organization of ATC in BAF		
2.	**Regulations and Procedures for Safe Operation of Aircraft**			
	Sub Topic	General Regulations	6	9
		Air Traffic Services	2	
		Altimeter Setting		
		Pre-Flight Action		
		Diversities	1	
		Overdue		
3.	**Air Field Standard Dimension and Physical Characteristics**			
	Sub Topic	Flying Gap	2	5
		Surfaces	1	
		Indication and Signaling devices		
		Airfield-Markings	2	
4	**Flight Plans and ATS Messages**			
	Sub Topic	Flight Plan	2	2
		ATS Messages		
5.	**Airspace Organization**			
	Sub Topic	Introduction	2	4
		Designation and establishment of specific portions of the airspace		
		Airspace Restrictions and Reservations	1	
		Special Designated Airspace	1	
6	**Aerodrome Control**			
	Sub Topic	Selection of Runway	1	5
		Airfield Inspection	3	
		Wake Turbulence	1	
		Aerodrome Identification and Approach Aids		
7.	**Approach Control Service**			
	Sub Topic	Introduction and general co-ordination	2	8
		Minimum Separation between Departing Aircraft	1	
		Separation of Departing Aircraft from Arriving Aircraft		
		Reduction in Separation Minima	2	
		Holding		
		Approach Sequence		
		Expected Approach Time (EAT)		
		Instrument Approach Procedure	3	
		Ground Control Approach (GCA) Procedure		
	Emergencies			
8.	Sub Topic	Introduction	1	5
		Emergency Calls and Procedures		
		Action by DATCO		
		Crash Action		
		Escort in Distress	2	
		Abandoning of Aircraft		
		Procedure in the Event of Hang-up Armament		
		Radio Communication Failure	2	
		Local Lost		
		Obtaining Urgency Assistance		
		Miscellaneous Procedures		
9.	**Instrument Approach Procedure**			
	Sub Topic	Introduction	1	8
		The instrument Approach Procedure		
		Initial Approach Segment	1	
		Final Approach Segment	2	
		Missed Approach Segment		

Sl No	Topic		Period Distr	Total Period
		Missed Approach Phases	2	
		NDB on Aerodrome with no Final Approach Fix	2	
		NDB with Final Approach Fix (FAF)		
10	**Meteorology**			
	Sub Topic	Atmospheres	2	6
		Layers		
		Temperature		
		Standard Atmospheres		
		Lows		
		Highs		
		Wind Patterns		
		Isobars		
		Buys Ballot's Law		
		Gust Wind		
		Squall Wind		
		Viability	2	
		Fog		
		Mist		
		Clouds		
		Divisions of Clouds		
		Cloud Genera		
		Thunderstorm	1	
		Nor' Westars		
		Climatology of Indo-Bangladesh Sub-Continent		
		Codes of Meteorological Information	1	
		Meter Reporting Procedure		
		Weather Warning		
11	**Air Legislation**			
	Sub Topic	Flight Operation	2	5
		Aeroplane Instrument,Equpment and Flifgt Document	3	
12.	**Miscellaneous**			
	Sub Topic	Introduction	2	6
		Fuel Consumptions		
		Rates of Climb		
		Drag Chute		
		Fuel Calls		
		Air Test Flight		
		Border Flying		
		Flight by Jet Aircraft	2	
		Aircraft Lighting		
		Minimum Crash and Let Down Facilities		
		Breaches of ATC Regulations		
		VVIP Flight Air Traffic Facilities		
		Air Traffic Control Order Book	2	
		Accident Prevention and Flight Safety		
		Crash & Incident Report		
		Duties – ATC Officers		
		Duties – ATCOs		
13.		**Enrichment-1**		
14.		**Enrichment- 2**		
14.		**TAE & Revision**	10	10
TOTAL PERIOD (Duration 08 wks)				**75**

INTRODUCTION TO THE PHASE

Scope **of the Phase**

1. This is your professional subject. By this time, you know about your subject quite well. Air Legislation is the Only important topics that have been included in this phase. The main aim of this phase is to review and recheck your knowledge on profession. In addition to this phase note**, y**ou should consult AFM 60-1, AFM 60-13 (MATS)**,** AFM 61-1, AFM 55-3 and AFO 61-1, AFO 61-2, AFO 61-3 etc. You should also consult ICAO Annexes & Docs on ATS and AIP Bangladesh & other publications on ATS by CAAB. You may also go through relevant manuals/publications on Navigation and Meteorology. Also do not forget to visit different ATC related website on internet.

2. Duration of the phase is 8 weeks. Your study during this period is very vital and your exercise result will reflect how much benifit you have derived from it. Self assed exercises of different tasks are given in the phase note. You should try and solve those problem meticulously.

TASK-1

PRINCIPLES AND ORGANISATION OF ATC

Air Traffic Control Policy

1. **Bangladesh Air Force Policy**. The policy for Air Traffic control in the BAF is that it shall provide, in time of peace and war, aeronautical facilities and ground organisation which will:

a. Enable pilots of BAF aircraft to operate safely with tactical freedom in all weather conditions. The object are:

(1) To prevent collision between aircraft or on the maneuvering area between aircraft and obstructions.

(2) To expedite and maintain an orderly flow of aircraft.

b. Provide Flight information Service.

c. Alert emergency services and initiate Search and Rescue Service when required.

d. Meet the requirement of Air Defense organizations for the notification of aircraft movements.

2. **Civil Aviation Policy**. Bangladesh being a member state of the International Civil Aviation Organisation (ICAO) is bound to adhere, where possible, to ICAO Standards and 'Recommended Practices'.

3. **Joint Military/Civil Policy**. To avoid duplication of efforts, Military and civil aircraft must share the use of the ground organisation and aeronautical facilities. It is desirable that a Pilot, whether Military or Civil, Flying anywhere in Bangladesh should find a uniform ground organisation, governed by Standard regulations and using Standard procedures.

4. The following principles are to he observed when implementing Air Traffic Control Policy:

a. The BAF is to conform to the rules of the Air.

b. The BAF is to conform to the ICAO 'Standards' and 'Recommended Practices' Provided that they do not conflict with military requirements.

c. Aeronautical facilities and ground organizations required in Bangladesh are to be provided jointly by BAF and Civil Aviation Authorities.

d. The air space over Bangladesh is to be a Single Flight Information Region (FIR) and Controlled air spaces are to be established by Civil Aviation Authorities (CAA) in consultation with Air HQ.

e. Flight Information Centre (FIC) is to be established, manned and equipped by CAAB.

f. Military aircraft unless exampted by special regulations are to comply with the regulations for controlled air spaces when flying in those air spaces.

g. The regulations and procedures applicable to FIR are to be relaxed for aircraft engaged in exercise, whenever possible.

h. Joint user aerodromes are to be established at the description of Air Headquarters where aerodrome facilities are required for both Military and Civil Aviation and where one aerodrome is to meet those requirements.

Policy in National Emergency

5. In National Emergency, the BAF may take over control of any air traffic control ground organization, service or facility, which is operated by CAA in Bangladesh. For this purpose, adequate number of BAF ATCOs are required to be current in different Air Traffic Controlling Positions.

BAF ATC Instruction

6. Instructions to the captain of Aircraft originated by BAF Controllers are usually advisory. Controllers cannot normally originate mandatory instruction, they relay those on behalf of an appropriate authority when authorised. In such cases when time and circumstances permit, controllers are to specify the authority when relaying the mandatory instructions.

7. **Exception to rule**. Mandatory instructions can be originated by BAF Controllers in the following circumstances:

a. When the aircraft are flying within controlled air spaces.

b. When aircraft are flying under Radar Control.

Civil Air Traffic Control Instructions

8. Civil ATC instructions are generally advisory but Civil Controllers can originate mandatory instructions to captains of Aircraft provided that the aircraft are flying within controlled air spaces.

9. The organisation of ATC in the BAF comes under the Director of Air Traffic Services (DATS) in the Air Headquarters. At the Base level the senior Air Traffic Control Officer (SATCO) locks after all matters pertaining to ATC. He comes under Officer Commanding Operations Wing. An organisational chart of a typical ATC Squadron at a Flying Base is given in Fig 1.

10. The GCA Radar comes directly under ATC Sqn. In a shift, there may be more than one Controller Viz, Tower, Approach, GCA etc and the senior most ATCO is to work as DATCO.

ORGANISATION CHART OF AN ATC SQN
(As Proposed)

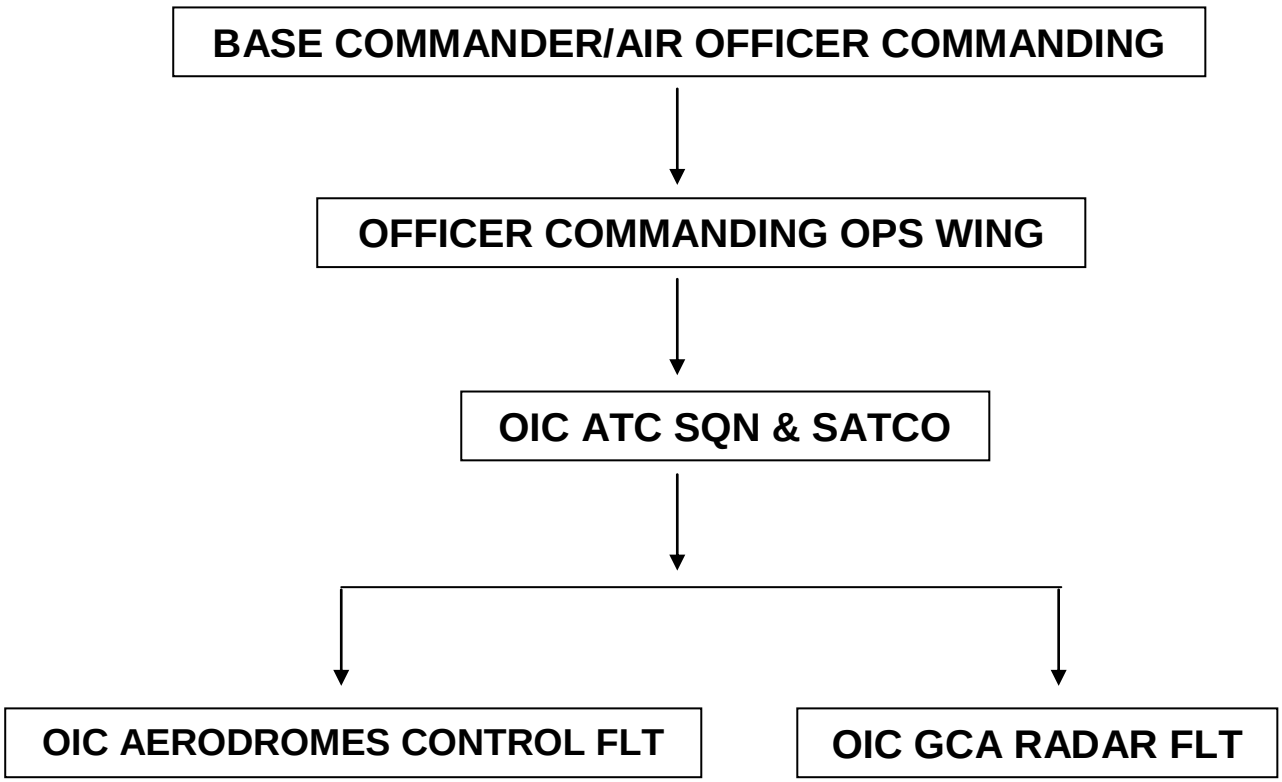


Figure – 1

CONSOLIDATION EXERCISE-1

Q1. What are the Air Traffic Control Policies in BAF

Q2. What are the Principles to be observed while implementing BAF Air Traffic Control Policy?

ANSWER TO CONSOLIDATION EXERCISE-1

A1. The policies of Air Traffic Control in BAF are:

a. To enable Pilots of BAF aircraft to operate Safely with tactical freedom in all weather conditions. The objects are:

(1) To prevent collision between aircraft or on the maneuvering area between aircraft and obstructions.

(2) To expedite and maintain and orderly flow of air traffic.

b. Provide Flight Information Service.

c. Alert emergency services and initiate search and rescue activities when required.

d. Meet the requirements of Air Defence organisation for the notification of aircraft movements.

A2. The following principles are to be observed when implementing Air Traffic Control policy:

a. BAF is to conform to the rules of the Air.

b. BAF is to conform to the ICAO standards and recommended Practices provided that they do not conflict with military requirements.

c. Aeronautical facilities and ground organisation required in Bangladesh are to be provided Jointly by BAF and Civil Aviation Authorities.

d. The airspace over Bangladesh is to be a single Flight Information Region (FIR) and controlled airspaces are to be established by Civil Aviation Authorities in consultation with Air HQ.

e. Flight Information Centre (FIC) is to be established manned a-nd equipped by CAA.

TASK-2

REGULATION AND PROCEDURES FOR SAFF OPERATIONAL OF AIRCAFT

General Regulations

1. **Rules of the Air.** The "Rules of the Air '' are published in ICAO documents Annex 2 and DOC 7030. For the benefit of Air Traffic Controllers and their subordinates , to have a general knowledge, the more prominent orders are given in succeeding paragraphs .

2. The following shall be the power of captain of the ac:

   a. Every person, whatever his rank or status, shall, while he is in an aircraft, be under the command, for all matters relating to the flying or handling of the aircraft or effecting the safety thereof, of the captain whether the person is subject to the BAF Act or not.

   b. If the aircraft is a Glider and is being towed by another aircraft, the captain of the Glider shall, so long as his aircraft is being towed, be under the command of the captain of the towing aircraft, whether the former is subject to the BAF Act or not.

3. If a GD (P) Officer of the rank of Squadron Leader or above, who is senior in rank to the captain, considers that in deciding to Take-off, the latter is displaying a serious error of judgment, it is both his right and duty to forbid the Take-off. Whenever this happens, the mater is to be reported to Air Headquarters.

4. **Right of Way**. The following are some of the rules laid down to reduce the hazard of collision:

   a. **Giving Way**. Aircraft are to give way to each other in the following order:

      (1) Aero planes and Helicopters.
      (2) Airships.
      (3) Two and Glider combinations
      (4) Gliders.
      (5) Balloons.

   b. **Converging**. When two aircraft are converging at approximately the same altitude the aircraft that has the other on its right shall give way.

   c. **Approaching head on**. When two aircraft are approaching head on or approximately so, each shall alter course to the right.

   d. **Overtaking**. An aircraft overtaking another aircraft is to turn to the right and keep clear until all danger of collision is passed. An aircraft is said to be over taking another aircraft if it is approaching from the rear at an angle of less than 70^0 from the fore and aft axis of the aircraft is front.

   e. **Landing Aircraft**. An aircraft, irrespective of type, on the final stages of landing, has the right of way over all other aircraft in the air and on the ground.

f. **Approaching to Land**. When two or more aircraft are approaching an aerodrome for the purpose of landing , the aircraft at the lower altitude has the right of way .but it shall not take advantage of this rule to cut in front of another which is on final approach to land ,or to overtake that aircraft, however, as matter of courtesy, Captain of light aircraft should give way to heavier types ,.Jet aircraft is to be given right of way over position engine aircraft unless the latter is a final of landing .

g. **Emergency Landing**. Aircraft in distress have right of way over all other air traffic.

h. **Aircraft Preparing to Take Off**. Aircraft are not to taxi or take off across the path of an aircraft approaching to land or landing.

j. **Formations.** Single aircraft are to give way to aircraft flying in formation

5. **Dangerous or Negligent Flying**. The pilot of an aircraft is forbidden to fly or maneuver his aircraft, in the air or on the ground in any manner likely to cause injury or annoyance to any person or persons or damage to the live stock or properly or to the aircraft itself.

6. **Unauthorized Flying**. A pilot is not to carry out any maneuver or exercise (eg Formations). for which he has not been authorised.

7. **Circuit Area**. The aerodrome circuit area varies with the role of the aerodrome and cannot be dimensionally defined. An aircraft is not to over fly over an air field when flying below 3,000 ft AGL and are not to pass within 3,000 yards of the perimeter of any aerodrome en-route. In no circumstances is an aerodrome to be crossed against the direction of the circuit, however, when over flying is necessary, permission of appropriate air traffic control is to be obtained regardless of height at which the aircraft is flying.

8. **Flying Over Prohibited Area**. Towns and cities are to be crossed at height which is to unable the aircraft to reach open country in the event of loss of power. If sufficient height cannot be maintained because of weather or any other cause, the populated area is to be avoided; Provided this does not jeopardize flight safety. This height shall not be less than 1,000 ft above the highest obstacle within a radius of 2,000 ft from the aircraft and not less than 2,000 ft when flying over the cities.

9. **Flying over Public Assemble**. Flying over any place where large number of people are assembled in the open is prohibited except when:

a. Specially authorised in connection with air display or fly-past.

b. It is necessary to do so while carrying out the arrival and departure procedures at an airfield.

c. Flying at a reasonable height.

10. **Flying Over the Surface of Water**. The pilot of an aircraft flying within 1,000 ft of Surface of water is to keep clear of all vessels as far as possible.

11. **Low Flying**. Any flying below 2,000 ft, AGL is to constitute low flying and is prohibited except:

a. When taking off, landing, preparing to land, or making a force landing.

b. When required for training and operational purpose.

12. **All Low Flying**. All low flying practices are to be specially authorised by flight commander or higher authority. The route is to be chosen so as to avoid towns, populated and industrial areas as far as possible.

13. Low flying is not to be practiced at a height lower than 250 ft AGL except when a lower height has been authorised by Air headquarters for specific exercise or mission.

14. If forced to fly at less than 1,000 ft above ground or water because of poor visibility or weather or any other reason the captain is to record the occurrence immediately in flight authorisation book. If the flight authorisation book is not available, the occurrence is to be reported to DATCO who is to enter the details in air traffic control log book.

15. **Semi Circular Rules**. To reduce the hazard of collision between aircraft engaged in enroute flying in un-controlled air space, vertical separation is necessary. This is achieved by a simple system of relating flight level chosen to the magnetic track being flown and by ensuring that, when in level flight at or above the transition level aircraft fly at flight levels on standard altimeter setting ie. 29.92 inches, 1013.2 Hectopascats and 760 millimeters.

16. The relation between the magnetic track of an aircraft and its appropriate flight level is obtained by dividing the compass rose into semi circles and by allocating each semi circle associated flight levels shown in flg-1.

a. Magnetic Track 000^0-179^0.

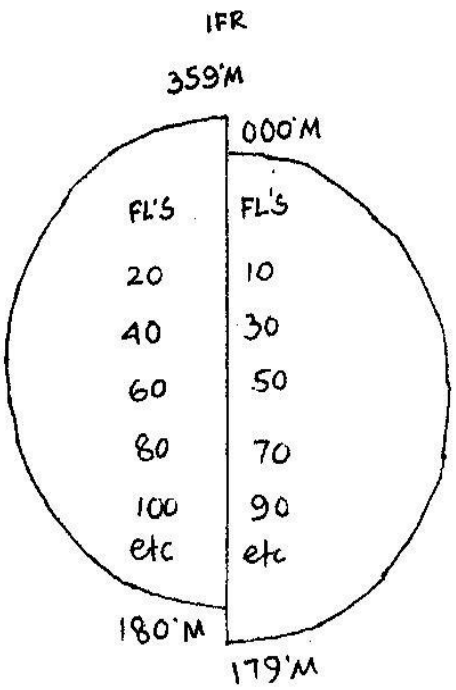
(1) IFR flight 1,000; 3,000; 5,000 and so on upto flight level 290, thence flight level 330, 370, 410 and son on.

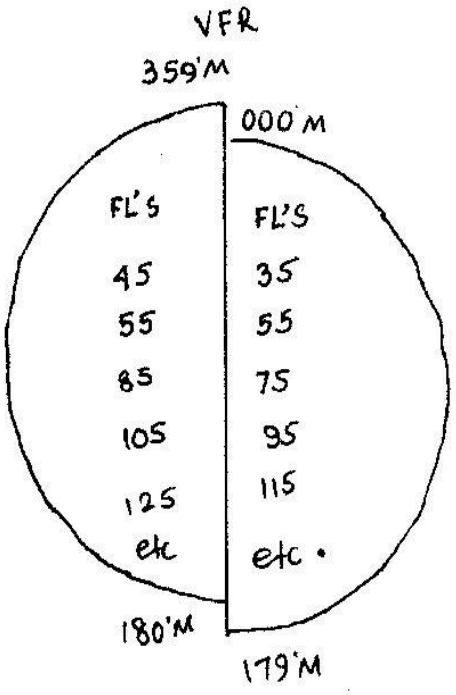
(2) VFR flight 3,500 ; 5,5oo ; 7,500 ; and so on upto 27,500 thence flight level 300, 340 and 380 so on.

FIG - 1

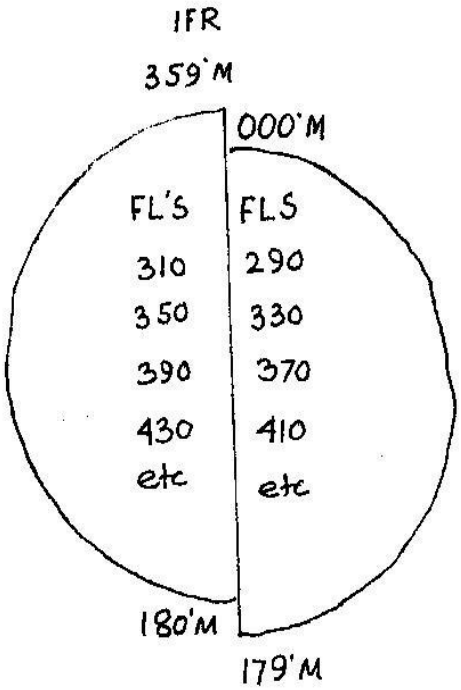
ICAO STANDARD SAMI-CIRCULAR CRUISING LEVELS

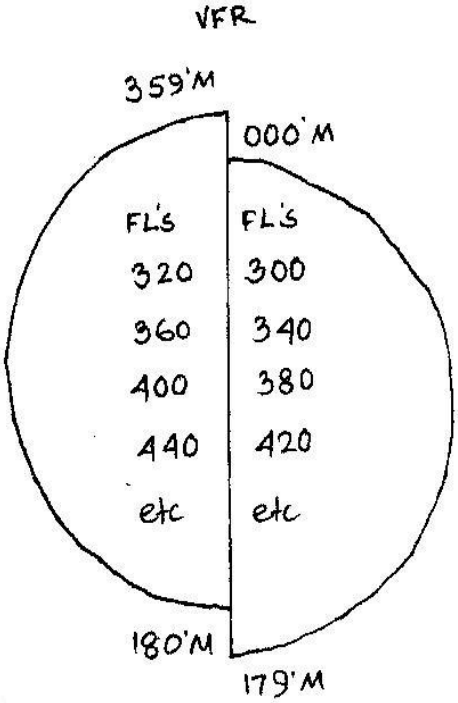
BELOW FL 290





FL 290 AND ABOVE





b. Magnetic Track 180^0 - 359^0

(1) IFR flights 2,000 ; 4,000 ; 6,000 and so on upto flight level 280 thence flight level 310; 350 ; 390 and so on.

(2) VFR flights 4,500 ; 6,500 ; 8,500 and so on upto flight level 285 thence flight level 320, 360 and 400 and so on.

17. **Position Reporting**. It is mandatory for the aircraft to pass position reports to the ATC unit in whose jurisdiction they are flying at designated reporting points on when instructed in controlled air spaces. They may also pass position when requested by ATC in order to:

a. Provided information of aircraft movements to the air defence system.

b. Assist ATC unit to effect clearance into controlled air spaces.

c. Prevent unnecessary overdue action being taken on notified flights.

18. **Avoidance of Collision**. When flying VMC it is the direct responsibility of the person in command of an aircraft to avoid collision with other aircraft not with standing that the flight is being conducted on an air traffic clearance.

19. **Boom Flights**. Any flight which results in sonic boom is to be referred to as a “Boom Flight”. The following restrictions are to apply:

a. Boom flights are to be authorised only when necessary in the interest of training or for demonstration purposes.

b. Prior approval of Base Commander is to be obtained before demonstration boom flight is authorise.

c. Training boom flights are to be made over sparsely populated areas or cver sea.

d. Base Commander is to specify suitable areas for such flights.

e. If a pilot causes a sonic boom inadvertently outside specified area, he is to enter details of time and position of the occurrence in the flight authorisation book.

f. If the sonic boom is produced by diving the aircraft the dive is to be started at such a height that recovery is completed by 20,000 ft.

20. **Instrument and Visual Flights Rules**. Instrument and Visual meteorological condition (IMC,and VMC)-refer to weather condition encountered during a flight. These terms are used to denote actual weather conditions as distinct from flight rules under which the flight is being conducted.

a. VMC Minimum requirements shall be.

(1) Flight visibility 5 nm.

(2) Distance from clouds horizontal 1 nm.

(3) Distance from clouds vertical 1,000 ft.

Except that outside controlled air space at below. 3,000ft AMSL or 1,000 ft above terrain which ever s higher, Flight visibility 1nm clear of clouds and insight of ground or water.

b. IMC exists when weather conditions are below the minimum standard presented for VMC.

21. **Instrument and Visual Flight Rules**. These are rules under which flight is conducted and are applied as follows:

a. In IMC Flight under IFR is mandatory

b. In VMC Flight may be under IFR as follows:

(1) The captain may elect to fly under IFR.
(2) An ATC authority may impose IFR.

c. Unless authorised by ATC. VFR flights are not to be operated.

(1) During night
(2) Above flight level 150.

d. Except when clearance is obtained from an ATC unit VFR flights are not to take off or land at aerodrome within control zone or enter the aerodrome traffic zone or traffic pattern when:

(1) Ceiling is less than 1,500 ft
(2) Ground visibility is less than 5 nm.

e. Except in sub para (b) (1), (2) flights in VMC are normally conducted under VFR.

22. **Special VFR**. In special circumstances flights may enter control zone or aerodrome traffic zone in IMC without complying with IFR provided that air traffic clearance is obtained from appropriate ATC unit.

23. **Aircraft Lighting**. During the period 30 minutes before official sunset until 30 minutes after official sunrise or any time when the prevailing visibility as seen from the cockpit is less than three miles, an aircraft in-flight or operated on the ground, or if stationary and likely to cause a hazard, is to show standard position flights.

24. When installed the anti-collision light is to be used from take-off unit landing during all flights. The anti-collision light is to be turned off during flight through clouds when the rotating light reflects into the cockpit.

25. Formation flights are exempted from Paragraph 23 and 24.

26. **Landing Area Rules**. All aircraft are to guard the airport Control frequencies.

a. When operating with a two-way radio communications, pilots are to guard the appropriate air traffic control frequencies.

b. When operating without two-way radio, pilots are to monitor the flight signals operated from the tower.

27. **Landing Take Off**. Normally, landing and take off are to be made on the runway most nearly aligned into the wind or as recommended by the airfield control. If the pilot does not concur with the air traffic controller for reasons of safety, he is to land or take off on any usable runway after obtaining clearance from the air traffic control.

28. **Night Operation**. A take-off or landing is not to be made during the period between official sunset and official sunrise unless the active runway is outlined by lights and readily dissemble.

29. **Control of Arriving & Departing Aircraft**. Unless for considerations of safety or training dictates otherwise the following procedures shall be followed:

a. **Departing aircraft**. A departing aircraft shall not be declared for take-off until the preceding departing aircraft has crossed the end of runway or has started a turn or until all preceding landing aircraft are clear of the runway.

b. **Arriving aircraft**. A landing aircraft shall not be cleared to cross the beginning of the runway on its final approach until the preceding departing aircraft has crossed the end of runway or has started a turn or all preceding landing aircraft are clear of the runway.

30. **Operating in the Vicinity of an Airfield**. In the vicinity of an airfield where normal traffic pattern are in force aircraft are not to be operated in an unusual altitude, manner or at a speed which night interfere with aircraft flying the normal traffic pattern unless clearance has been obtained from the air traffic control.

31. **Traffic Patterns**.

a. At BAF Airfield, a pilot is normally to be allowed to fly a standard traffic pattern as specified for the type of aircraft.

b. At civil aerodromes the pilot is to conform to the traffic pattern of the airfield being used.

32. **Aircraft Priority**. Air traffic control normally gives take-off priority to active air defence aircraft for take-off. All aircraft, except where specially authorised, are to enter the traffic pattern with sufficient fuel to be able to land in sequence with other aircraft, If the fuel supply should get below this amount, the pilot is to declare “minimum fuel” to alert the controller that any undue delay in handling the flight can result in creating an emergency. Where “minimum fuel” has been declared a pilot can expect enough priority to assure landing. These interactions are not intended to prevent air traffic controllers firm using good judgment to controlling traffic around and airfield.

33. **Oxygen Requirements**. Pressurised Aircraft, All crew members and passengers are to use oxygen when cabin pressure altitude exceeds 10,000 feet.

34. **Aircraft Flying Time**. Aircraft flying time is to be recorded according to the procedure given below:

a. Air traffic controls are to record the exact time when an aircraft becomes airborne and when it lands. These timings are to be sent to those concerned at the end of the day's flying under arrangement of the Base. Air traffic controls are to transmit the flying time to aircraft in transit before they leave the circuit and after they have landed.

b. A series of landing, involving taxing before each take-off is to be considered as one flight. The flying time is to be recorded (to the nearest five minutes) from the first time the aircraft becomes airborne till its final touch down. Additional taxing time is not to be added.

c. All flying that takes place between the hours of sunset and sunrise rounded to the last 5 minutes is to be reckoned as night flying. If a sortie consists of day and night, flying such part of the flight which takes place between sunset and sunrise is to be recorded as night flying and the rest as day flying.

d. The timing of sunrise and sunset are to be taken from air Almanac which is to be provided by Base met section.

35. **Flights by Jet Aircraft**. For a cross-country flight of over 200 nm and involving landing away from base, the following conditions are to apply.

a. The captains of jet aircraft are to hold a valid instrument rating regardless of weather.

b. The actual weather at the destination airfield is to be checked through ATC but not sooner that one hour before take-off.

36. **Safety Altitude**. The safety altitude for a particular route or exercise area is to be calculated on the basis of the elevation of highest ground (AMSL) over which there is any possibility of the aircraft passing pls one tenth of this elevation ,plus 1500 feet. In deciding the highest ground over which an aircraft is to pass, account is to taken of the fixing aids available and the standard of training of the crew.

37. The captain of the aircraft is not to descend below the safety altitude for the roue or area over which he s flying unless compelled to do so in an emergence or in to be taken of the fixing aids available and the standard of training of pass of the crew.

38. If is essential to descend below the height ,eg .for landing the captain is to do so only if he is able to see the ground or use an approved radio radar let down aid.

39. **Minimum Crash Fire and Rescue (R**FF**) Facility.** Normally two crash tenders are to be available for full scale flying by jet aircraft. Following are the exceptions in this respect:

a. Aircraft proceeding out station are permitted to take-off and incoming aircraft are permitted to land with one crash tender serviceable.

b. When only one serviceable crash tender is available, depending on the urgency of the flying missions and the state of reliability of the crash tender available, the officer commanding Base may permit flying to continue. Authority to take this decision is not to be delegated.

40. **Minimum Navigational Facilities**. Jet aircraft are not to operate under IMC unless either a TACAN/DME/NDB (for aircraft so equipped or a VHF/UHF DF facility is available at or within 25 miles of:

a. The airfield from where take-off is intended.

b. The airfield of intended landing.

c. Alternate airfield.

Division of Air Spaces

41. **Flight Information Regions (FIR)**. Defined areas of Air space extending vertically from ground/water level and normally have no upper limit. within which flight information and alerting services are provided.

42. **Controlled Airspace**. Defined areas of airspace within which Air Traffic Control service is provided to IFR and Controlled VFR flights. Controlled airspaces are of the following types.

a. **Control Zone (CTZ).** A controlled airspace extending upwards from ground/water level to a specified height.

b. **Control Area (CTA).** A controlled airspace extending upward from a specified height above ground or water level to a specified height or unlimited.

c. **Terminal Control Area (TMA).** A control area at the confluence of one or more airways/ATS routes.

d. **Control Aerodromes**. Those aerodromes where it is determined that air traffic control service designated as controlled aerodromes.

e. **Air Way** A controlled area in the from of a corridor equipped with radio navigational aid..

43. **Advisory Airspace**. An airspace of specified dimension within which air traffic advisory service is provided.

a. **Advisory Route**. A route within an FIR within which air traffic advisory service is available.

44. **Air Defence Identification Zone (ADIZ**). Defined areas of airspace extending upwards from ground/water level within which certain rules for the security control of air traffic are mandatory.

45. **Prohibited Area**. Specified areas of airspace within which flights are prohibited.

46. **Danger Area**. Specified areas of airspace within which there may be activities dangerous to aircraft.

47. **Restricted Area**. Specified areas of airspace designated, other than air traffic control purposes, as areas in which flight is restricted in accordance with certain specified conditions.

48. **No Light Areas**. Areas within which aircraft may be engaged in night flying exercises without displaying navigational light or conforming to the semicircular rule.

Classification of Airspace

49. **Class of Airspaces**.

a. ATS airspaces shall be classified and designated in accordance with the following.

(1) **Class-A**. IFR flights only are permitted, all flights are subject to air traffic control service and are separated from each other.

(2) **Class-B.** IFR and VFR flights are permitted, all flight are subject to air traffic control service and are separated from each other.

(3) **Class-C.** IFR and VFR flights are permitted, all flights are subject to air traffic control service and IFR flights are separated from other IFR flights are separated from other IFR flights and from VFR flights. VFR flights are separated from IFR flights and receive traffic information in respect of other VFR flights.

(4) **Class-D**. IFR and VFR flights are permitted and all flights are subject to air traffic control service, IFR flights are separated from other IFR flights and receive traffic information in respect of VFR flights, VFR fights receive traffic information in suspect of all other flights.

(5) **Class-E** IFR and VFR fights are permitted and all flights are subject to air traffic control service and are separated from other IFR flights. All other flights receive traffic information as far as is practical.

(6) **Class-F**. IFR and VFR flights are permitted, all participating IFR flights receive an air traffic advisory service and all flights receive flight information service if required.

(7) **Class-G**. IFR and VFR flights are permitted and receive flight information service if required.

b. States shall select those airspace classes appropriate to their need.

c. The requirements for flights within each class of airspace shall be shown in table=1.

Note: Where the proposed ATS airspaces adjoin vertically, ie, one above the other flights at a common level would comply with requirements of, and be given services applicable to, the less restrictive class of airspace. In applying this criterion, Class-B shall therefore be considered less restrictive than Class-A airspace, Class-C less restrictive than Class-B airspace, etc.

	Type of Flight	Separation Provided	Service Provided	VMC visibility and Distance from cloud minima	Speed Limitation	Radio Communication requirement	Subject to an ATC clearance
A	IFR only	All aircraft	Air traffic control service	Not applicable	Not applicable	Continuous two-way	Yes
B	IFR	All aircraft	Air traffic control service	Not applicable	Not applicable	Continuous two-way	Yes
	VFR	All aircraft	Air traffic control service	8 km at and above 3050m (10000ft) AMSL 5 km below 3050m (10000ft) AMSL. Clear of clouds.	Not Applicable	Continuous two-way	Yes
C.	IFR	VFR from IFR from VFR	Air traffic control service	Not applicable	Not applicable	Continuous two-way	Yes
	VFR	VFR from IFR	(1) Air traffic control service for separation from IFR (2) VFR/VFR traffic information (and traffic avoidance advice on request)	8 km at and above 3050m (10000ft) AMSL 1500km horizontal: 300 m vertical distance from cloud.	250 kt IAS below 3050m (1000ft) AMSL	Continuous two-way	Yes
D	VFR	Nil	Traffic Information between VFR and IFR flights (and traffic avoidance advice on request)	8 km at and above 3050m (10000ft) AMSL 1500 m horizontal; 300 m	250 kt IAS below 3050m (10000ft) AMSL	Continuous two-way	Yes

				vertical distance from cloud.			
	VFR	Nil	Traffic Information between VFR and IFR flights (and traffic avoidance advice on request)	8 km at and above 3050m (10000 ft) AMSL 1500 m horizontal; 300 m vertical distance from cloud.	250 kt IAS below 3050m (10000ft) AMSL	Continuous two-way	Yes.
E	IFR	IFR from IFR	Air traffic control service and traffic information about VFR flights as far as practical	Not applicable	250 kt IAS below 3050m (10000ft) AMSL	Continuous two-way	Yes
	VFR	Nil	Traffic information as far as practical	8 km at and above 3050m (10000ft) AMSL 1500 m horizontal: 300 m vertical distance from cloud.	250 kt IAS below 3050m (10000ft) AMSL	Continuous two-way	Yes
F	IFR	IFR from IFR as far as practical	Air trafic advisory service flight information service	Not applicable	250 kt IAS below 3050m (10000ft) AMSL	Continuous two-way	No
	VFR	Nil	Flight information service	8 km at and above 3050m (10000ft) AMSL	250 kt IAS below 3050m (10000ft) AMSL	No	No

				1500 ft) AMSL 1500 m horizontal: 300 m vertical distance from cloud. At and below 900 m AMSL or 300 m above terrain whichever is higher – 5km clear of cloud and in sight of ground or water.			
G	IFR	Nil	Flight information service	Not applicable	250 kt IAS below 3050m (10000ft) AMSL	Continuous two-way	No
	VFR	Nil	Flight information service	8 km at and above 3050m (10000ft) AMSL 1500 m horizontal; 300 m vertical distance from cloud. At and below 900 m AMSL or 300 m above terrain whichever is higher –	250 kt IAS below 3050m (10000ft) AMSL	No	No

5km clear
of cloud
and in
sight of
ground or
water.

When the height of the transition altitude is lower than 3050m (10000 ft) AMSL. FL 100 should be used in lieu of 10000 ft.

When so prescribed by the appropriate ATS authority.

a. Know flight visibilities to 500 m may be pointed for flights operating

(1) At speeds that will give adequate opportunity to observe other traffic or any obstacles in time to avoid collision or,

(2) In circumstances in which the probability of encounters with other traffic would normally be low, eg. In arenas of low traffic volume and for aerial work in low levels.

b. Helicopters may be permitted to operation less than 1500 m flight visibility. It maneuvered at a speed that will give adequate opportunity to observe other traffic or any obstacles in time to avoid collision.

Air Traffic Services

50. **Division of Air** Traffic Services. Various types of Air Traffic Services and units responsible to provide such services are listed below:

Name of the services	**Units responsible**
a. Flight information service	Flight Information Centre.
b. Advisory Service	Flight Information Centre
c. Alerting Service	Flight Information Centre
d. Air Traffic Control Service	
(1) Aerodrome Control Service	Aerodrome Control Tower
(2) Approach Control Service	Approach Control Officer
(3) Area Control Service	Area Control Centre

51. **Objective of Air Traffic Service**. The objectives of Air traffic savvies shall be to:

a. Prevent collision between aircraft.

b. Prevent collision between aircraft on the manicuring area and obstruction on that area.

c. Expedite and maintain an orderly flow of air traffic.

d. Provide advice and information useful for the safe and efficient conduct of flights.

e. Notify appropriate organisation regarding aircraft in need of search and rescue aid, and assist such organisation as required.

52. **Determination of the Need of Air Traffic Services**. The following are the criteria for provision of air traffic services:

a. The types of air traffic involved.

b. The density of air traffic.

c. The meteorological conditions.

d. Other factors that may be relevant.

53. **Flight Information Service (FIS).** FIS is provided for the purpose of giving advise and information useful for the safe and efficient conduct of flight.

54. **Scope of Flight Information Service**. Flight information service shall include pertinent information consuming:

a. Thunder storm, Tropical revolving storms, lines of squalls and server turbulent conditions.

b. Change in serviceability of navigational aids.

c. Condition of aerodrome and associated facilities.

d. Other information which as considered pertinent to safety.

55. Flight information service provided to VFR flights shall include weather conditions along with the route that are likely to make operation under visual flight rules impracticable.

57. **Advisory Service**. A service provided to ensure separation between aircraft operating outside controlled airspace. It offers a continuous separation service base on flight planed and position reports to aircraft flight, flight on IFR flight plans within the airspace covered by the advisory service provided aircraft are maintaining communication.

58. The procedure to be observed by pilots are not compulsory. Nevertheless, it is obvious that advice intended to preserve e separation can only be sound if it is based on accurate knowledge of the movement of all aircraft within the advisory airspace and those about to join or cross it.

59. Pilots are clearly to understand that air traffic advisory service does not afford the degree of safety and does not carry the responsibility of the air traffic control service in respect of the avoidance of collisions since it gives advice only and aircraft may be operating within the advisory route or area, unknown to the unit providing the service.

60. **Alerting Service**. Flight information centre is responsible to warn appropriate organisation for guarding of specified radio frequencies.

61. **Air Traffic Control Service**.

a. **Aerodrome Control** Aerodrome control is responsible for the control of all traffic (aircraft, vehicular and pedestrian) on the maneuvering area of an airfield, and on the control of aircraft taking off and landing of flying within the vicinity of the airfield provided that the flying is being conducted under visual flight rules. If flying is conducted for the overall control of aircraft flying in the vicinity of the airfield may be assumed by Approach Control.

b. **Approach Control**. Approach Control is responsible (with the radar and radio aids) for:

(1) In IMC-Exercising control of aircraft in regard to sequence and separation from known traffic:

(a) From take-off until the aircraft clears the aerodrome traffic pattern, or leaves the approach frequency.

(b) From the commencement of an instrument initial approach until the aircraft clears the instrument runway.

(2) In VMC-Exercising control in respect to sequence and separation from known traffic of all aircraft homing on radio or radar aids, until these are handed over to aerodrome control.

(3) Providing enroute navigational or other assistance as required by captains of aircraft and, when necessary, acting as communication link between aircraft and controlling authority.

Altimeter Setting.

62. Functions of a Pressure Type Altimeter. Atmospheric pressure reduces with the increase of height at uniform rate. The difference of pressure at any particular height for the sea level pressure is counted and converted into feet or meter shown by the pointer. The instrument which measures the height in an aircraft is called Altimeter.

63. The following pressure settings in a pressure type altimeter are used by aircraft flying in Bangladesh:

a. At all airfields - CNH

b. Enroute - (1) 1013.2 hPa
(2) 29.92 inches
(3) 760 mm

c. **Controlled Airspaces**. A value of QNH as specified by ATC unit concerned.

64. **Airfield QNH**. Airfield QNH is the observed pressure at an airfield elevation concocted for temperature and reduced to mean see leval (MS)L) using International commission for Air Navigation (ICAN) formula. The ICAN formula which is also called as ICAN standard formula is as follows:

a. The air is assumed as Dry

b. MSL pressure is 1013.25 hPa

c. MSL Temperature is 15^0c

d. Lapse Rate (LR) is 6.5^0c per KM (2^0/1000 ft)

e. Tropopause is up to 11 KM (36000 ft)

65. **Standard Altimeter Setting**. 1013.25 HP or 29.92 in or 760 mm. When set to a pressure altimeter it will show flight level. It is set for vertical separation during enroot flight. It is normally used above transition altitude.

66. **Terms Relation to vertical displacement**. Vertical displacement of the aircraft at or below the transition altitude and while descending through transition layer is to be expressed in terms of altitude when the altimeter is set to QNH. The same will be expressed as flight levels while ascending through transition layer when set to 'standard altimeter setting.'

67. **Flight Level**. Flight levels are expressed in units of hundred ie the number obtained by deleting the last two figures of the altimeter reading such as:

Flight level	Altimeter Reading (feet)	RT description
30	3000	Three zero zero
50	5000	Five zero zero
150	15000	One five zero
200	20000	Two zero zero

Pre-Flight Action

68. **Pre-flight Planning**. Before beginning a flight the captain of an aircraft is to familiarize himself with all available information appropriate to the mission Before a flight the captain of an aircraft is to:

a. Obtain weather forecast in writing for cross country flights longer than 200 nm and all outstation landing.

b. Have the flight authorised.

c. Carry out the full flight planning.

69. **Meteorological Briefing**. A general meteorological briefing is to be conducted centrally at all Flying Wings/Units before flying commences on any day or night, while submitting Flight Plan, pilots are to obtain met briefing and the Flt Plan is to be signed by DFO.

70. **ATC Clearance**. The pilot of an aircraft is to obtain approval from the ATC for the proposed flight. The detailed procedure for filing of a flight plan is given in the flight plan chapter.

71. **Acquaintance with current ATC Procedure**. Detailed ATC information is contained in AFM 60-13 and AFM 96-5. Captain of an aircraft is to ensure that he and the appropriate members of his crew keep update with ATC meters which may concern them in carrying out their normal air crew duties.

72. **Definition.** Diversion is the act of flying to an airfield, other than that originally intended for the purpose of landing. This term applies both when the captain of the aircraft makes the decision and when the advice or order emanates from an appropriate ground authority.

73. **Categories of Diversion.** Diversions originated by ground authority are of two types ie Grade-I (Mandatory) and Grade-II (Advisory). When captain of aircraft requests the diverting for reasons of his own, may be classified according to the nature of the cause though they do not fall in any category.

a. **Grade-**1. This message to the Captain of the aircraft indicate one of the following conditions:

(1) The weather enroot or destination is hazardous for flying.

(2) The diversions are to be made for some administrative or operational reasons;

b. **Grade-2**. This massage to the Captain of the aircraft indicate the following:

(1) The weather enroute or destination is hazardous for flying.

(2) For physical reasons landing at the destination airfield is hazardous.

74. **Reasons for diversions**. Diversions are normally made for any of the following reasons:

a. Aircraft unserviceability or shortage of fuel.

b. When the weather enroute is hazardous.

c. When the weather at the destination is below the minima for the pilots instrument rating.

d. When there is a failure of essential ground navigational aids.

e. Landing area is hazardous due obstruction.

f. When the destination airfield is closed.

75. **Diversion Procedure**. When the marginal weather conditions exist or diversion is likely owing to weather or airfield facilities DATCO is to inform:

a. Aircraft operating authority.

b. Dhaka FIC and ADOC.

76. The DATCO is to assist the Captain of the aircraft selecting the most suitable airfield for diversion, providing the for information:

a. Weather information enroute and at diversion airfield.

b. Serviceability state of the airfield facilities of the destination including the airfield state.

c. Clearance instructions.

77. The DATCO is to pass, as far as possible, the following information to diversion airfield on land line or on HF:

a. Type of aircraft.

b. Radio Call sigh.

c. Navaids on board.

d. Approximate ETA.

e. Remaining endurance.

f. Any other pertinent information.

OVERDUE

78. **Jet Aircraft.** A Jet aircraft (including turboprop aircraft and turbine engine helicopters) is “Overdue” if it fails to arrive at, or is not in radio communication with its destination airfield:

a. Within one hour after ETA; or

b. Within its notified endurance, if less.

79. **Action by Air Traffic Control Officer**. The following are the guidelines for DATCO:

a. Check with the runway controller and dispersal crew to ensure that the aircraft has not landed without the knowledge of ATCO.

b. Check with the airfield of departure that the aircraft did in fact depart as notified.

c. Check with ADOC if they had any radar contact.

d. After ensuring that the aircraft is genuinely overdue inform all flying units and inform search and rescue units.

e. Make additional efforts to locate the overdue aircraft.

f. Inform the appropriate unit personnel in accordance with local instructions.

CONSOLIDATION EXERCISE – 2

Q1. What are the minima for Control of Arriving and departing aircraft?

Q2. What are the minimum crash and let down facilities for Jet operation at an airfield?

Q3. What are the Contents of Flight Information Service?

Q4. What are the actions of an ATCO after an aircraft is genuinely overdue?

ANSWERS TO CONSOLIDATION EXERCISE-2

A1. Unless for considerations of safety or training dictates otherwise the following procedure shall be followed:

a. A departing aircraft shall not be cleared for take-off until the proceeding departing aircraft has crossed the end of runway or has started a turn or until all proceeding landing aircraft are clear of the runway.

b. A landing aircraft shall not be cleared to cross the beginning of the runway on its final approach until the proceeding departing aircraft has crossed the end of runway or has started a turn or all proceeding landing aircraft are clear of the runway.

A2 Normally two crash tenders are to be available for full scale flying by jet aircraft. Following are the exceptions in this respect:

a. Aircraft proceeding out station are permitted to take-off and incoming aircraft are permitted to land with one crash tender serviceable.

b. When only one serviceable crash tender is available, depending on the urgency of the flying missions and the state of reliability of the crash tender available, the Officer Commanding Base may permit flying to continue. Authority to take this decision is not to be delegated. Jet aircraft are not to operate under IMC unless either a TACAN (for aircraft so equipped) or a VHF/UHF DHF facility is available at or within 25 miles of:

(1) The airfield from where take-off is intended.

(2) The airfield of intended tending.

A3. Flight information service shall include pertinent information concerning:

a. Thunder storm, Tropical revolving storms, lines of squalls and severe turbulent conditions.:

b.

b. Change in serviceability of navigational aids.

c. Condition aerodrome and associated facilities.

d. Other information which is considered pertinent to safety. Flight information service to IFR flights is also to include the following information as well:

(1) Weather conditions reported or forecast at destination or alternate airfields.

(2) Icing conditions.

(3) Collision hazard of aircraft operating outside control zone.

A4. The following are the guidelines for DATCO:

a. Check with the runway controller and dispersal crew to ensure that the aircraft has not landed without the knowledge of ATCO.

b. Check with the airfield of departure that the aircraft did in fact depart as notified.

c. Check with ADOC if they had any radar contact.

d. After ensuring that the aircraft is genuinely overdue to all flying units and inform search and rescue units.

e. Make additional efforts to locate the overdue aircraft.

f. Inform the appropriate unit personnel in accordance with local instructions.

TASK-3

AIR FIELD STANDARD DIMENSION AND PHYSICAL CHARACTERISTICS

Lay out and Criteria of Air Field.

1. **Fair Weather Strip**. The width of the fair weather strips is to be 225 ft from the sides of the runway. This is to be leveled and compacted. The first five feet from the edges of the runway are to be bituminized.

2. **Runway Clearance**. A side clearance of 750 ft from the centre line of the runway is to be maintained free of all obstructions for the full length of the runway including over-run. The outer margin of the side clearance is to be known as the runway clearance line. The whole area is to be acquired and maintained free from obstructions.

3. **Clearance for Taxi Tracks**.

   a. No taxi track is normally to be built within the runway clearance area is 750 ft from centre line of the runway.

   b. Clearance for taxi way is to be 225 ft measured from centre line of the taxi track on either side.

   c. Width of te taxi tracks is normally to be 50 ft. The first five feet width of the shoulders from the edges of the tracks is to be bituminized and an additional width of 45 ft to be compacted.

   d. All curves on taxi way are to be bituminized for a width of 25 ft on outer side and equal width compacted.

4. **Airfields Clearance Policy**. It also applies to secondary runway. However, no expenditure is to be incurred on removal of existing obstructions but no new obstructions are to be allowed within the flying gap.

Flying Gap

5. **Over-run**. The length of the over-run area is to be 900 ft with a width of 750 ft on either side of the runway axis. This area will invariably be acquired. A width equal to that of the runway for the full length of over-run is to be constructed of flexible Pavements to a bearing strength equal to that of the runway.

6. Over-run Extension. The length of the over-run area is to be 3,000 ft. It is to be acquired and cleared of all obstructions including canals and ditches.

7. **Funnel**.

   a. The flying gap will start 900 ft from the end of the runway in line with the runway clearance line, spreading out to maximum width of 2,000 ft on either side of runway axis over-run.

b. The elevation clearance of the funnel is to be 1 : 50 commencing 3,900 ft from the ends of the runway and rising to a maximum of 182 ft at a distance of 13,000 ft from the end of the runway. The maximum height of 182 ft is to be maintained for a further distance of 15,000 ft with a width of 2,000 ft on either side of the runway.

c. To facilitate the maintenance of the funnel, the funnel area is to be demarcated by boundary pillars along the two outer sides up to a distance of 2,000 ft from end of extension of over-run. The approximate distance between the pillars is to be 300 ft, and the height about 3 ft. The transition area within the inner horizontal surface is to be similarly demarcated.

8. **Aprons.** A horizontal clearance of 125 ft from the edges of the aprons is to be maintained around such aprons. The first 25 ft from the edge are to be bituminized and an equal width to be compacted.

9. **Translation Area**. Transition surface with a slope 1:7 measured outward and upward be provided all along the runway including over0run, over-run extension, flying gap end at its end. The slope however of the same ratio is to be measured at right angles to runway axis except at the ends where it is to be measured parallel to it.

10. **Reference Point**. Reference points for measuring inner horizontal surface, inner conical surface, outer horizontal surface etc are to be as follows:

a. In case of single runway the mid point of the run-way axis is to be taken as reference point.

b. In case of two runways, it is to be the point where the perpendicular bisecting lines intersect.

c. In case of three runways, it is to be the point equivalent from the centers of each runway.

d. All heights are to be measured with reference to the ground level of the reference point.

Surfaces

11. **Inner Horizontal Surface**. Is to be a circle of radius 13,000 ft measured from the reference point. Within this area, obstructions are to be limited to a height of 150 ft above level of the reference point.

12. **Inner Conical Surface**. From the circumference of the inner horizontal surface, on outward and upward slope 1 in 20 is to be maintained from the reference point until reaching a maximum height of 500 feet.

13. **Outer Horizontal Surface.** From the outer circumference of the inner conical surface, a height of 500 ft above the level of the reference point is to be maintained for a distance of 50,000 ft from the reference point.

14. **General**. This policy is to apply to Civil and Military airfields in Bangladesh except that at all Civil airports fair weather strips are to be 425 ft wide as required by ICAO.

15. Pavement Classification Number (PCN). The bearing strength of the surface as defined by a number PCN which is determined by MES (Air) to indicate that a particular strength posses by a hard standing. The PCN should be displayed in the Control Tower so that it can be issued on request.

Indicators and Signaling devices.

16. The various signals and Indicators described below are displayed as required :

a. In the signal Area.

b. On the Signal mast.

c. In appropriate position in the airfield.

17. Signal displayed within the Signal area or horizontally on the airfield are for interpretation by pilots in the air. Signal displayed on the Signal mast or vertically on the airfield are for interpretation by pilots in aircraft on the maneuvering area of the airfield.

18. **Wind Direction Indications (Wind Socks).** An aerodrome shall be equipped with a at least one wind Direction Indicator and shall be located so as to be visible from aircraft in flight or on the movement area free from the effects of air disturbances caused by nearby objects. Location for sitting wind socks along with dimension is shown in figure No 1.

19. **Landing Direction Indicator (Landing T).** It is a white or orange letter ‘T’ displayed to indicate the direction of landing and take-off. An illuminated landing ‘T’ shall be made available as part of the aerodrome lighting system for use at night. Dimension is shown in figure No 2.

20. **Signaling Lamp**. A signaling lamp shall be provided at a controlled aerodrome in the control tower capable of producing red, green and white signals and of:

a. Being aimed manually at any target as required;

b. Giving a signal in any one colour followed by a signal in either of the two other colours, and

c. Transmitting a message in any one of the three colours by Morse code up to a speed of at least four words per minute.

WIND DIRECTION INDICATION

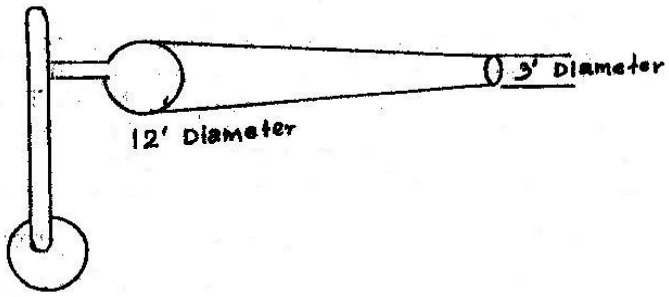


FIG – 1

LANDING DIRECTION INDICATOR

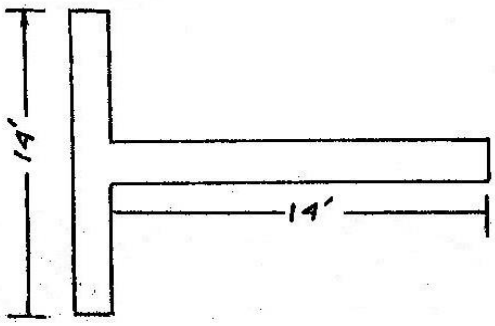


FIG – 2

SIGNAL SQUARE

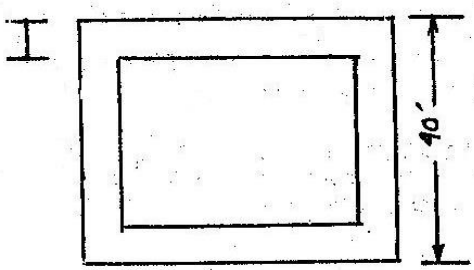


FIG - 3

Signal Area. The signal area is to consist of a square formed by a white border on foot wide, with internal sides measuring 40 ft. The border may be portable or permanent and made of any suitable material. The inside of the signals is to be black to provide the maximum contrast with the signals displayed (Fig-3). To ensure that ground signals indicate the correct state of airfield, the following regulations are to be observed when the air traffic control tower is not manned :

a. The landing “T” is to be covered or removed from the square.

b. The “Land in Emergency only” signal is to be displayed.

c. The runway control caravan is to be removed from the runway.

d. QDM Boards are to be removed from the tower.

Airfield Markings

23. Airfield Markings consist of signs on surface of movement areas to convey the following aeronautical information:

a. Runway marking,

b. Taxiway marking.

c. Unserviceability marking.

24. **Runway Designation Markings**. Runway designation markings shall be provided on all instrument and non instrument runways consisting two digit numbers. On parallel runways it shall be supplemented by al letter in the order shown below from left to right when viewed from the direction of approach : (Figure No 4).

a.	For two parallel runways	20L	20R	
b.	For three parallel runways	20L	20C	20R

25. **Runway Threshold Markings**. These markings shall be provided to all runway leaving 20 ft from the beginning and consist of series of longitudinal strips of uniform dimensions symmetrically placed about the runway centre line and extending laterally to 3 ft. from the edge of the runway. Strips dimension is 100 ft by 6 ft with gap of 6 ft in between the strips. (Figure No-5)

26. **Runway Centre Line Markings**. Runway centre line markings shall be provided on all instrument and non instrument runways. The dimensions of longitudinal white line shall be 100 ft by 3 ft with a gap of 100 ft between the strips (Figure No-4).

27. **Touch Down Zone Marking**. These shall be white longitudinal strips marked symmetrically about the runway centre line. Dimensions of touch down zone markings shall be 75 ft and 6 ft wide with a gap of 5 ft between subsequent strips (Fig No-6).

28. **Barrier Guideline Marking**. The Barrier guidelines of each runway end will be indicated by drawing two continuous lines 15 ft inward from edge of runway. Dimension of Barrier guidelines is 1500 ft by 1 ft, yellow colour starting from Barrier Cables, (Figure No-5).

29. **Taxiway Centre Line Marking**. Taxiway centre line shall be single unbroken yellow lines 6 inches wide along the centre line of the taxiway tracks and shall terminate after extending parallel to the runway centre line marking for a distance of at least 200 ft beyond the point of tangency (Figure No-4).

30. **Taxi Holding Position Marking**. These marking shall consist of two broken and two continuous yellow lines 6 inches width from edge to edge of the taxi track at right angles to its centre lines. The location of taxi holding markings shall be 250 ft from the runway centre line (Fig No-4).

31. **Closed Runways and Taxi Track Markings**. The closed marking shall be in the from of a cross with the minimum dimensions shown in Figure No-7 and shall be of single contrasting colour yellow or white.

32. **Incidental Failed and Dangerous Area**. Where a relatively small area of a runway taxi track or apron has failed or for any other reason becomes dangerous for aircraft operation, the incidental area is to be marked by flags for day marking and red lights for night marking of the dangerous area.

RWY DESIGNATION MARKING AND TAXI HOLDING MARKING

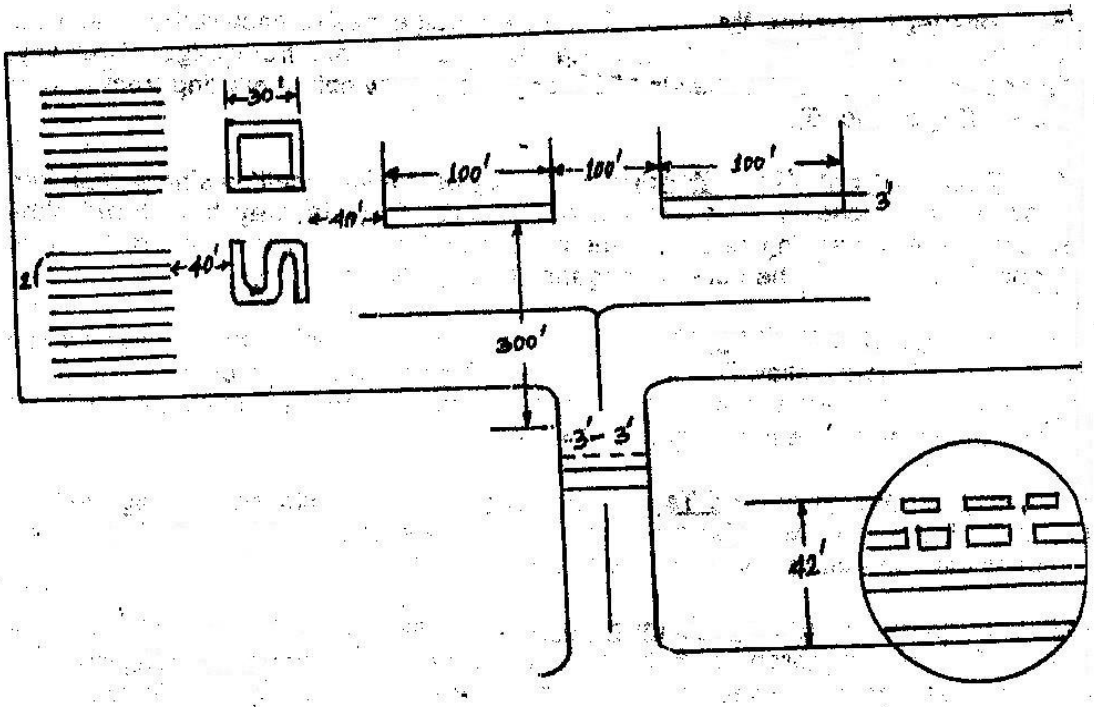


FIG – 4

THRESHOLD MARKING & BARRIER GUIDE LINE MARKING

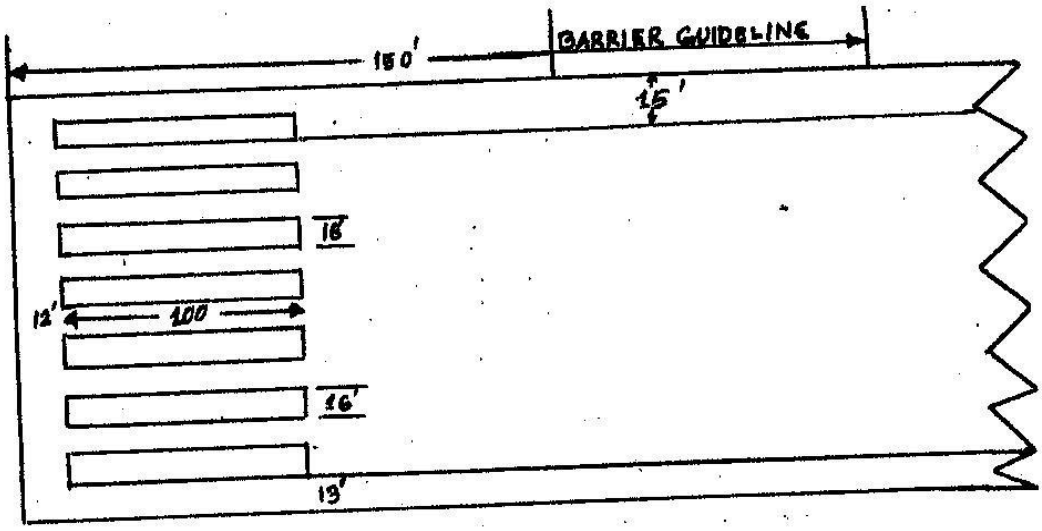
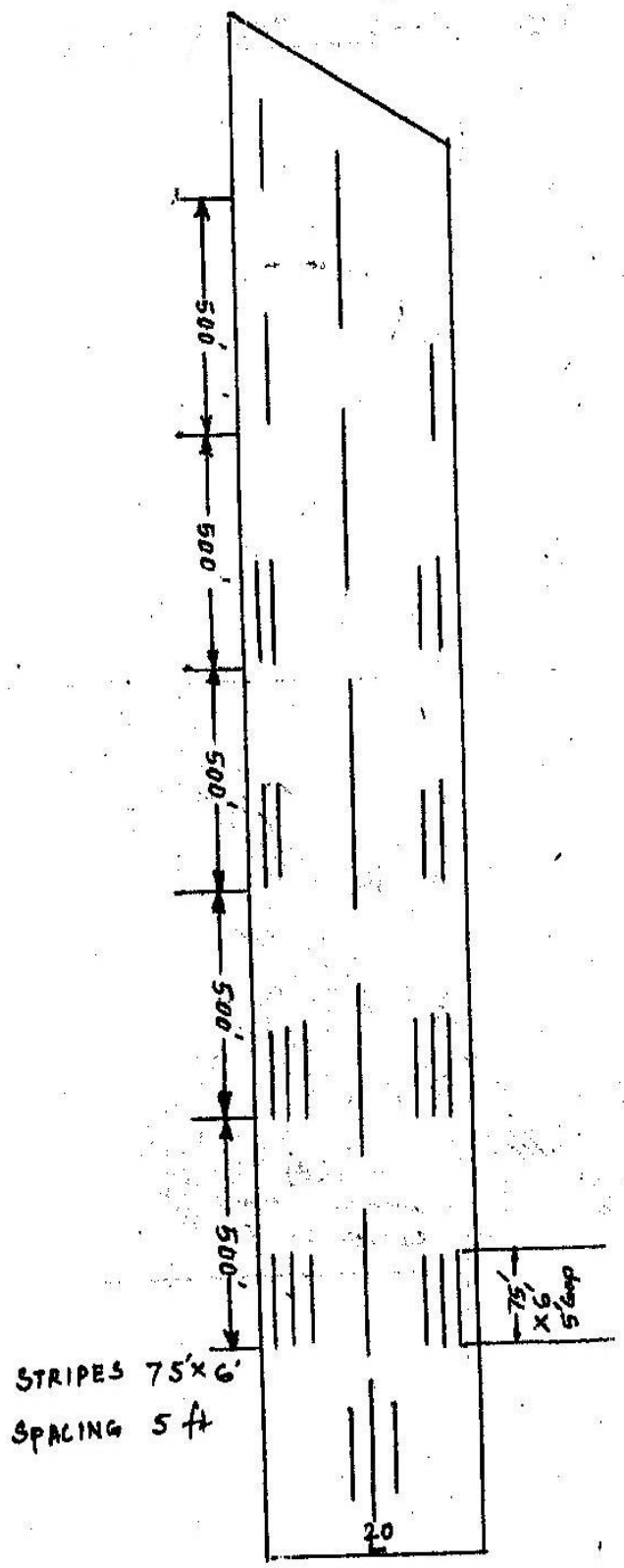


FIG - 5



TOUCHDOWN ZONE MARKING

FIG - 6

CLOSED RUNWAY AND TAXIWAY MARKING

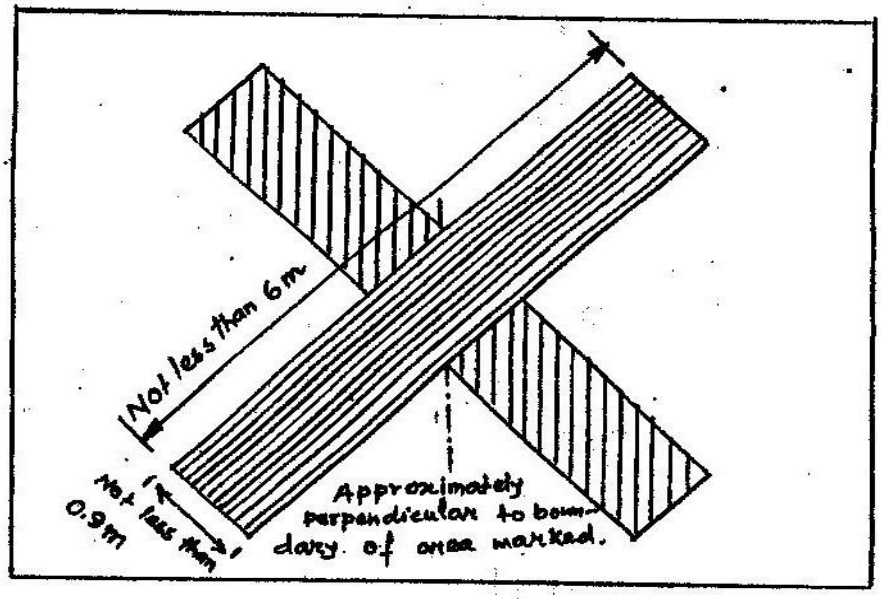


FIG -7

CONSOLIDATION EXERCISE – 3

Q1. What is the BAF Policy for runway clearance?

Q2. What are the Points for measuring the reference point of an aerodrome?

ANSWER TO CONSOLIDATION EXERCISE – 3

A1. A side clearance of 750 ft from the centre line of the runway is to be maintained free from all obstructions for the full length of the runway, including over-run. The outer margin of the side clearance is to be known as the runway clearance line.

A2. Reference points for measuring inner horizontal surface, inner conical surface, outer horizontal surface etc, are to be as follows:

a. In case of single runway the mid point of the runway axis to be taken as reference point.

b. In case of two runways, it is to be the point where the perpendicular bisecting lines intersect.

c. In case of three runways, it is to be the point equivalent from the centers of each runway.

d. All heights are to be measured with reference to the ground level of the reference point.

TASK-4

FLIGHT PLANS AND ATS MESSAGES

Flight Plan

1. A Flight plan is specified information provided to air Traffic Services units relative to intended flight of an aircraft. It is the responsibility of the captain or the aircraft to ensure that flight plan is correctly complied and submitted to the appropriate air traffic services unit. It is also to be filed through intermediate stops.

2. **Requirement to Submit a Flight Plan**. Flight Plans are required for all flights prior to departure with the exception of such local flight as may be exempted by Air Traffic Control.

3. Flight Plans are to be filed advance. The minimum period of advance notification is as follows:

   a. **In-flight IFR Flight Plan**. A flight plan filed from an aircraft is to be transmitted at least ten minutes flying time before the intended point of entry into a controlled airspace if transmitted by radio telephone and twenty minutes if transmitted by radio telegraphy.

   b. **On ground**. Flight plans are to be accepted only within two hrs prior to departure. A flight plan for an IFR flight is to be submitted at least 60 minutes prior to departure.

4. A Flight plan is to be field with ATC of departure airfield as specified below:

   a. **Transit Flights**. For all transit flights whether planned in VFR or IFR, the flight plan is to be invariably filed in writing irrespective of distance in BAF from 2919.

   b. **Local Flights**. For flights in local flying area or over approved firing ranges, the flight plan can be filed on R/T. This is to be done independently or in supplement to the flying programme supplied to ATC earlier.

   c. **Training Cross Country Flights**. If the syllabus is already available in ATC, only serial no of the training cross country may be informed to ATC. For other cross country flights, not involving landing out station, details of each leg are to be given.

5. Weather briefing is the personal responsibility of the Captain of the aircraft. He is also required to be current with latest NOTAMS and weather enroot. The ATCO on duty has the right to demand a written flight plan whenever in his judgment the nature of flight or traffic requires or he considered it necessary to keep a record of the flight clearance. In such cases he is to made the reason known to the Pilot.

6. Delay. In case of delay of one hour or more in the expected scheduled ground time a new flight plan is to be submitted and the old flight plan is cancelled.

7. **Chang in Flight Plan**. Appropriate ATC authority is to be notified immediately of a change in plan as applicable as follows:

a. **VFR Flight Plan**

(1) Cancellation.

(2) More than 30 minutes in ETD

(3) Route or Destination.

b. **IFR flight plan outside Controlled Air space**

(1) Cancellations.

(2) More than 30 minutes in ETD.

(3) Route or Destination.

(4) Height.

c. **IFR Flight Plan in Controlled Air Space**

(1) Cancellation.

(2) More than 10 minutes in ETD.

(3) More than 5 minutes in ETA.

8. **Cancellation of IFR Flight Plans in Flight**. Pilot may cancel VFR flight at any time by notifying ATC provided they are operating in VMC and the weather indicates that the rest of the flight can be conducted in accordance with VFR. The cancellation must be specified by Pilot in command than cancel my IFR flight. The aircraft flying in VMC or reporting field ground in sight does not indicate that IFR flight is cancelled. Whenever IFR flight is cancelled, and subsequently the flight encounters IMC the pilot in command can file another IFR flight plan.

ATS Messages

9. The types of aircraft movement massages used for the exchange of information within the Air Traffic Control Service are listed below.

10. **Types of Messages**.

Types of Messages	Message Type Designator	Military	ICAO Prefix
Flight Plan	FPL	Operational Immediate	FF
Short Departure	DEP	-“-	FF/DD
Flight plan and Departure	FPL/DEP	-“-	FF/DD
Departure	DEP	-“-	FF/DD
Delay	DLA	Priority	GG
Cancellation	CNL	-“-	GF
Diversion	Not to be Abbreviated	Operational Immediate	FF/DD
Request news	-“-	-“-	FF

CONSOLIDATION EXERCISE – 4

Q1. a. What is a Flight Plan?

b. What is the minimum advance notification of Flight Plans Passed to ATC?

Q2. Describe the procedures for cancellation of IFR Flight plan in Flight.

ANSWERS TO CONSOLIDATION EXERCISE – 4

A1. a. A Flight Plan is a specified information provided to Air Traffic Services units relative to the intended flight of an aircraft. It is the responsibility of the Captain of the aircraft to ensure that flight plan is correct, compiled and submitted to the appropriate air traffic service. It is also to be filed through intermediate stops.

b. The minimum period of Advance notification is as follows:

(1) In flight IFR Flight Plan. A flight plan field from an aircraft is to be transmitted at least ten minutes flying time before intended point of entry into a controlled airspace if transmitted, by radio telephony and twenty minutes transmitted by radio telegraphy.

(2) On Ground. Flight Plan is to be accepted only within two hrs prior to departure, a flight plan for an IFR flight is to be submitted at least 60 minutes prior to departure.

A2. Pilots may cancel IFR flight plans at any time by notifying ATC provided, they are operating in VMC and the weather indicates that the rest of the flight can be conducted in accordance with VFR. The cancellation mist be specified by Pilot in command that “Cancel my IFR flight”.

TASK-5

AIRSPACE ORGANIZASTION

Introduction

1. Ideally, the organization of the airspace over a given area should be arranged so that it corresponds to operational and technical considerations only. This is a concept which, in view of the may divergent and sometimes contradicting demands made on its use can, however, never be achieved other than by approximation of a more or less satisfactory nature. It is therefore believed to be more useful, if a number of principles were listed there which, when judiciously applied, should permit an acceptable compromise to be reached in this field of airspace organization.

2. In planning the organization of the airspace, the first point to be made is that none of those laying claim to its use should attempt to exploit his advantages because he finds himself momentarily in a position of strength (be it political or numerical) when compared with that of other parties. Experience has shown that, over a longer period, such positions tend to change with the effect that, when they do, others will then exploit their temporary advantages, thus setting the stage for a course of events which, in the long run, is damaging to all parties conceded and to the air traffic services (ATS) system of the States concerned.

3. The second point, following directly from the first, is that any airspace organization must provide for an equitable sharing of its use by all those having a legitimate interest in it. In this respect, it has been found that, to resort to segregation of the airspace, i.e. its splitting and subsequent systematic allocation to the exclusive use by a specific party, generally results in the least efficient over-all use of the available airspace as it invariably leads to a sterilization of large portions of the airspace for prolonged periods of time. The objective should therefore be to organize the airspace so that it can be used in the most flexible way, through co-ordinate, or better yet, combined use by as many parties as possible. This applies particularity with respect to the two major groups of users, i.e. the civil and military.

4. A third point to be borne in mind in this respect is that, because of the imitational character of many aircraft operations, the organization of the airspace over one State can hardly be looked at in isolation but mst, by necessity, be seen as an integral part of a much wider system covering, in general, not less than an ICAO region. It is therefore essential that States co-ordinate any modifications to airspace organizations at the required level.

DEsIGNATION AND ESTABLISHMENT OF SPECIFIC PORTIONS OF THE AIRSPACE

5. The relevant provisions in Annex 11, 2.5 specify that, once it has been decided that ATS are to be provided, the airspace, wherein such services are rendered, should be designated by the following terms:

a. Flight information Region (FIR).
b. Control Area (CTA).
c. Control Zone.

In addition, aerodromes where air traffic control (ATC) is provided, should be designated as controlled aerodromes.

6. FIRs normally encompass the entire airspace over the entire airspace over the territory of a state. Adjacent FIRs should be contiguous and, if possible, be delineated so that operational considerations regarding the route structure encompassed by them take precedence over their alignment along national borders. The decision to establish more than one FIR to cover the airspace over a State is, for obvious reasons, not only primarily dependent on the size of the State concerned but also dependent on the air route structure extending over the State, its topography and, last but not, least, cost effectiveness considerations and the need to keep facility management problems of the ATS units providing services in them to manageable proportions.

7. With regard to the delineation of FIR boundaries over the high seas, these will, in any case, be subject to regional air navigation agreement and should be based on the existing and expected air route structure as well as on the ability of selected provider States to furnish the required services without undue efforts.

8. CTAs should be established so that they cover that airspace which will encompass the flight paths of those instrument flight rules (IFR) flights within an FIR to which it is believed necessary to provide ATC. When deciding whether or not ATC should be provided, the following should, among other factors, be taken into account:

a. The desire of operators of flights concerned to obtain that service.

b. The type and density of air traffic at any moment or during specific periods and the resulting risk of possible collision between flight.

c. The prevailing meteorological conditions.

d. Other relevant factors of a local nature, i.e the general topography, hospitability of the area over flown, etc.

9. ATC service may be suspended under the following conditions:

a. When traffic density and/or complexity along certain routes followed by aircraft decreases below the critical point; or

b. When traffic density and / or complexity, on which the requirement for ATC is based, is limited to definable periods of time.

10. CTAs can be formed by:

a. Terminal control areas (TMAs) of sufficient size to contain the controlled traffic around the busier aerodromes;

b. Interconnecting airways of:

(1) A lateral extent determined by the accuracy of track-keeping of aircraft operating on them, as well as the navigation means available to aircraft and their capability to exploit them.

(2) A vertical extent covering all levels required to be provided with control service; or

c. Area-type control areas within which specific ATS routes have been defined for the purpose of flight planning and which provide for the organization of an orderly traffic flow;

d. In the case of oceanic airspace, control areas may be achieved by the establishment of one or more route structures serving specific traffic flows; or if the complexity of oceanic ATS routes so warrants, by the establishment of an area type oceanic control area.

11. Control area arrangements have the advantage that, whenever traffic conditions permit, ATC may authorize specific flights under its control to deviate from the established ATS routes or route structure, normally in order to follow a more direct flight path between specified points along its route, without aircraft leaving controlled airspace and thus losing the benefit of ATC.

12. In certain areas, it could also be desirable to divide FIRs and CTAs so that an upper and a lower airspace is provided along a vertical plane. When this is done, an FIR and/or CTA in the upper airspace may laterally encompass the areas of more than one lower FIR or CTA. However, the lateral limit of such an upper FIR or CTA should, in any case, coincide with the corresponding peripheral lateral limits of the underlying FIRs or CTAs encompassed by the upper FIR/CTA, in order to retain the necessary compatibility in the transfer of responsibility for aircraft between adjacent ATS units in the lower and in the upper airspace (see Appendix A, Figure A-6).

13. The reasons for the vertical division of airspace as described above can be two-fold:

a. Either to spilt the workload of ATS so that the workload imposed on one ATS unit remains within manageable proportions, both as to its area of responsibility and the amount of traffic it is required to handle; or

b. To apply to air traffic operating in the upper airspace, operating conditions which are different from those applied in the lower airspace and which are motivated by operating parameters which are motivated by operating parameters which are peculiar to traffic operating in that airspace (e.g. prohibition to operate in accordance with visual flight rules , use of the area – type control versus the airway type, etc) ; or

c. A combination of (a) and (b) above.

In any case, if such a vertical split is made, it should be ensured that the plane of division, chosen for the reasons under (a) above, is not different from that chosen for the reasons given in (b) above because it will complicate procedures for pilots as well as for controllers. Furthermore, the plane of division chosen by one State should be carefully co-ordinate with adjacent States in order to avoid transition and co-ordination difficulties at the transfer points,. Whenever possible, such a plane should be established uniformly over the largest possible area and the borderlines between different planes of division, if these must exist, should be placed where they have the least detrimental effect on pilots and ATC.

14. Furthermore, (ref: Part-I, Section-2, Chapter-1, 1.5.5 and 1.5.6) with respect to control zones and aerodrome traffic zones, it appears sufficient to stress once more that control zones should be kept as small as possible, consistent, with the need to accommodate the flight paths of controlled IFR flights between the lower limits of a CTA and the aerodrome for which the control zone is established. In addition, their size may also be influenced by the need to permit special VFR operations around the aerodrome in question. As to aerodrome traffic zones, these should only be established where the activities requiring their establishment are of sufficiently frequent duration and involve a reasonably large number of aircraft.

15. From the nature of the air traffic advisory service, as described in Part-I, Section-2, Chapter-2, 2.7, it follows that the establishment of advisory airspace should be governed by what has been said for the establishment of advisory airspace should be governed by what has been said for the establishment of CTAs and control zones as to their extent and configuration. In fact, such airspace should be considered as the precursor of controlled airspace during that period when air traffic advisory service is provided in anticipation of full ATC.

AIRSPACE RESTRICTIONS AND RESERVATIONS

General

16. Since the demands on the use of airspace are manifold, some of which are not compatible with civil aviation (e.g. rocket firing) and because there exist sensitive areas on the ground which need protection from possible disturbance by over flying aircraft, it is recognized that there will be a need for States to establish airspace restrictions of varying degrees of severity. In addition there are aerial activities by specific users or user groups which may require the reservation of portions of the airspace for their exclusive use for determined periods of time.

17. Whenever such restrictions and/or reservations have to be imposed, they invariably constitute a limitation to the free and unhampered use of that airspace with the associated restrictive effects on flight operations. It is therefore evident that the scope and duration of restrictions established should be subject to very stringent scrutiny in order to keep undesirable effects to the minimum consistent with the reasons causing their creation. To achieve this, it will be essential to create appropriate methods or organizations, in which all users and providers are adequately represented, for screening requests for airspace restrictions or reservations.

18. Such methods or organizations should:

a. Ensure that the activities leading to the request for the establishment of an airspace restriction or reservation are in fact valid and justify such action.

b. Determine the minimum needs, in terms of space and time and the conditions of use, required to confine the activities so that potential hazards and disruptions to other users of the airspace are minimized or avoided.

c. Keep established airspace restrictions and/or reservations under frequent review in order to determine whether they are still required or may be abandoned when their need has ceased to exist, or whether modification in the light of changed requirements may be necessary.

19. With respect to (a) above, one important aspect is the determination of how a request can best be met with the least interference to other users of the airspace. In many cases, experience has shown that requests have led to restrictions of the airspace when in fact the some purpose could have been achieved by an airspace reservation. If appropriate co-ordination had been effected between all parties concerned, granting an airspace reservation versus an airspace restriction would have resulted in significantly less detrimental effects on other users of the airspace in question.

Types of Restrictions

20. Airspace restrictions can take the following from:

a. Danger area; or

b. Restricted area; or

c. Prohibited area.

21. According to their definitions, a danger area implies the least degree of restriction, while the prohibited area constitutes its most stringent form. It should also be noted, however, that this definition is applied only with respect to airspace which is situated over the territory of a State. In areas where no sovereign rights are exercised (e.g. over the high seas) only danger areas may be established by that body responsible for the activities causing their establishment.

22. The establishment of a danger area by a State over its territory is justified when the activity in that area is of such a nature that the risk involved requires non-participating aircraft to be aware of the risk. Since, in all cases, it is mandatory that the reason causing the establishment of an airspace restriction be given in its publication, it remains then at the discretion of the pilot to decide whether or not he can face the risk with a reasonable degree of certainty that it will not have serious consequences for his flight.

23. Over the high seas, regardless of the risk involved, only danger areas can be established. Those who initiate danger area restrictions over the high seas are under an increased moral obligation to judge whether establishment of the danger area is unavoidable and if it is, to give full details on the intended activities therein. It would also appear that activities exceeding a certain risk level should not be conducted in such airspace and that other method of achieving the desired objective such as temporary airspace reservations should be applied.

24. Restricted areas are generally established when the risk level involved in the activities conducted within the area is such that it can no longer be left to the discretion of individual pilots whether or not they want to expose themselves to such risk. In many cases the activities within a restricted area are not permanently present, it is therefore of particular importance that the times when these areas are actually required be closely surveyed and monitored.

25. The establishment of prohibited areas should be subject to particularly stringent requirements because the use of that portion of the airspace encompassed by the prohibited area is completely forbidden to aircraft. It has therefore become general practice to establish such areas only to protect important State Installations critical industrial complexes whose damage as a result of an aircraft accident could assume catastrophic proportions especially sensitive installations which are essential for the national security.

Airspace Reservation

26. It is generally accepted practice that airspace reservations should only be applied during limited periods of time and should be abolished as soon as the activity having caused their establishment ceases. In addition, establishment of airspace reservations is governed much more by ATS considerations than is the case with airspace restrictions. In fact, airspace reservations should be coordinated primarily with the ATS units directly concerned because they will be in the best position to propose and develop the procedural means required to put the reservation into effect.

27. In general, there exists two types of airspace reservations-namely, those which are established in a fixed relation to defined areas on the surface of the earth and those which are “mobile” because they follow activities which move in relation to the surface. Fixed airspace reservations generally cover specific flying or other events which are restricted to a specific area (military exercises, flying displays, etc) while mobile airspace reservations are loosed to cover activities such as aerial refueling, en-route mass formation flights, etc,. For both types of reservations it is, however, essential that, depending on the activities conducted therein, adequate buffer areas be established around the reserved areas in order to ensure that ATS can provide an adequate buffer areas be established around the reserved areas in order to ensure that ATS can provide an adequate margin of safety between non-participating aircraft and the activity concerned.

28. While it is recognized that there may exist legitimate reasons for establishment of airspace reservation experience also seems to indicate that, once established, their existence is maintained long after the conditions having caused their creation have ceased to exist. It is therefore important, that such airspaces be critically reviewed by States, especially with regard to maintaining a reasonable balance between the purpose to be achieved by their creation and the appreciable additional workload and interference they impose on flight crews in the conduct of their flight.

Special Designated Airspace

29. In a number of cases, States have found it necessary to establish special portions of designated airspace where aircraft, when operating therein, are required to comply with procedures additional to those resulting from normal provision of ATS (mainly special identification and/or reporting procedures). Such areas are designated by a variety of names, i.e. Air Defence identification Zone (ADIZ) being one of the more common ones, but they all have in common the understanding that non-compliances by aircraft with the imposed provisions generally result in prompt retaliatory action (interception, forced landing, etc).

APPENDIX A
ILLUSTRATION OF AIRSPACE CONFIGURATION

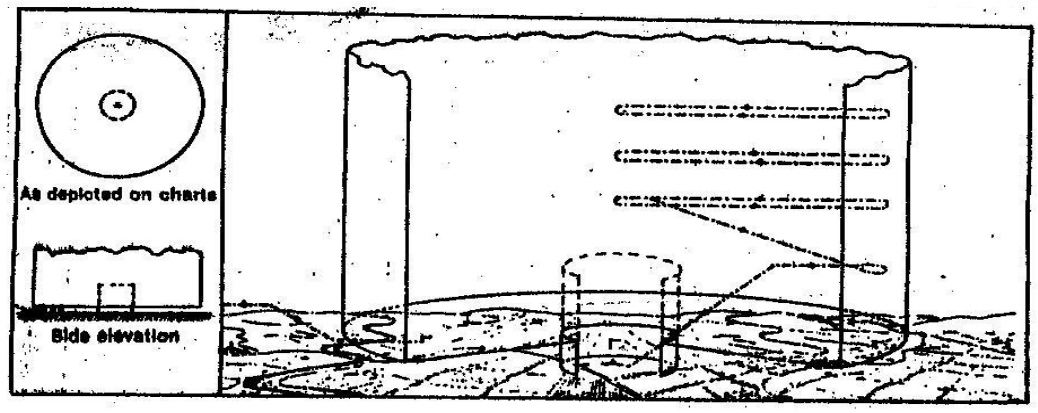


Figure A-1

1. When the provision of ATC service to IFR flights is limited to traffic arriving at and departing from an aerodrome used in instrument meteorological conditions (IMC), a control zone encompassing the flight path of the IFR traffic to be protected must be established. Since a control zone extends upwards from the surface of the earth and the provision of control therein will of necessity entail the imposition of certain restrictions on VFR flights operating within the control zone, it is essential that its lateral extent be kept to the minimum. However, in accordance with Annex 11, 2.7.5.2 the lateral limits of the control zone should not be less than 9.3 km (5NM) from the centre of the aerodrome concerned, in the directions form which approaches may be made.

2. To keep the lateral limits of a control zone to a minimum, thereby enabling the maximum number of VFR operations to be conducted outside it, the control zone is invariably supplemented by additional controlled airspace normally in the form of a terminal control area (TMA), the lower limit of which, as may be noted in Annex 11, 2.7.3.2, must be established at a height of not less than 200 m (700 ft) above the ground or water.

3. Figure A-1 illustrates a simple combination of a control zone and a TMA which should be used unless problems due to the proximity of other controlled airspaces obstructions dictate otherwise.

4. Where it appears desirable to increase the airspace within which special VFR flights may be authorized, the control zone may be extended upward so as to protrude into the TMA up to a specified limit.

5. When meteorological conditions do not permit a VFR flight to be conducted in a TMA or control zone, such flight may, within the meteorological conditions prescribed in Annex-2 – Rules of the Air, be operated below the TMA or, subject to special ATC authorization into, within or out of the control zone.

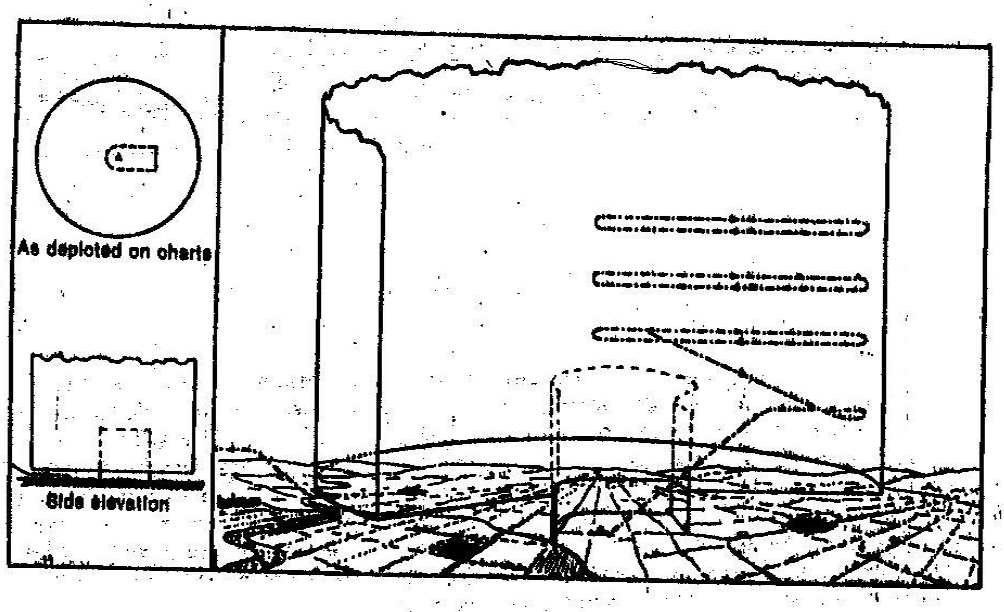


Figure A-2

1. Figure A-2 is similar to figure A-1 except that the lateral limits of the control zone are not shown circular in shape but are extended to a least 9.3 km (5 NM) only in the direction of approach when circumstances preclude its extension to that distance in all directions.

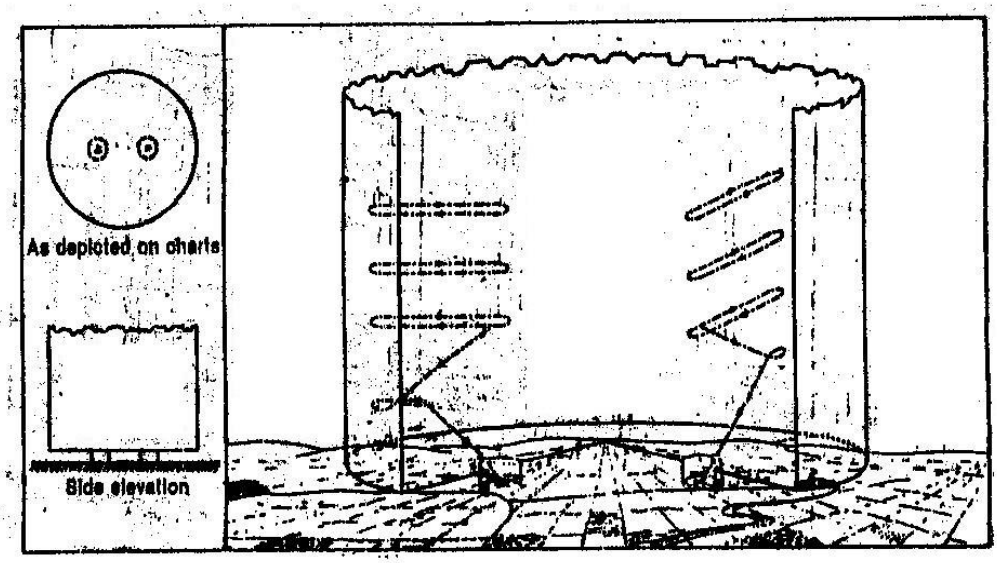


Figure A-3

1. Where two (or more) control zones are located close together and it is operationally undesirable to supplement each with a separate TMA, the control zones should be supplemented by one common TMA.

2. Figure A-3 shows a combination of two control zones and one TMA centred hafl-way between them. The TMA can, however, take any other shape as long as it encompasses the airspace required by IFR flights to be protected, always bearing in mind that it should also permit VFR operations conducted outside its limits and not bound for aerodromes which it serves.

1. Figure A-4 depicts a typical orgasitation of airspace into control zones and control area of specifictypes (i.e. TMAs and airways) to meet the minimum requirementsof IFR traffic during enroute, approach and departure phasesof flight. As indicated, the TMA together with the airwaysextending there from, forms one homogeneous control area.

2. It is to be noted that whereas the control zone in the centreof the diagram are shown supplimentedby a TMA, the control zone at the left extrimity of the diagramshown supplementedby an airway because the establishment of TMA is not always warrented.

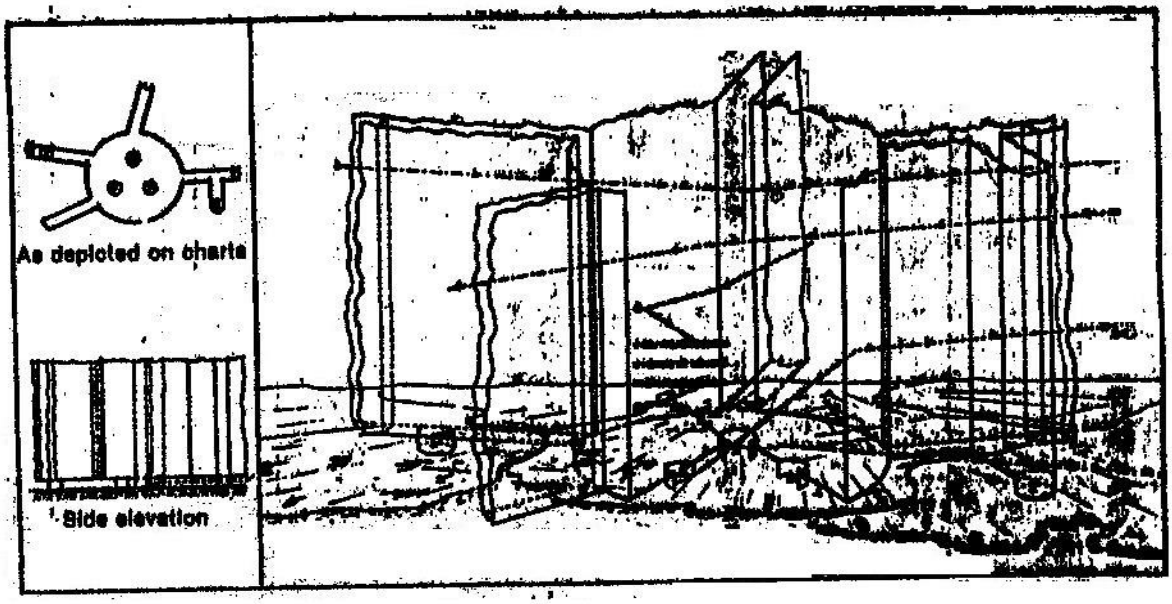


Figure A-4

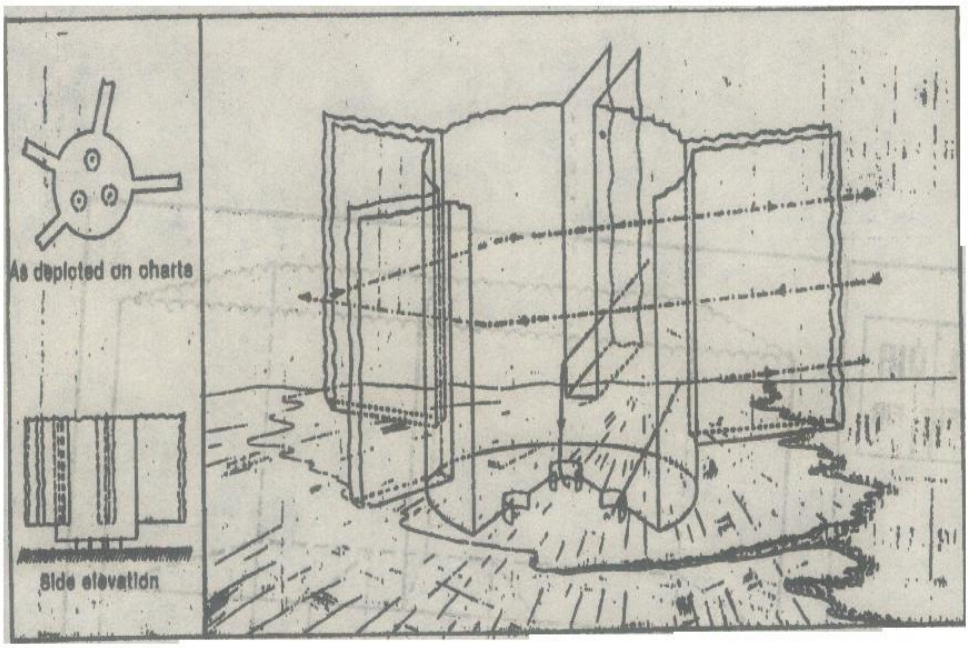


Figure A-5

1. Figure A-5 depicts a similar orgasition of airspace as figure A-4, except that the lower limit of the airways has been established at a relatively high level, to that of the TMA, in order to give more freedom for the operation of VFR flight below the airways.

2. However, in this case, it is necessary to complement the airways with TMAs in the vicinities of aerodromes used for IFR operations, in order that the size of the control zone may be kept to the minimum.

1. Where an upper flight information region (UIR) is established which encompasses the airspace of more than one FIR situated beneath it, the outer boundaries of the UIR should be coincident with the peripheral boundaries of the lower FIRs it encompasses.

2. The place of division between the lower and the upper airspace should be VFR cruising level selected from the table in Appendix C to Annex.

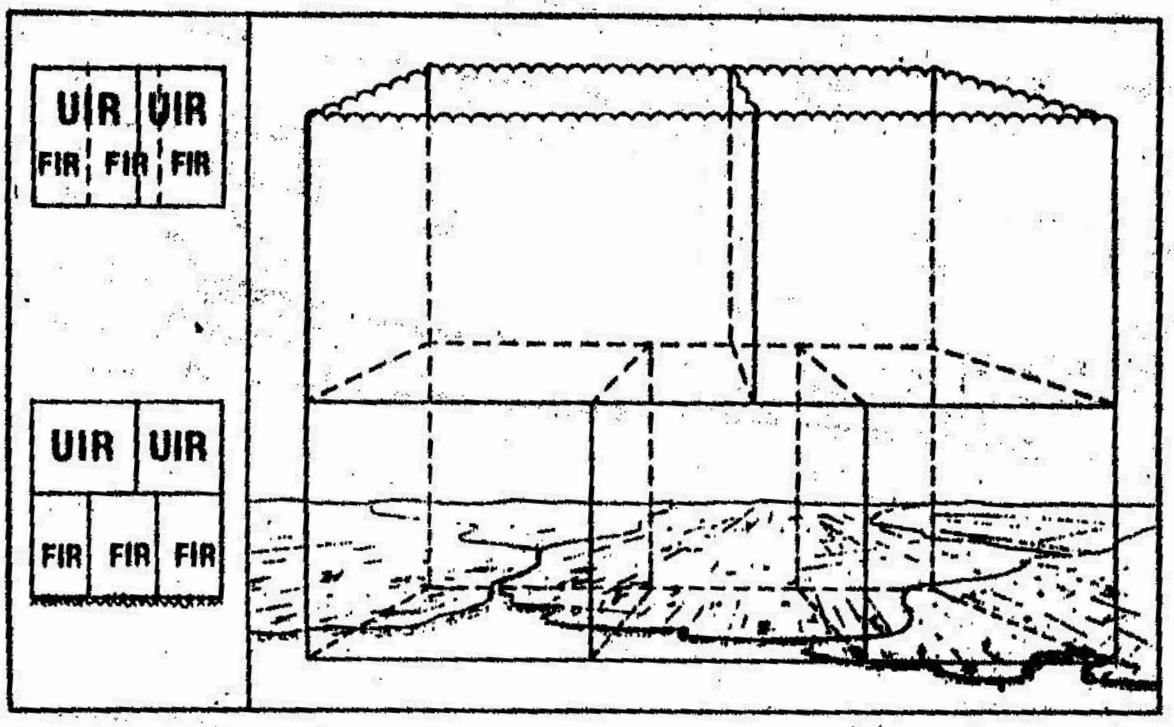


Figure A-6

CONSOLIDATION EXERCISE – 5

Q1. When restricted areas are established?

Q2. Describe special designated airspace in brief.

ANSWERS TO CONSOLIDATION EXRCISE – 5

A1. Restricted areas are generally established when the risk level involved in the activities conducted within the area is such that it can no longer be left to the discretion of individual pilots whether or not they want to expose themselves to such risk. In many cases the activities within a restricted area are not permanently present, it is therefore of particular important that the times when these areas are actually required be closely surveyed and monitored.

A2. In a number of cases, States have found it necessary to establish special potions of designated airspace where aircraft when operating therein, are rewired to comply with procedures additional to those resulting from normal provision of ATS (mainly special identification and/or reporting procedures). Such area are designated by variety of names, i.e. Air Defence identification Zone (ADIZ) being one of the more common ones, but they all have in common the understanding that non-compliance by aircraft within imposed provisions generally result prompt retaliatory action (interception, forced landing etc).

TASK-6

AERODROME CONTROL

Selection of Runway

1. Landing performance of modern aircraft being critical, it is necessary to lay down a policy Guide for the selection of the most suitable runway under varying conditions to ensure effective and efficient operations. It is not the intention to deprive the local commanders of their initiative and judgment by a set of inflexible rules but the followings are to be used as a guideline for selection of the suitable runway at BAF airfields.

2. **Direction of the Wind**. Normally the runway most nearly aligned into wind is used for all take offs and landings. A runway however, is continued to be used in light and variable wind, conditions not exceeding a down wind component of 6 knots. The maximum permissible cross wind components of each aircraft laid down in appropriate dash one are not to be exceeded.

3. **Factors Affecting the selection of Runway**. Following are some of the factors other than prevailing wind which affect the selection of the suitable runway:

a. Availability of the runway barrier for fighter aircraft for a particular runway end.

b. Length, slope and braking conditions of the runway.

c. Availability or otherwise of radio visual aids for approach and landing, (eg GCA, VASI. Strobe Beacon and approach lights) on a certain runway particularly during marginal weather conditions.

d. Position of the sun especially in the morning and evening.

4. **Air Defence Alert Aircraft**. The parked position of Air Defence Alert aircraft is a serious consideration for selection of the suitable runway. Hot scramble are to have priority over all other traffic. These aircraft are to be allowed to take-off on any runway direction provided the down wind and cross wing components are in consistency with safe aircraft operation. The Base Commanders are to lay down the maximum permissible down wind component for, each type of aircraft on a hot scramble keeping in view the local and aircraft limitations and pass this information to Air Headquarters. They are also to lay down the procedure for repositioning the Air Defence alert aircraft should the down wind component exceed the laid down limit. The aircraft on practice scramble, however, are not to be permitted the above relaxation and are to take-offs on a suitable runway with down wind component not exceeding 6 knots as for normal traffic. After the completion of the mission the aircraft on hot scramble are to land on the runway into wind and not necessarily on the runway on which the take-offs are being accomplished. This might necessitate quick raising and lowering of the arresting barriers and the bases are to evolve procedures to accomplish this.

5. **Landing on Wet Runway**. As a general rule the landing run is doubled on a wet and a slippery runway. No landings are therefore, to be permitted on a wet runway with a down wind component unless the aircraft is in emergency.

6. **Availability of Arresting Barrier**. In marginal weather and poor visibility conditions a pilot might not be able to land without the use of available radio radar, or visual aids for approach and landing. If the needed aid is available on only one end of the runway and the aircraft is not in a position to proceed to a suitable diversions a landing is to be permitted upto a maximum down wind component of 14 knots provided the runway is not wet and a barrier is available for this runway.

7. **Poor visibility on Approach**. Should a pilot request for a take-off or a Landing in direction other than the one in use due to poor visibility on approach or position of the sun, it is to be permitted if the traffic position and the limitation laid down above are not violated.

Airfield Inspection

8. **Inspection in General**. The physical condition of the surface is to be inspected and checked thoroughly. Careful attention is to be given for loose stones, subsidence, cracking grass and weeds growing in concrete joints. The SATCO has progress of weekly runway and taxiway sweeping, but if any area requires sweeping urgently this is to be noted and arranged. Mechanical Debris (Such as nuts or bolts) is to be picked up and kept for cower examination; there is always a remote possibility that it may have fallen from an aircraft. Light aircraft landing Areas and any other grass surfaces to be used by aircraft is to be checked for soft patches, displaced marker strips and obstructions. Lighting sodium lamps and VASI's is to be checked "ON". If a lamp is out, check the fitting for possible damage. Jet Bemires is to be checked for obvious damage to cables nets or uprights. A measuring for is to be provided to check the height of the upper cable. Obstructions likely to be a danger to aircraft are to be removed if they are within the clearance limits of runways or taxi ways. Any obstructions which are not to be, removed for operational or other reasons, are to be marked with obstructions markers by day and red marker lamps by night. Markings are to be checked for good contrast and definition. A note is to be made if any replanting is necessary.

9. **Aerodrome Inspections before Night flying**. The aerodrome Controller is to make a complete inspection of all runway, taxiway and obstruction lighting to be used during the night flying period. The aerodrome beacon, if invisible from the tower is not to be forgotten. The emergency flare path is to be in position and any pert of it which local orders specify, is to be lit. Immovable obstructions and other hazards are to be provided with sufficient red Marker lamps.

10. **Action After Completing Inspection**. All aerodrome inspections are to be recorded in the ATC log and the result of the inspection is to be recorded:

a. In the Aerodrome Inspection Log, (usually kept) otherwise the ATC log.

b. On the Work in Progress Plan, which is thereby brought up to date.

Any unusual or hazardous conditions are to be notified to flight planning (usually at the morning or night aircrew briefing by the DATCO) and to all flying units. Visiting pilots are to be advised by R/T.

11. **Sweeping of Paved Surfaces.** Mechanical sweepers which are provided, for sweeping if not self propelled are to be towed by tractors; the speed of tow is not to exceed 3 miles per hour and no other vehicle is to be used for towing. Sweeping is to be carried out under control of duty ATCO who is to detail an airman, properly briefed, to accompany the driver. The tractor and the driver are to be detailed by officer commanding Admin, Wing according to requirements of ATCO. Runways, taxi-tracks, dispersal's and hard standings are to be swept as routine once every week and additionally on the following occasions:

a. After a storm.

b. After an accident (Only the area affected is to be swept).

c. Whenever considered, necessary.

The weekly sweeping is to be carried out by breaking up the task, for example, as follows:

a. Runways to be swept on non-flying day.

b. Taxi-tracks are to be divided into two areas and each area is to be swept on separate days after cessation of intensive flying.

c. Dispersal and hard standings are to be swept after cessation of normal flying.

12. **Limiting Weather Conditions at BAF Airfields**. The color code used for airfield states is an intelligible system of indicating the prevailing weather fond safe operations at an airfield. The airfield states are to be used as a guide and are related to the instrument ratings. It would be unrealistic to lay down any rigid weather minima for aircraft operation since it depends on variables like aircrew proficiency anticipated and enrooted weather availability and serviceability of aids at home destination and diversion airfields cross wind component and wet runway conditions. It had therefore been left ot the Base Commanders to establish safer minima if they feel the need and on the other hand authorise aircraft operations in conditions below the prescribed minima if sufficient justification exists due to operational reasons or in emergencies. The aircraft in the BAF have been divided in to following four categories according to their performance for the purposes of operations at airfields with critical weather:

Category – I Transport, Basic Trainer, Maritime and other Light aircraft.

Category – II Subsonic bomber, Fighters and advanced Trainer aircraft

Category – III Supersonic Fighters.

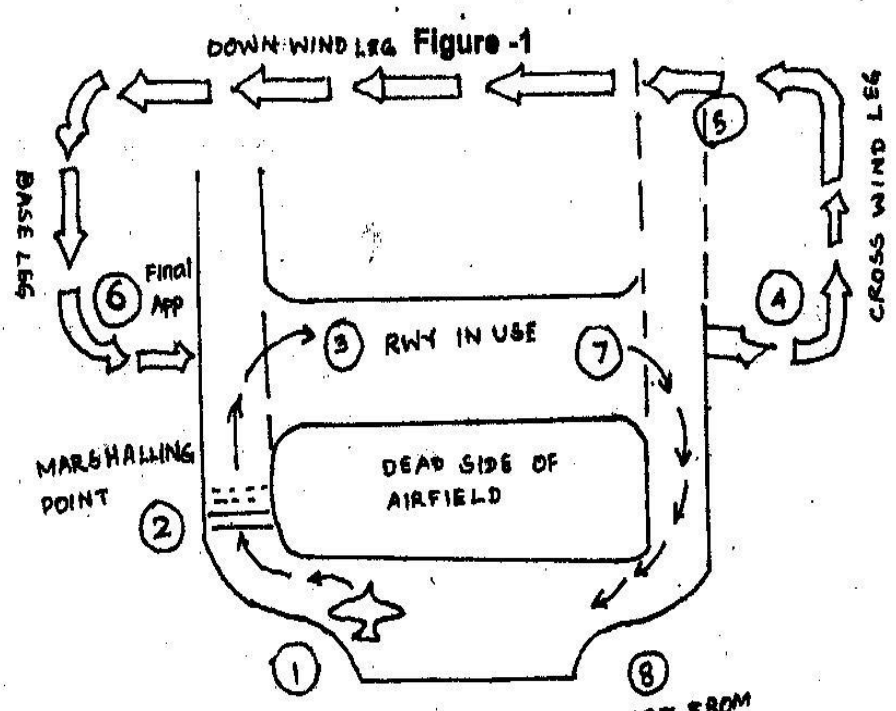
Category – IV Helicopters.

13. **Airfield Designation.** The airfield are to be designated as follows according to the prevailing weather. The limitations imposed are indicated against each airfield state.

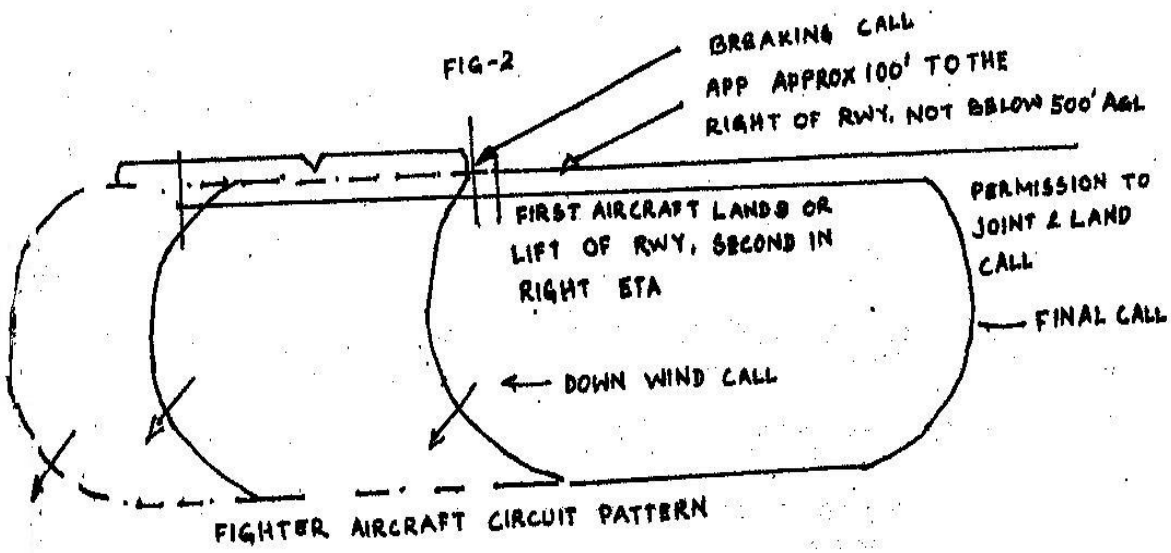
Airfield Designation	Prevailing Weather	Limitations imposed
Red	Cloud more than 5/8 at or below 200' AGL. Visibility less than 1/2 NM.	No take offs and landings permitted.
Orange	Cloud-more than 32001 to 500 ft AGL. Visibility 1/2 to 1 NM.	Cat. I Visual take offs and landings permitted. Cat, II Controlled descent and GCA landings only.
Yellow	Cloud-more than 5/8 at 500' to 1500' AGL. Visibility 1 to 2 NM.	Cat. 1 & II visual take offs and landings permitted, controlled descent mandatory if in IMC. Cat. III Controlled descent and GCA landings only.
Green	Any cloud amount above 1500' provided not more than 5/8 below 1500' Visibility more than 2 NM.	

14. **Circuit Pattern**. The circuit patterns of an aircraft depend on the type of aircraft employed and the prevailing weather conditions. As a general guide, Figs 1 and 2 shows the different types of standard circuit pattern, stress the vital positions on each one. For jet Fighter and Bomber aircraft the standard circuit pattern has been modified as shown in Figure No 2. This modification constitutes a tactical maneuver for all jet airfields; it is not a standard air traffic control patter. Jet fighter aircraft landing any airfield at which the standard circuit pattern is in force are to comply with the standard procedure. However, at standard circuit airfields the air traffic controller is to expedite landing of visiting or joint using jet fighter aircraft by giving clearance for the tactical circuit pattern to be flown, provided that the circuit and approach are clear of all other types of aircraft. This is to be regarded as a concession.

15. **Asymmetric Procedure.** Before carrying out a simulated engine failure on take-off, asymmetric landing or asymmetric over shoot Procedure clearance is to be obtained from the Air Traffic Control. Thereafter, the control tower to be warned by R/T immediately prior to the commencement of each exercise. No attempt is to be made by Air Traffic Control to send an aircraft “round again” once it has been cleared to land on asymmetric power, Asymmetric power flying exercise which are carried out in the airfield circuit are only to be authorised when the cloud base will permit the pilot to maintain visual flight from 600 ft AGL. Except in emergency asymmetric landings in multi (or heavy twin) engine aircraft are not to be practiced on runways less than 4500 feet.



CRITICAL POSITION OF AIRCRAFT FROM AN AERODROME TRAFFIC VIEW POINT



FIGHTER AIRCRAFT CIRCUIT PATTERN

16. **Essential Airfield Information**. The following airfield conditions are to included as essential airfield information to all aircraft:

a. Construction work along or near the runway in use.

b. Rough portion of the maneuvering area whether marked or not.

c. Any maintenance apparatus or workmen on or near any portion of the maneuvering area an aircraft might use.

d. Slippery condition of runways or taxiways.

e. Failure or irregular functioning or any portion of the airfield lighting system.

f. Any other pertinent information

17. **Traffic Information.** When aircraft are operating in visual meteorological conditions, it is the responsibility of the captain of an aircraft to avoid collision with other aircraft. However, owing to restricted space on an around airfield it is offen essential than traffic information is to be issued to aid the captain of an aircraft to avoid collision.

18. **Initials.**

a. Initials are to vary with different airfields but normally is a straight run-in-two miles from and in line with the runway in use. Normally two 45 degree turns are done into initials.

b. Sufficiently before turning to initials the leader or solo aircraft is to descend, or solo aircraft is to descend, or climb to 1500 AGL.

c. When a formation is 90^0 to the initials, aircraft are to assume the appropriate echelon.

d. Aircraft is to turn on to initials as laid down for the runway-in-sue at their airfield.

19. **Pre-joining for Landings**. For landing the leader or solo pilot is to obtain landing instructions and normally give a 3-minutes warning before turning initials.

20. **Landing and Taxi Back**.

a. Over the beginning of that runway the formation is to pitch out at 3 second intervals.

b. On base leg each pilot is to make and call a green check.

c. Aircraft should have 4500’ spacing on finals.

d. Nos. 1 and 3 are to land on the inside and Nos. 2 and 4 on the outer side of the runway.

e. After landing, aircraft in formation are to taxi in alternate halves of the taxiways (Where possible) at a stagger distance of 300’.

21. **Standard lamp Signals and Airfield Ground Signals and markings**. The Airfield ground signals and marking are shown in Fig 3 and 4 are:

Colour	Signal	Meaning
GREEN	INTERMITTENT	Permission to taxi
GREEN	STEADY	Permission to take-off
RED	STEADY	STOP
RED	INTERMITTENT	TAXI CLEAR OFF RUNWAY IMMEDIATELY
WHITE	INTERMITTENT	Return to dispersal
RED & GREEN	ALTERNATING RED & GREEN	Exercise extreme Caution.

Fig 2: Controller to Aircraft – on Ground

Colour	Signal	Meaning
GREEN	STEADY	Permission to land
GREEN	INTERMITTENT	Permission for landing (Followed by a steady green at the proper time)
RED	STEADY	DO NOT LAND-LOK FOR OTHER AIRCRAFT
RED	INTERMITTENT	LANDING PROHIBITED AERODROME - UNSAFE
RED & GREEN	ALTERNATING RED & GREEN	General Warning Signal

Fig 3: Controller to Aircraft – In the Air:

22. **Mobile Control**.

a. **Requirements**. All regular flying bases are to maintain a pilot on mobile officer duty during normal flying periods, night flying and whenever base aircraft are expected to take-off or land after cease work.

b. **Jurisdiction**.The jurisdiction of the mobile officer is as follows:

(1) **Aircraft on take-off Point**. To the aircraft holding at the take-off point, the mobile officer is to give executive orders i.g. “Return to Dispersal” “Clear the Runway” etc. He is to follow it up with reasons for this order if by doing so there is no chance of his attention being diverted from more urgent matters.

(2) **Aircraft on take-off Run**. While taking a decision whether to abort or continue take – off, the speed of the aircraft and runway length remaining are important considerations. The pilot is the best judge of these factors. Hence the mobile officer is not to give executive order to aircraft on take-off

run; instead he is to confine himself to reporting the nature of malfunction to the pilot e.g. “You have a fuel leak”

(3) **Aircraft on Approach for Landing**. To the Aircraft approaching for landing, the mobile officer is to give a clear executive order e.g. “Go round”.

c. **Qualifications**. The mobile officer is to be an experienced pilot. He is to be “Operational” on the major type of aircraft operating from the base. To be effective the mobile Officer is, in addition to the operational status, to possess the qualities of calmness, clear thinking, quick re-action and clear R/T speech. Staff operation officers are to maintain a list of officers with experience level and qualities specified above and the mobile duties are to be confined to the list.

23. **Runway Controller**. The runway controller where established is a qualified air traffic controller detailed to perform control duties. He comes under the overall supervision of the senior air traffic control officer, and when on duty under the direct and sole control of the duty air traffic control officer. In no circumstances is the controller to vacate his position unless:

a. He is relieved by a fully qualified relief : the duty control officer being informed.

b. Instructed to do so by the duty control officer.

c. Permitted to do so by the duty control officer when no flying is taking place, or is expected to take place. In this case he is to remain immediately available with the control tower, unless properly relieved or permitted to stand down by the duty control officer.

24. **Mobile Control Caravan**. The runway control is responsible for the mobile controller caravan. This is to be either a prime move vehicle or a taller. It is to be painted with standard distinguishing markings ie. red and white chequered squares. Control Caravan is to be positioned 750 feet down and 250/300 feet away from the edge of the runway in use. They are to face the circuit of the major use to enable to controller to see the aircraft all the way from down wind to touch down. A mobile control caravan is to contain the following facilities:

a. Airfield control frequencies.

b. Two very Pistols and sufficient cartridges.

c. Red and Green Aldis lamps.

d. Flight Hand – Books of all aircraft operating from the base.

25. **Radio Check**. All solo aircraft and leaders of formation before entering runway for take off, are to establish two-way radio contact with the mobile controller on the airfield control frequency. Should this contact not be possible aircraft is not to take-off.

26. **Airfield Diagram**. Before night flying starts. An airfield diagram is to be prepared showing the following details:

a. Layout of flare path including the emergency flare path arrangements.

b. Position of marshalling points.

c. Taxing routes to be followed.

d. Position and nature of airfield obstructions with details of associated obstruction lighting.

e. Position of dispersed aircraft if they are likely to cause obstruction, including details of their obstruction lighting.

27. This diagram is to serve four main functions, namely :

a. To serve as a specification of portable lighting requirements for use by flare path assistants.

b. To serve as a guide to lighting inspection.

c. To provide notes for reference during night flying briefing.

d. To provide a presentation of the lighting layout for use during the watch keeping period, eg. for briefing other controllers, MT drivers, visiting pilots.

28. **Briefing**. All night flings excluding that relating to transport aircraft engaged in their outstation commitments are to be preceded by organized briefing. Briefing is to include layout of the airfield and alternates as well as emergencies.

29. **Officer I/c Night Flying**. OC Flying Wing is to detail a suitably qualified pilot of the rank of Flt. Lt. and above as Officer i/c Night Flying when intensive night flying is envisaged. The OIC night flying is to:

a. Be present either in the ATC or at the caravan during the time he is detailed to perform these duties.

b. Assist the Aircraft on the ground or in the air as situation warrants.

30. **General Rules**. The following are the general rules for the information and guidance of the air traffic controllers.

a. Aircraft are not to be flying at night unless their R/T equipment, when fitted is serviceable on local approach, distress and guard channels.

b. Aircraft is to display standard navigation lights at all times when aircraft engines are running.

c. Number of aircraft carrying out circuit and landing exercise is not to exceed four at a time.

d. Only aircraft with similar circuit speeds are to be employed on circuits and landings in any one detail.

31. **Taxi Take – off Procedure.** The following points are to be observed (in addition to standard air traffic control procedures) by night:

a. Pilots of aircraft are to switch on al appropriate to aircraft lighting before obtaining permission to taxi from dispersal, Should aircraft be observed to taxi without appropriate lighting the traffic controller is to advise the pilot of the aircraft and in addition the pilots of other aircraft taxing in its vicinity.

b. Runway controllers' Aldis lamp signals to aircraft requesting permission to take-off is to be pointed directly at the pilot.

c. On take-off captains of aircraft are to call "AIRBORNE"

Wake Turbulence

32. Wake turbulence vortices are present behind every aircraft but are particularly severe when generated by large and wide bodied aircraft. The vortices are most dangerous to following aircraft ruling the take-offs, initial climbs final approach and landing phases of flight.

33. Three basic effects of wake turbulence on a following aircraft are imposed roll, loss of height or rate of climb and imposed roll on the penetrating aircraft to a degree exceeding its counter controlling capability.

34. Wake Turbulence Categorization of Aircraft All aircraft according to their all uyp weight are categorized into the following:

a. Heavy (H) - 136,000 Kg or above.

b. Medium (M) - Less than 136,000 kg and more than 7,000 Kg.

c. Light (L) - 7,000 Kg or less.

35. **Separation Minima**. The following separation minima shall be applicable to avoid turbulence:

a. **Arriving Aircraft**

Landing aircraft		Following aircraft	Separation minima
(1)	Heavy	Heavy	1 ½ min
(2)	Heavy	Medium	2 min
(3)	Heavy	Light	3 min
(4)	Medium	Medium	1 ½ min
(5)	Medium	Light	2 min

b. **Departing Aircraft**

Departing aircraft	Following aircraft	Minimum spacing
(1) Heavy	Medium or Light (Departure from same position)	2 min
(2) Heavy	Medium or Light (Departing from an intermediate position of the same runway)	3 min

c. **Cautionary wake Turbulence Message**. Whenever the existence of wake turbulence is apprehended by an aerodrome controller a caution for wake turbulence should be issued to aircraft.

Aerodrome Identification and Approach Aids

36. **Aerodrome Identification Beacon (AIB**). Airfield identification beacons are provided at all airfields having night flying commitment and sited within their boundaries. Airfield identification beacons are as follows:

a. **All airfields**. During local night flying or on request even though no night flying is taking place. Therefore an identification beacon being on does not necessarily indicate that an airfield is open for flying.

b. In poor visibility by day an identification beacon switched to emit steady light, is to be used to aid Pilots to identify the touchdown end of the runway in use. In cases the beacon is to be sited 150 feet from the edge of the downwind end of the runway and is to be near as possible to the boundary of the maneuvering area.

37. The beacons flash red colored more characteristics as a general rule. The signal is visible throughout 360^0 in azimuth and upto 80 vertically. In good visibility it can be seen upto distance of 30 miles.

38. **Aerodrome Beacon.** An aerodrome beacon is an aeronautical beacon used to indicate the location of an aerodrome from the air. It is to be kept “ON” during night and in inclement weather conditions. It shall be located on or adjacent to the aerodrome which will give uninterrupted vision to the aircraft. The aerodrome beacon shall show either colored flashes alternating with flashes or white flashes only.

39 **Visual Approach Slope Indicator System (VASIS)**. VASIS shall be provided to-serve the approach to a runway whether or not the runway is served by other visual approach aids. The VASIS shall consist of twelve light units arranged in upwind and downwind positions and symmetrically disposed about the runway centre line in the form of two pairs of wind bars, with three light units in each wing bar. Each light unit shall project a beam of light having a white colour in its upper part and a red colour in its lower part. The light units shall be arranged in such a manner that the captain of te aircraft during an approach will.

a. When above the approach slope, see all the lights to be white in colour,

b. When on approach slope, see the down wind lights white and the upwind light red.

c. When below the approach slope, see all the lights to be red in colour.

40. **Precession Approach Path Indicator (PAPI).** The PAPI system shall consist of a wing bar of 4 sharp transition multi-lamp or paired units equally spaced. The system shall be located on the left side of the runway.

41. A wing bar shall be constructed and arranged in such a manner that the captain of an aircraft will:

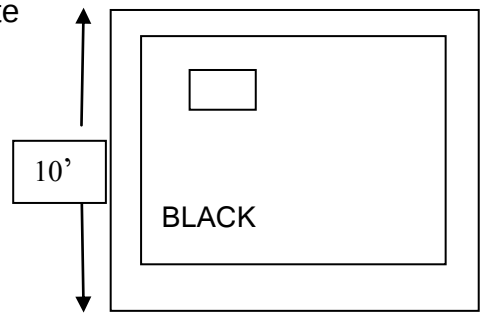
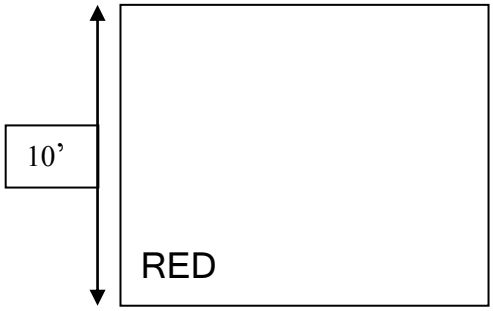
a. When on or close to the approach slope, see the two units nearest the runway as red and the two units furthest from the runway as white.

b. When above the approach slope, see the one unit nearest the runway as red and the three units furthest from the runway as white, and when further above the approach slope, see all the units as white.

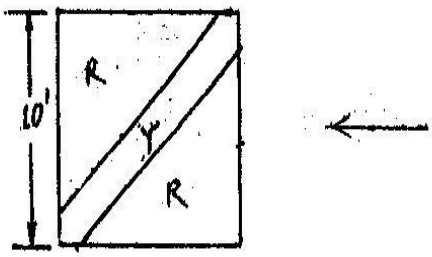
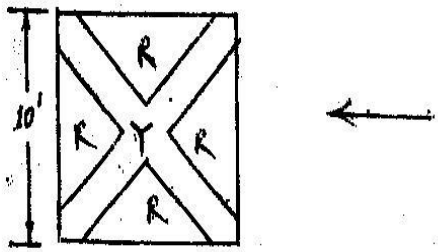
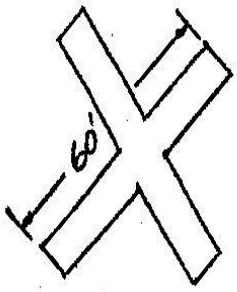
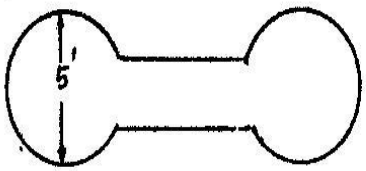
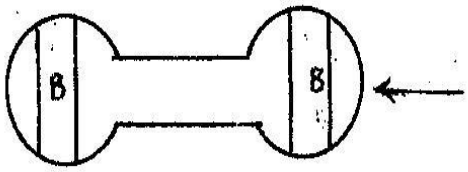
c. When below the approach Slope, see the three units nearest the runway as red and the unit furthest from the runway as white, and when further below the approach slope, see all the units as red.

42. **Airfield Ground Signals and markings**. Some of the airfield ground signals are shown in Fig 3 and Fig 4.

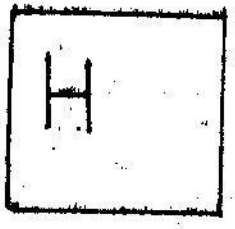
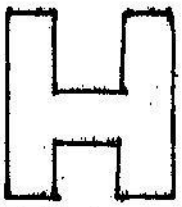
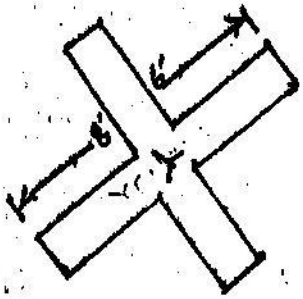
AIRFIELD GROUND SIGNALS & MARKINGS.

Meaning	**Description and Notes**	
Signal Square	Black centre with white Border 1 ft wide.	
Special rules for Air Traffic Control in force in the vicinity of BAF Airfields.	A red squire with 10’ wide placed in a corner of the signal square	

AIRFIELD GROUND SIGNALS & MARKINGS

Meaning	Description and Notes	
Exercise care on landing owing to temporary obstructions or special reasons.	A yellow diagonal superimposed on the red square, Yellow bar 20" wide.	
Landing prohibited	A Yellow cross super imposed on the red square. Yellow bars 20" wide.	
Runway Unusable	A white painted cross on the ends of the closed runway. Cross bars 60' long 5' wide.	
Use runway only for landing & take-off and taxing	A white dumb-bell displayed with in the signal square. Width of bar 2'-4'.	
Aircraft may taxi on the grass but must land and take-off on the runways.	Black bars placed across the lands of the white dumbbell 1" wide. The bars are to be removed when the grass becomes unusable for any reason'.	

AIRFIELD GROUND SIGNALS & MARKINGS

Meaning	Description and Notes	
Helicopter operations may take place	A white letter "H" 6' high, 3' wide, 8" wide bars is displayed in the signals area. A white letter "H" 12' high 6' wide 16" wide bars is displayed in the middle of the helicopter landing area.	 
Dropping area for towing cables and drogues.	A yellow cross at the upwind end of the dropping area. Bars 8'-6" long 1 ft 4 inches wide .	

CONSOLIDATION EXERCISE – 6

Q1. What are the factors affecting the selection of Runway?

Q2. What are the essential airfield information passed to an aircraft?

Q3. Before night flying while preparing the aircraft diagram what are the Points to be shown on the diagram?

Q4. Explain the function of PAPI.

ANSWER TO CONSOLIDATION EXERCISE – 6

A1. Following are some of the factors other than prevailing wind which affect the selection of the suitable runway:

a. Parked position of air defence alert aircraft.

b. Availability of the runway barrier for fighter aircraft for a particular runway end.

c. Length, slope and Barking conditions of the runway.

d. Availability or otherwise of radio or visual aids for approach and landing (eg. GGA, VASI, store beacon and approach lights) on a certain runway particularly during marginal weather condition.

e. Position of the sun specially in the morning and evening.

A2. The following aircraft conditions are to be included as essential airfield information to all aircraft:

a. Construction work along or near the runway in use.

b. Rough portion of the maneuvering area whether marked or not.

c. Any maintenance apparatus or workmen on or near any portion of the maneuvering area an aircraft might use.

d. Slippery condition of runways or taxiways.

e. Failure or irregular functioning or any portion of the airfield lighting system.

f. Any other pertinent information.

A3. Before Night flying starts, an airfield diagram is to be prepared showing the following details:

a. Layout of flare path including the emergency flare path arrangements.

b. Position of marshalling points.

c. Taxing route to be followed.

d. Position and nature of airfield obstructions with details of associated obstruction lighting.

e. Position of dispersed aircraft if they are likely to cause obstruction including details of their obstruction lighting.

A4. The PAPI system shall consist of a wing bar of 4 sharp transition multi lamps or paved units equally spaces. The system shall be located on the left side of the runway unless it is physically impracticable to do so.

TASK-7

APPROACH CONTROL SERVICE

1. **Approach Control Service**. Air Traffic Control Service for arriving or departing controlled flights.

2. **Approach Control Unit**. A unit established to provide Air Traffic Control Service to controlled flights arriving at, or departing from one or more aerodromes.

3. **Responsibilities of Approach Control**. Approach control is responsible for the provision of standard separation between IFR (Including Special VFR) flights from the time and place at which:

a. Inbound aircraft are released by Area Control until control of such traffic is transferred to ADC.

b. Outbound aircraft are taken over from ADC until Control of such traffic is transferred in Area Control.

c. Aircraft from the FIR come under its jurisdiction until control of such traffic is transferred to ADC.

In addition, it is responsible for:

a. Retaining all arriving VFR flights under its jurisdiction until information on pertinent known traffic both VFR and IFR has been issued to the and co-ordination affected with ADC.

b. Issuing pertinent traffic information on known VFR flights to IFR flights.

4. **Co-ordination between Approach & Aerodrome Control**. Approach Control shall supply the following information to Aerodrome Control:

a. Pertinent data on all relevant flights including the type of flights (ie IFR of VFR) level of arriving aircraft and ETA at least fifteen minutes prior to ETA.

b. The anticipated order in which control of aircraft is to be transferred.

c. The anticipated delay to departing IFR flights together with the reason for the delay.

5. **Co-ordination between Approach & Area Control**. Approach control shall supply to area control as appropriate the following date on controlled flights:

a. Lowest level at the holding facility available for use by area control.

b. Revision of expected approach times issued by area control when approach control calculations show a variation of 5 minutes or such other time as has been agreed between to two ATC Units concerned.

c. The average time interval between successive approaches.

d. Arrival times over the holding point if these vary from the estimate by 3 minutes or more.

e. Missed approaches.

f. Departure times of departing aircraft.

g. All available information relating to overdue or unreported aircraft.

h. Cancellations by aircraft of their IFR flights if these will affect levels at the holding point or expected approach time of other aircraft.

6. Area Control shall supply to approach control as appropriate the following data on controlled flights:

a. Identification, type and point of departure of arriving aircraft.

b. Estimated time and proposed level of arriving aircraft over holding point or actual time if aircraft is released to Approach Control after arrival over the holding point.

.c. Expected approach time issued.

d. Statement that aircraft has been cleared to contact Approach Control.

e. Statement that an aircraft has been released to approach control including, if , the time and conditions of release.

f. Anticipated delay to departing traffic due to congestion.

7. **Co-ordination between Approach Control and Aerodrome Control**. Approach Control shall co-ordinate with aerodrome control :

a. Aircraft approaching to land; if necessary requesting clearance to land.

b. Arriving aircraft which are to be cleared to visual holding points.

c. Aircraft routing through the traffic circuit.

8. **Division of Responsibility between Aerodrome Control and Approach Control**. Except for flights which provided aerodrome control service only, the control of arriving and departing controlled flights shall be divided between units providing aerodrome control service and units providing approach control service as follows:

a. **Arriving Aircraft**. The responsibility for the control of an aircraft approaching to land shall be transferred from the unit providing approach control service to the unit providing aerodrome control service when the aircraft :

(1) Is in the vicinity of the aerodrome, and

(a) It is considered that approach and landing will be completed in visual reference to the ground, or

(b) It has reached uninterrupted visual meteorological conditions, or

(2) Has landed,

Whichever is the earlier.

b. **Departing Aircraft**. The responsibility for control of a departing aircraft shall be transferred from the unit providing aerodrome control service to the unit providing approach control service:

(1) When visual meteorological conditions prevail in the vicinity of the aerodrome :

(a) Prior to the time the aircraft leaves the vicinity of the aerodrome, or

(b) Prior to the aircraft entering instrument meteorological conditions.

Whichever is earlier.

(2) When instrument meteorological conditions prevail at the aerodrome:

(a) Immediately before the aircraft enters the runway-in use for take-off, or

(b) Immediately after the aircraft is airborne if local procedure render such action preferable

9. **General Procedure for Departing Aircraft**

a. Air Traffic Control (ATC) clearance issued by Approach control shall specify any or all of the following :

(1) Direction of Take-Off

(2) Turn after Take-Off

(3) Track to make good before turning on to desired heading.

(4) Level (s) to maintain before continuing to climb to assigned cruising level.

(5) Time, point and/or rate at which changes of level should be made.

(6) Any other necessary maneuver consistent with the safe operation of the aircraft.

(7) Transition level (on request).

b. When so requested by the aircraft, departing IFR flights may be cleared to maintain VMC and their own separation until a specified time, location and/or level, if reports indicate that is possible.

c. Departing aircraft may be expedited by suggesting a take-off direction which is not into the wind. It is the responsibility of the pilot-in-command of an aircraft to decide between making such a take-off or waiting for normal take-off in a preferred direction.

d. If departures are deployed to avoid excessive holding at destination, delayed flights shall normally be cleared in an order based on their estimated time of departure, except that deviation from this order may be made to facilitate the maximum number of departures with the least average delay.

e. Air Traffic Control Units should advise aircraft operators or their designated representatives when anticipated delays due to traffic conditions are likely to be substantial and in any event when they are expected to exceed thirty minutes.

f. When requested by the aircraft and if so prescribed by the appropriate authority a departing aircraft may be cleared to climb, subject to maintain own separation and remaining in visual meteorological conditions until a specified time or to a specified location if reports indicate that this is possible.

g. Information regarding significant changes in the meteorological conditions in the take-off or climb-out area, obtained by the unit providing approach control service after a departing aircraft has established communication with such unit, shall be transmitted to the aircraft without delay, except when it is known that the aircraft already has received the information.

Minimum Separation between Departing Aircraft

10. The following provisions are complementary to the standard longitudinal separations :

a. One minute separation if aircraft are to fly on tracks diverging by at least 45° immediately after take-off so that lateral separation is provided. This minimum may be reduced when aircraft are using parallel runways or when using diverging runways which do not cross and lateral separation is effected immediately after take-off, provided instructions covering the procedure have been approved by the appropriate ATS authority. (Figure No–1).

b. Two minutes between take-off when the preceding aircraft is 74 Km/h (40 Kt) or more faster than the following aircraft and both aircraft propose to follow the same track. (Figure No-2).

c. Five minutes separation at the time cursing levels are crossed if a departing aircraft will be flown through the level of a proceeding departing aircraft and both aircraft propose to follow the same track. Action must be taken to ensure that the five minute separation will be maintained or increased when cruising levels are crossed. (Figure No-3).

11. **General procedures for Arriving Aircraft**.

a. Arriving aircraft may be required to report when leaving or passing a reporting point, or when starting procedure a base turn on final approach, or to provide other information required by the controller to expedite departing aircraft.

b. An IFR flight shall not be cleared to descent below initial Approach altitude (IAA) unless :

(1) The Pilot has reported passing an appropriate point defined by a radio aid ; or

(2) The Pilot reports that he has and can maintain the aerodrome in sight ; or

(3) The aircraft's position has been positively determined by the use of Radar.

12. **Clearance to Descend Subject to Maintaining Own Separation**. When requested by the aircraft and if so prescribed by the appropriate authority, an arriving aircraft may be cleared to descend subject to maintaining own separation and remaining in VMC if reports indicated that this is possible.

Separation of Departing Aircraft from Arriving Aircraft

13. Except or otherwise prescribed by the appropriate authority, the following separation shall be applied when take-off clearance is based on the position of an arriving aircraft:

a. If an arriving aircraft is making a complete instrument approach, a departing aircraft may take – off :

(1) In any direction until an arriving aircraft has started its procedure turn or base turn leading to final approach.

(2) In a direction which is different by at least 45 degrees from the reciprocal of the direction of approach after the arriving aircraft has started procedure turn or base turn leading to final approach, provided that the take-off will be made at least three minutes before the arriving aircraft is estimated to be over the beginning of the instrument runway. (Figure No – 4)

b. If an arriving aircraft is making a straight-in approach, a departing aircraft may take – off:

(1) 0In any direction until five minutes before the arriving aircraft is estimated to be over the instrument runway.

(2) In a direction which is different by at least 45 degrees from the reciprocal of the direction of approach of the arriving aircraft :

(a) Until three minutes before the arriving aircraft is estimated to be over the beginning of the instrument runway (Figure No – 4), or

(b) Before the arriving aircraft crosses a designated fix on the approach track; the location of such fix is to be determined by the appropriate authority after consultation with the operators.

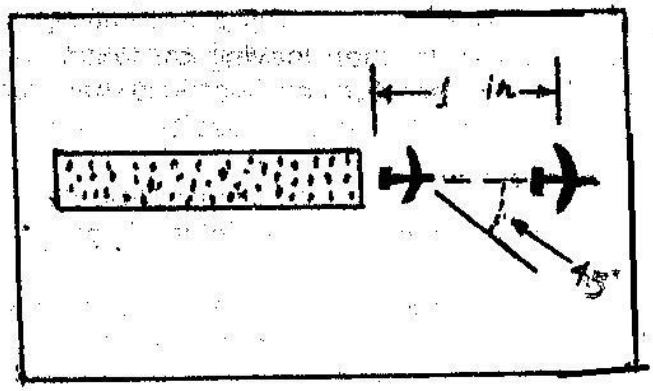


FIG – 1

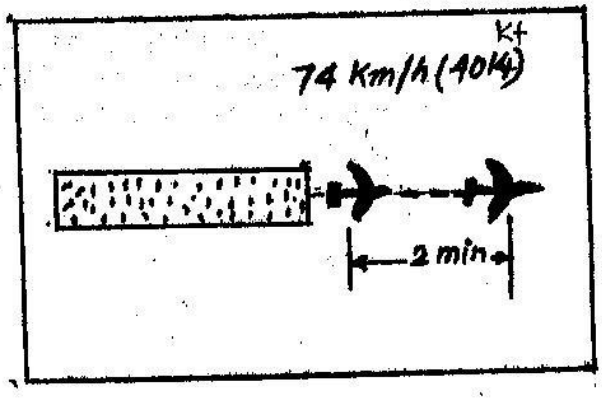


FIG – 2

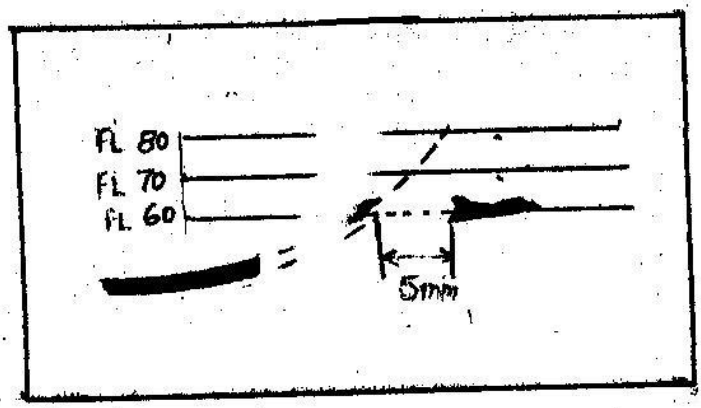


FIG – 3

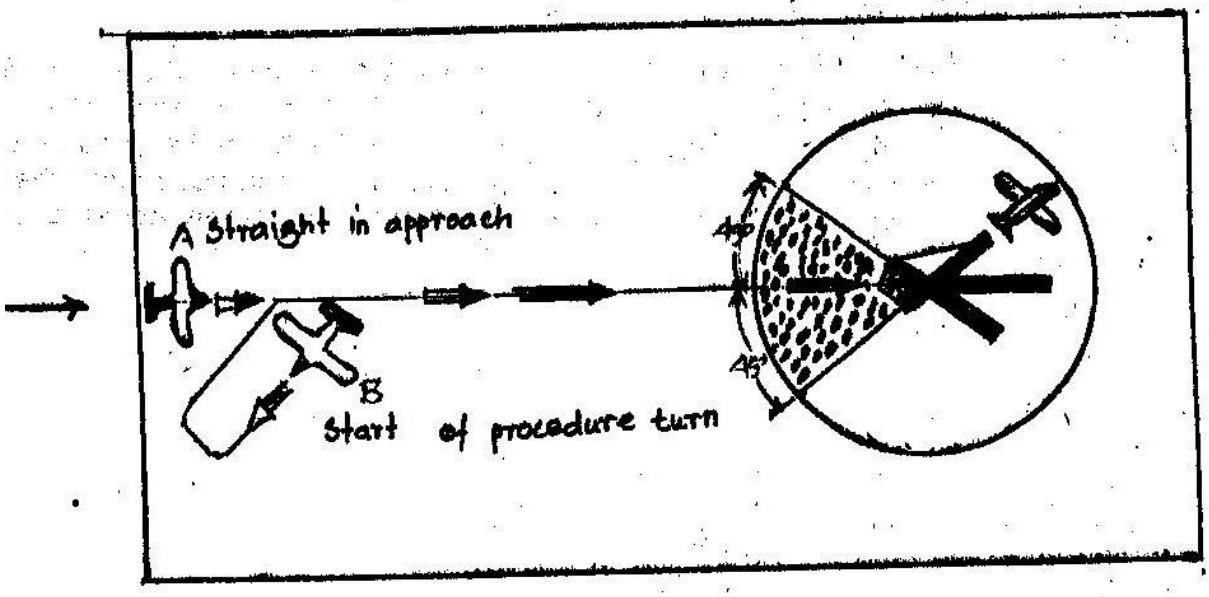


FIG - 4

Reduction in Separation Minima

14. The separation minima may be reduced in the vicinity of aerodromes on the following cases :

a. Adequate separation can be provided by the aerodrome controller when each aircraft is continuously visible to the controller ;

b. Each aircraft is continuously visible to pilots-in-command of the other aircraft concerned and the pilots thereof report that they can maintain their own separation; or

c. In the case of one aircraft following another, the pilot-in-command of the succeeding aircraft reports that he has the other aircraft in sight and can maintain separation.

Holding

15. Holding and holding pattern entry is to be accomplished, in accordance with procedures published by the State concerned. If entry and holding procedures are not published or, if the procedures are not known to the pilot-in command of an aircraft, the appropriate air traffic control unit is to describe the procedures to be followed.

16. Aircraft are to be held at a designated holding point. The required minimum vertical, lateral or longitudinal separation from other aircraft, according to the system in use at that holding point is to be provided except during the hours of day-light where aircraft are cleared to operate subject to maintaining own separation and remaining in visual meteorological conditions.

17. When aircraft are being held in flight, the appropriate vertical separation minima is to continue to be provided between holding aircraft and en-route aircraft while such en-route aircraft are within five minutes flying time of the holding area, unless lateral separation exists.

18. Levels at holding points is to be assigned in a manner that is to facilitate clearing each aircraft to approach in its proper priority. Normally, the first aircraft is to arrive over a holding point is to be at the lowest level, with following aircraft at successively higher levels.

19. If a pilot-in-command of an aircraft advises that he is unable to comply with the approach control holding or communication procedures that alternative procedure(s) requested by him it to be approved if known traffic conditions permit.

Approach Sequence

20. The approach sequence shall be established in a manner which will facilitate arrival of the maximum number of aircraft with least delay.

21. Approach control shall retain all arriving VFR flights under its jurisdiction until information on pertinent traffic, both VFR and IFR has been issued to them and co-ordination effected with aerodrome control.

22. Approach control shall ensure that VFR flights are transferred in sufficient time for aerodrome control to pass additional information and clearances.

Expected Approach Time (EAT)

23. Expected approach time is to be issued and currently revised as soon as practicable after an aircraft enters the control area. If the expected approach time indicates delay of thirty minutes or more, the expected approach time is to be issued by the most expeditious means as soon as determined.

24. **Visual Approach**. An approach by an IFR flight when either or all of instrument approach procedure is not completed and approach is executed in visual reference to terrain IFR flights may be cleared to execute visual approaches provided the pilot has aerodrome in sight; and

a. The reported ceiling is not below the approved initial approach level for the aircraft so cleared; or

b. The pilot reports at the initial approach level or at any time during instrument approach procedure that the visibility will permit a visual approach and he has reasonable assurance that the landing can be accomplished.

25. Separation shall be provided between an aircraft cleared to execute a visual approach and other arriving or departing aircraft.

26. **Entry Procedure**. The entry into holding pattern shall be according to heading in relation to the three entry sectors shown in figure-5, recognizing a zone of flexibility of 5° either side of the sector boundaries.

27. **Parallel Entry (Sector-1)**.

a. Having reached the fix the aircraft is turned left on to an outbound heading for the appropriate period of time.

b. The aircraft is then turned left on to the holding side to intercept the inbound track or to return to the fix,

c. On second arrival over the holding fix, the aircraft is turned right to follow the holding pattern.

28. **Off-Set Entry (Sector-2)**.

a. On reaching the fix, the aircraft is turned on to a heading to make good a track making on an angle of 30^0 from the reciprocal of the inbound track on the holding side.

b. Aircraft will fly for an appropriate period of time.

c. The aircraft is turned right to intercept the inbound holding track.

d. On second arrival over the holding fix, aircraft is turned right to flow the holding pattern.

29. **Direct Entry (Sector- 3)**. On reaching the fix, the aircraft is turned right to follow the holding pattern.

Categories of Aircraft

30. The speed of an aircraft has direct effect for the conducts of an instrument approach. Therefore based on the different speed aircraft

a. Category A - Less than 91 kts IAS.

b. Category B - 91 kts or more but less than 121 kts IAS.

c. Category C - 121 kt or more but less than 141 kts IAS

d. Category D - 141 kt or more but less than 166 kt IAS

e. Category E - 166 kt or more but less than 211 kt IAS.

Instrument Approach Procedure

31. The design of an instrument approach is, in general, dictated by the terrain surrounding the aerodrome, the type of operations contemplated and the aircraft to be accommodated. An instrument approach procedure may have five separate segments:

a. Arrival segment

b. Initial Approach

c. Intermediate Approach

d. Final Approach

e. Missed Approach

32. **Intermediate Approach Segments**. In the intermediate approach segments there are three generally recognized maneuvers related to the reversal procedure:

a. **Procedure Turn (45°/180°)**. It consists of a 45° turn or (left turn for procedure turn left and right for procedure turn right) away from the outbound track for 1 minute followed by a 180° turn in the opposite direction to intercept the inbound track (Fig –7).

b. **Procedure Turn (80°/260°).** It consists of an outbound track for a specified period of time, an 80° turn away from the outbound track, followed by a turn of 260° in the opposite direction to intercept the inbound track. (Fig-8).

c. **Base Turn/Tear Drop Turn**. It is consisting of a specified outbound track and timing from the fix, followed by a turn to intercept the inbound track. (Fig-9)

33. **Race Track Procedure**. A race track procedure consists of a turn from the inbound track through 180° from overhead facility or to the outbound track, for 2 minutes (1 minute for Jet aircraft) followed by a 180° turn in the same direction to return to the inbound track (Fig-11). The outbound leg may be limited by a DME distance or intersecting radial/bearing. Fig-6.

34. **Missed Approach**. On completion of instrument approach when runway is not sighted a missed approach is done. It has been kept as simple as possible keeping in mind the Pilots demanding task of aircraft attitude and configuration. A missed approach procedure is designed to provide protection from the obstacles through out the approach and specified a point where the missed approach begins and a point or altitude where it ends (Fig-10). The missed approach procedure for Jet ac has following segments:

a. Climb out segment.
b. Outbound heading (from a beam the fix fly parallel to the inbound for a specified time).
c. Base turn
d. Final Approach.

35. **Reduced Separation**. In the vicinity of aerodrome the standard separation minima may be reduced if:

a. Adequate separation can be provided by the tower controller when each aircraft is continuously visible to the controller.

b. When each aircraft are visible to each other and the Pilots can maintain their own separation.

c. When the following aircraft can see the proceeding aircraft and can maintain separation.

ENTRY PROCEDURES

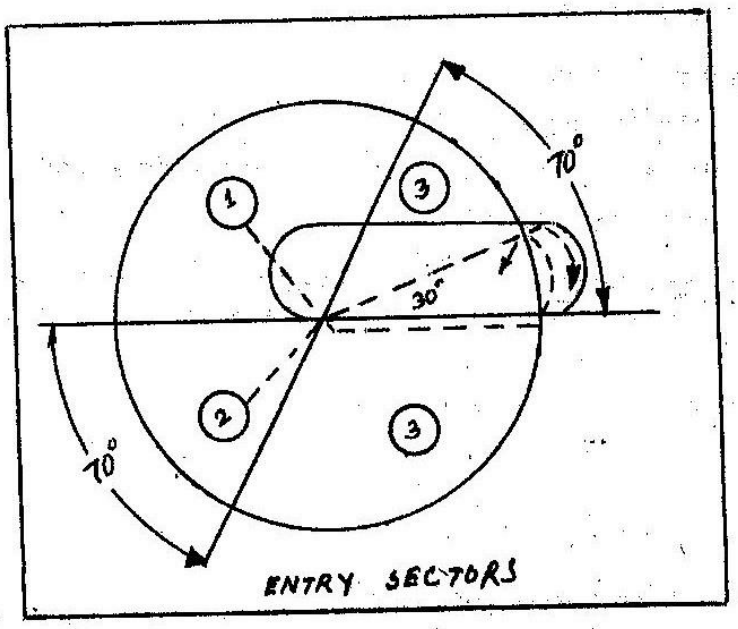


FIG – 5

RACE TRACK PATTERNS

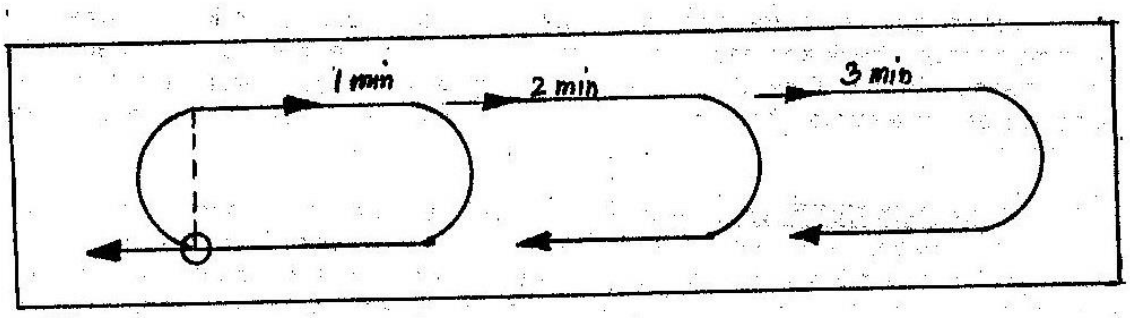


FIG - 6

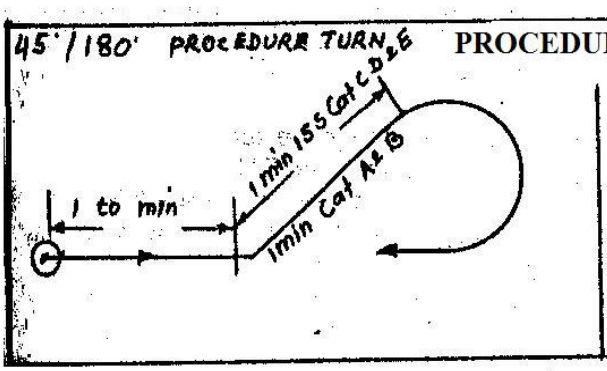


Fig - 7

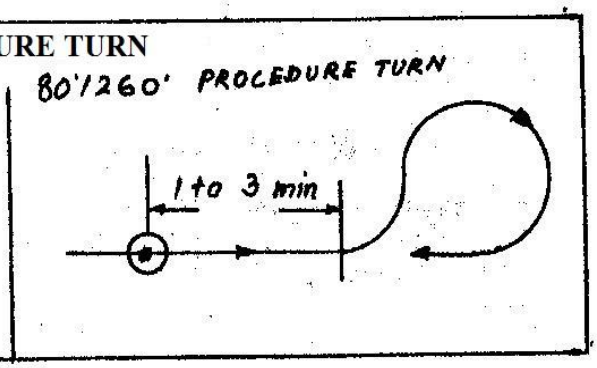


Fig - 8

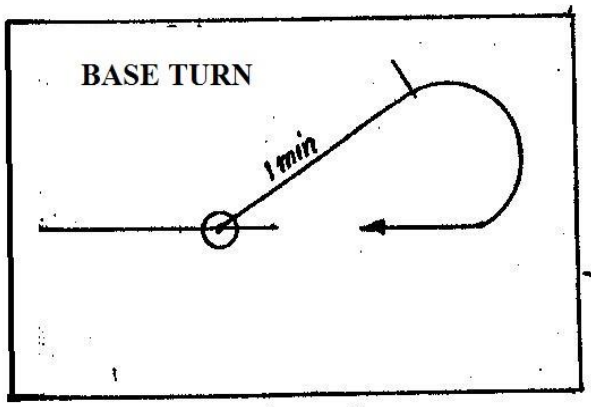


Fig - 9

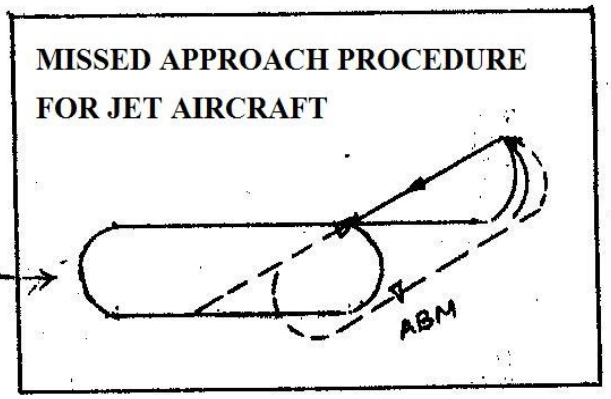


Fig - 10

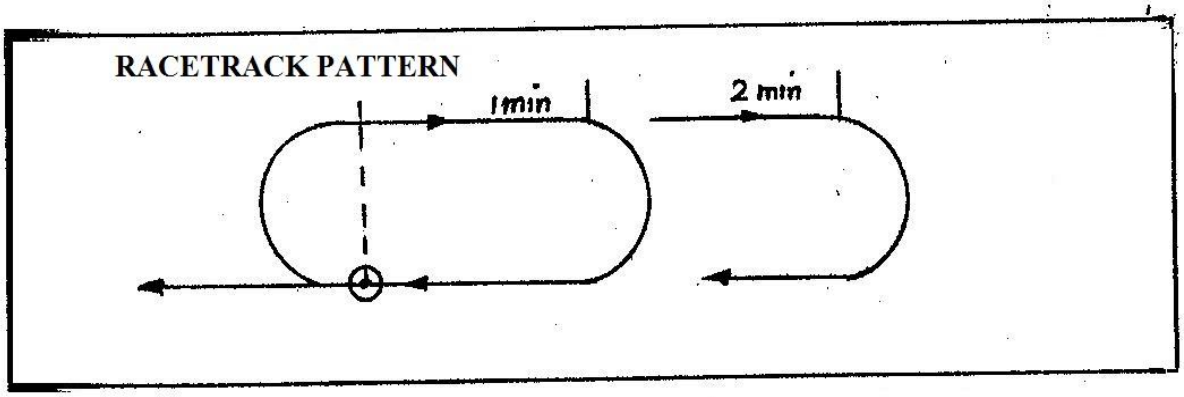


Fig-11

36. **Essential Traffic Information**. Essential traffic is that controlled traffic which is separation for any period less than the specified standard separation. Essential traffic information is to include:

a. Direction of conflicting aircraft.

b. Type of conflicting aircraft.

c. Cruising level & ETA reporting point of conflicting aircraft.

d. Any other clearance.

37. **VMC Climb and Descent.** When requested by Pilots aircraft may be cleared to climb and descend maintaining their own separation subject to the following conditions:

a. The aircraft are in VMC.

b. During the house of daylight.

c. Essential traffic information is given.

Ground Control Approach (GCA) Procedure

38. An arriving traffic shall be taken over by the final controller at the GCA gate from where the traffic is to be talked down to the Decision Height (DH) or the Missed Approach point (MAP). The precision Approach Radar (PAR) of the GCA system monitors the traffic within a cone of 20 degrees on the final approach to landings. The aircraft shall be brought upto the gate with the help of :

a. VHF D/F.

b. VOR/NDB let down procedure.

c. Surveillance Radar.

d. Visual.

39. When aircraft is transferred to the GCA, final controller is to make the communication check and pass the “Communication Failure” procedure immediately if not passed earlier. Final Controller is then to give continuous transmissions to the Captain of the aircraft. The internal between transmission are not to exceed five seconds.

40. **Glide Path Notification**. A short while before the aircraft reaches the point at which the descent will begin the Captain is to be advised that the aircraft is approaching the glide path and to prepare to commence descent. And finally descent instruction shall be passed and the Captain is advised that no acknowledgement is required.

41. **Position and Trend Information**. Throughout the approach the Captain is to be advised of the mileage/kilometer from touch down. The trend information as whether going left or right of course line and above or below the correct glide path or not is also to be passed.

42. **Co-ordination with the Aerodrome Control**. Final controller is to inform the aerodrome control of the position of the aircraft at specified point as determined by the local authority. Landing clearance shall be passed to the aircraft after obtaining from the tower.

43. **Termination of Approach**. A precision approach is to be terminated at the range at when the aircraft is computed to have reached the DH, however, the advisory instruction may continue till the touchdown. The captain is to be advised of termination of approach and instructed to change the frequency after landing or while executing the missed approach.

CONSOLIDATION EXERCISE – 7

Q1. What are the responsibilities of Approach Control?

Q2. What are the division of responsibilities between a unit providing Aerodrome Control service and a unit providing Approach Control Service?

Q3. When may an IFR Flight be cleared to descend below the initial approach altitude specified for the instrument approach altitude or the aerodrome safety altitude?

ANSWERS TO CONSOLIDATION EXERCISE – 7

A1. Approach Control is responsible for the provision of standard separation between IFR (Including Special VFR) flight from the time and place at which :

a. Inbound aircraft are released by Area Control Until control of such traffic is transferred to ADC.

b. Outbound aircraft are taken over from ADC until control of such traffic is transferred is Area Control.

c. Aircraft from the FIR come under its jurisdiction until control of such traffic is transferred to ADC,

In addition, it is responsible for :

a. Retaining all arriving VFR flights under its jurisdiction until information on pertinent known traffic both VFR and IFR has been issued to them and co-ordination effected with ADC,

b. Issuing pertinent traffic information on known VFR flights to IFR flights.

A2. **Arriving Aircraft**. The responsibility for the control of an aircraft approaching to land shall be transferred from the unit providing approach control service to the unit providing aerodrome control service when the aircraft :

a. Is in the vicinity of the aerodrome, and

(1) It is considered that approach and landing will be completed in visual reference to the ground, or

(2) It has reached uninterrupted visual meteorological conditions, or
Has landed, whichever is the earlier.

b. When visual meteorological conditions prevail in the vicinity of the aerodrome :

(1) Prior to the time the aircraft leaves the vicinity of the aerodrome, or

(2) Prior to the aircraft entering instrument meteorological conditions Whichever is earlier;

c. When instrument meteorological conditions prevail at the aerodrome :

(1) Immediately before the aircraft enters the runway-in use for take-off, or

(2) Immediately after the aircraft is airborne if local procedure render such action preferable

A3. An IFR Flight shall not be cleared to descend below initial approach altitude specified for the instrument approach unless:

a. The Pilot has reported passing an appropriate point defined by a radio aid, or

b. The Pilot reports that he has and can maintain aerodrome in sight, or

c. The aircraft position has been positively determined by the use of Radar.

TASK-8

EMERGENCIES

Introduction

1. Whenever an emergency exits or is eminent select and pursue a course of action Which appears to be most appropriate under the circumstances and which most nearly conforms to the institutions laid down in AFMs and your Base Pre-accident Plan, Because of infinite variety of possible situations, specific procedures cannot always be prescribed for every situation which might be considered emergency. As thumb rule an emergency includes any situation which places an aircraft in danger; i.e. uncertainty, alert being lost or in distress.

Emergency Calls ant Procedures

2. There are three states of emergencies viz safety, urgency and distress:

a. **Safety**. An aircraft is not in immediate danger but is experiencing conditions which may lead to danger eg uncertain of position, deteriorating weather. Aircraft will transmit “Security” three times followed by call sign once.

b. **Urgency**. Aircraft is in danger and in urgent need of assistance with the aid of which the danger may be overcome, ie aircraft lost, short of fuel, partial engine failure. Aircraft shall call “Pan Pan” three times followed by the call sign once.

c. **Distress**. Aircraft is threatened by serious and imminent danger and the crew is in need of immediate assistance, is ditching, crash landing or abandoning aircraft. Aircraft shall call “Mayday” three times followed by call sign.

3. The text of the emergency message is to include as much of the following information as time permits:

a. Estimated position and time.

b. Heading true and airspeed indicated.

c. Altitude.

d. Type of aircraft.

e. Nature of emergency and assistance required.

f. Intention of Captain (urgency and distress only).

g. Endurance remaining (urgency and distress only).

4. Emergency messages are transmitted as follows :

a. A safety message is to be addressed to one, several, or all stations, and not necessarily on emergency frequency.

b. An urgency message is to be addressed to a specific station if possible and transmitted on the available emergency frequency.

c. A distress message is to be transmitted in the same manner as an urgency message, but not addressed to specific station.

d. A Captain of an aircraft observing another aircraft in distress is to act as a "Mayday Relay".

5. **Frequency**. 121.5 MHz and 243 MHz have been designated as international emergency frequency. It might be best to keep the aircraft on the initial contact frequency. Frequency change is recommended only when there is a valid reason.

Action by DATCO

6. DATCO, on receipt of an emergency is to take the following action:

a. Reply immediately after the invitation to reply is received.
b. Give navigational and all available guidance.
c. Inform the appropriate agency that an emergency message has been received & passed the details.

d. Minimise R/T calls so as to allow emergency aircraft to transmit.

e. Take appropriate action as laid down in local Base Pre accident plan.

Crash Action

7. It is not possible to set hard and fast regulations concerning the "Crash action". Crash actions are enumerated, in details, in the local pre accident plan. The actual procedures do vary from base to base depending on :

a. Communication system within the Control tower and on the base,
b. Role of the base and aircraft used,
c. Civil facilities available in the base.

8. **On Base Crash.** A part from the local pre accident plan the following is the guidelines for controllers:

a. Operate Crash alarm, inform on Intercom/Primary Crash phone.
b. Instruct the safety services, the route to be followed.

c. Inform Ops clerk giving full crash message for onward transmission to the personnel concerned.

d. Warn all the aircraft on ground and in the air.

e. Check if the stand by fire vehicles have taken position in the crash bay or not.

f. Have the crash area marked during day and night.

g. If the runway is obstructed and can not be cleared within reasonable time take an appropriate NOTAM action.

h. Consider :

(1) Runway change.

(2) Diversion.

j. Have the crash area inspected before continuing the flying.

k. Inform Met Squadron to prepare the weather observation.

l. Make an appropriate entry in the watch keeping Log book.

9. **Off Base Crash**. When a crash takes place off the airfield, but in the near vicinity, the DATCO is to take the following action :

a. Dispatch the rescue vehicle and maintain liaison on radio.

b. Inform ops clerk to take appropriate action as per local order.

c. Request local aircraft to pin point the scene of the crash and pass observation in details.

d. Communicate with local Fire Services, Hospitals and Police stations.

e. Inform the Rescue unit immediately.

Escort in Distress

10. In case an aircraft experiences serious un-serviceability which is likely to jeopardize its safety or recovery, the captain is to request in interception and an escort by a search and rescue aircraft at his discretion or may request for a sheered aircraft.

Abandoning of Aircraft

11. When the Captain of an aircraft considers that the aircraft will have to be abandoned, he is to give a warning order “Put on Parachutes”, when it is certain that the aircraft is to be abandoned the captain is to be given the executive order, “JUMP, JUMP”.

Procedure in the Event of Hang-up Armament

12. The procedure to be followed in case of “Hang up” of the following type of armament store is explained in the subsequent paragraphs :

a. Bombs
b. RP

13. **Action in the Air**. The Captain of the aircraft is to carry out the following actions the moment he suspects a “Hang up” :

a. Report to the Range Safety Officer and the Base ATC.

b. Avoid over flying inhibited areas.

c. Make one more attempt to release the armament in the normal manner.

d. If this attempt fails, he is to select a suitable area and jettison the store.

e. In case he fails to jettison the armament load he is to ensure that all armament switches are off.

f. Join the circuit according to local “Hung ordnance pattern joining Procedure”.

14. **Action on Landing**

a. Make a smooth landing.

b. Clear the runway and park in the area designated by the ATC and Switch off.

c. In case of rockets, Pilot is to make sure that the aircraft nose is not pointing towards building or inhabited areas.

d. The Pilot is to ensure that no one approaches the aircraft except the armament personnel.

15. **Emergencies**. In case an emergency occurs simultaneously with a “Hang up” the following procedure is to be followed:

a. If gear cannot be lowered, aircraft is to be abandoned,

b. In case there is RT failure and the aircraft does not have an escorts, he is to fly along the runway at 200 feet avoiding build up area. He is then to follow the procedure laid down in para – 14.

16. **Jettisoning of Stores**. If the aircraft is airborne and brake trouble is suspected, efforts are to be made to consume fuel from the drop tanks, if unable to do so they may be jettisoned. On landing or take-off abort, should jettisoning is required following appropriate procedure being adopted:

a. **Single Aircraft**. If barrier engagement is necessary they are to be jettisoned at least 1000 ft ahead of the barrier.

b. **During formation Landing**. If the aircraft in trouble is ahead of or in line abreast with other aircraft. Pilot is to cut his engine and travel until the point of barrier entry, when the brakes are to be applied strongly.

Radio Communication Failure

17. As soon as it is known that a two-way radio communication has been disrupted between the ATC and the air traffic. The local traffic are to be handle according to the "No RT" procedure mentioned in your base ATC local order. ATC shall ask aircraft to execute specific manoeuvre and switch "ON' IFF or SSR code. If acknowledgement is received from the aircraft messages can be communicated in the same manner. If aircraft fails to indicate that it is able to receive any transmission, separation shall be maintained between aircraft having radio failure and other known traffic and aircraft will:

a. **In VMC**.

(1) Continue to fly in VMC.
(2) Land at the nearest airfield,
(3) Report its arrival in most expeditious means to appropriate ATC Unit.

b. **In IMC**.

(1) Proceed according to current flight plan.
(2) Arrange the flight to arrive overhead as close to the ETA passed.
(3) Complete normal instrument let down and land.
(4) Continue blind transmissions.

c. **When Flying under Radar Control**.

(1) When both transmitter and receiver is inoperative, fly a Triangular Pattern to the left hand Pattern having 2 minutes flying on each leg (1 min for Jet). Complete minimum of 2 pattern before resuming the Course.

(2) When transmitter is unserviceable but Receiver is operative, fly a triangular pattern to the right each leg for two minutes, 1 minute for Jet, and complete 2 patterns before resuming the course. Mean while continue transmitting blindly.

Local Lost

18. The local lost procedure will differ slightly depending upon the area of operation. However, the basic rule to establish contact is the identification of geographical feature. The following are the general guide lines for the pilots:

a. Gain height if possible but don't enter the clouds, and also do not descend below obstacle clearance limit.

b. Try to establish Radio contact.

c. Obtain VDF homing from Homer.

d. Contact nearest radar unit.

e. Put IFF to Emergency.

f. If flying around Dhaka steer 140°, if you, hit any big river, follow its down stream. Once over Chandpur set Course for Dhaka on 338°. If recognised the coast follow the coast line to Chittagong.

g. If flying around Chittagong steer 045° till you hit the coast, follow it northerly direction till you recognise the area then turn for Chittagong. If you hit hill range instead, turn to a heading of 270° till you hit the coast and proceed to Chittagong.

h. If you are flying around Jessore steer course 090°and fly for endurance if you hit river Gorai turn right and follow its down stream. When Kumarkhali is reached fly 270^0 & come to Jhenidah When river Bhairab is reached turn left and fly northerly heading till Lohagara.

j. If failed to establish ground position and running low on fuel, Eject.

k. Do not panic and jump to conclusion.

l. Try to identify the location correlating from the sun position.

Obtaining Urgency Assistance

19. Pilot in any distress or urgency condition should immediately take the following actions :

a. Climb, if possible, for improved communications and better radar and direction finding.

b. Continue squeaking assigned mode or code 7700 if fitted with SSR equipment.

c. Transmit distress and urgency messages.

d. After establishing radio contact, act according to the instructions passed by ATC.

Miscellaneous Procedures

20. **Avoiding bird hits**. Pilots are to be vigilant and avoid birds consistent with safety. Pilots are to be warned about the presence of birds in the vicinity of the airfield on the RT according to the following procedures :

a. **Indication of number**. Numbers are to be indicated under the following terminology:

(1) Few birds.

(2) Many birds.

b. **Indication of Area**. Birds are to be indicated as follows :

(1) On initials.

(2) On dumbbell.

(3) On down wind.

(4) On baseleg.

(6) On finals.

(7) On overshoot.

(8) Sitting on runway.

This warning is to be issued by ATC. However on occasions mobile officer can also issue such information.

21. **Fumes in the Cockpit**. If a Pilot detects fuel fumes in the Cockpit during flight he is to throttle back to a setting just sufficient to maintain a level flight. This would normally stop the fumes.

22. **Jettisoning of hoods**. Jettisoning of hood or canopy may cause damage to an RT aerial constituting loss of communication. Therefore, whenever ejection is eminent, aircrew are to transmit their distress call and message before jettisoning their canopy. Since jettisoning of Canopy causes aerodynamic disturbances, it is normally done in the event of abandoning of aircraft.

23. **Belly Landing**. The policies of belly landing are :

a. All belly landings are to be made on hard even surfaced runways.

b. Empty drop tanks are to be retained to minimize damage. Aircraft are not to attempt belly landing till it has consumed all fuel from drop tanks and 80% from the internals. However, if for any reason belly landing is to be made with fuel in drop tanks, than aircraft is to land on fair weather strip.

c. ATC, whenever, time permits, is to spread foam on runway, leaving first 1000 ft clean. This is to be done either by laying the foam along the centre line or in patches of 150 feet apart 3000 ft of runway for single engine jets and 5000 ft for multi-engine jets covered by foam is considered adequate for minimizing damage and risk of fire.

d. Aircraft is to approach at normal speed and land with fuselage parallel to the ground. A nose up touch down is to be avoided.

CONSOLIDATION EXERCISE – 8

Q1. Describe three states of Emergency.

Q2. What actions are to be done by DATCO on receipt of emergency call ?

ANSWER TO CONSOLIDATION EXERCISE – 8

A1. Following are three states of emergencies viz safety, urgency and distress:

a. **Safety**. An aircraft is not in immediate danger but is experiencing conditions which may lead to danger eg uncertain of position, deteriorating weather. Aircraft will transmit "Security" three times followed by call sign once.

b. **Urgency**. Aircraft is in danger and in urgent need of assistance with the aid of which the danger may be over come, ie aircraft lost, short of fuel, partial engine failure. Aircraft shall call ":Pan Pan" three times followed by the call sign once.

c. **Distress**. Aircraft is threatened by serious and imminent danger and the crew is in need if Immediate assistance, ditching, crash landing or abandoning aircraft. Aircraft shall call "Mayday" three times followed by call sign.

A2. DATCO, on receipt of emergency call is to take following actions :

a. Reply immediately after the invitation to reply is received.

b. Give navigational and all available guidance.

c. Inform the appropriate agency that an emergency message has been received and passed the details.

d. Minimise RT calls so as to allow emergency aircraft t transmit.

e. Take appropriate exactions as laid down in local Base Pre accident plan.

TASK-9

INSTRUMENT APPROACH PROCEDURE

Introduction

1. Specifications for instrument approach procedures detailed in this chapter are based on the new criteria for procedures construction specified in ICAO PANS OPS 8168. Instrument approach procedures for any aerodrome should be based on the criteria described in DOC 8168 modified by relevant AFOs and other instructions on the subject. Air Traffic Control personnel need not be intimately familiar with the detailed criteria. Nevertheless, they need to have an appreciation, from the operational point of view, of the parameters used in the standardised development of instrument approach procedures, of the various manoeuvres contained in these procedures and the limitations affecting on acceptable level of safety in the conduct of instrument approaches.

2. The new criteria deal with two categories of approaches, viz. Non-precision and precision approach procedures; precision approach procedures being ILS, (with Glide path operative) and PAR. Specific criteria for development of ILS PROCEDURES are however not included in these notes.

The Instrument Approach Procedure

3. Obstacle clearance is the basic aim in developing instrument approach procedures. The design of a particular instrument approach procedure is dictated by the following factors:

a. The terrain surrounding an aerodrome.

b. The type of operations contemplated.

c. The type of aircraft to be accommodated.

d. The sitting of navigational aids, and

e. The airspace available for operations.

4. **Procedure Construction**. An instrument approach procedure may have five separate segments. They are the arrival, initial, intermediate, final and missed approach segments. In addition, an area for circling the aerodrome under visual conditions should be considered. The approach segments begin and end at designated fixes. However, under some circumstances certain segments may begin at specified points where no fixes are available (or necessary), eg. The final approach segment of a precision approach may originate at the point of intersection of the designated intermediate flight altitude/height with the nominal glide path.

5. **Fix Names**. The fixes are named to coincide with the associated segment. For example, the intermediate segment begins at the intermediate fix and ends at the final approach fix. Where no fix is available as mentioned (in Para-4) the segments begin and end at specified points (eg. Glide path intercept and missed approach point in ILS procedure). The order in which this documents discusses the segments is the same order in which the pilot would fly them in a complete procedure, that is from arrival through initial and intermediate to final approach, and if necessary the missed approach.

6. **Segment Application**. Only those segments which are required by local conditions need be included in a procedure. In constructing the procedure the final approach track should be identified first because it is the least flexible and most critical of all the segments. When the final approach has been determined, the other necessary segments should be blended with it to produce an orderly manoeuvring pattern which is responsive to the local traffic flow.

7. **Track Guidance**. Track guidance should normally be provided for all phases of flight through the arrival, initial, intermediate, final and missed approach segments. When track guidance is provided, the appropriate segment shall lie within the established coverage of the navigational facility on which the track guidance is based. When track guidance is not provided the obstacle clearance area shall be expanded as prescribed in para 9(b). Terminal Area Surveillance Radar (TAR), when available, may be used to provide vectors to the final approach. En-route surveillance radar (**S**SR) may be used to provide track guidance through initial approach segments up to and including the intermediate fix or point.

Note : Detailed procedures regarding the use of primary radar in the approach control service are set forth in PANS – RAC, Doc 4444/501, procedures for Air Navigation Services – Rules of the Air and Air Traffic Services.

8. **Categories of Aircraft**. Aircraft performance differences have a direct effect on the airspace and visibility needed to perform certain manoeuvres such as circling approach, turning, missed approach, and final approach descent and manoeuvring to land including base and procedure turns. The most significant factor in performance is speed. The following categories of typical aircraft are established, based, on 1.3 times stall speed in the landing configuration at maximum certificated landing weight. These categories will be referred to throughout this document by their letter designations.

Category A - less than 169 Km/h (91 Kts) IAS.

Category B - 169 Km/h (91 Kts) or more but less than 224 Km/h (121 Kts) IAS

Category C - 224 Km/h (121 Kts) or more but less than 261 Km/h (141 Kts) IAS

Category D - 261 Km/h (141 Kts) or more but less than 307 Km/h (166 Kts) IAS

Category E - 307 Km/h (166 Kts) or more but less than 391 Km/h (211 Kts) IAS

9. **Other Parameters**

a. Except in the vicinity of earth's magnetic poles, all procedures are established in degrees magnetic, although degrees true shall be used while planning the procedures.

b. The performance factors and accuracies of the navigation system in use is taken into account. Thus in the determination of splay angles in segments of the instrument approach splays of 7.8° for VOR and 10.3° for NDB are used.

c. When designing procedures for mountainous terrain or high altitudes, consideration must be given to induced altimeter errors and pilot control problems caused by strong winds. The minimum obstacle clearance (MOC) should be increased in such cases after consultations with operations and prolonged flights at low altitudes and on lee-sides should be avoided.

d. Optimum and maximum descent gradients should be specified for each segment of the procedure in consultation with the operations. However the optimum descent gradient for final approach should not exceed 5.0 percent (appx 90M/300 feet per NM or 3° GP) and the maximum possible is 6.5 percent (appx 120m/400 feet per NM or 3.8° GD). Precision glide paths in excess of 3° are used only where alternated mea**n**s of satisfying obstacle clearance requirements are impracticable.

10. **Fixes**. Fixes and points used in destining approach procedures include initial approach fix (IAF), intermediate approach fix (IF), final approach fix (FAF), the turning point (TP), holding fix, and where necessary fix to mark the missed approach point (MA Pt). Fixes are based on standard nav systems or formed by intersection of two position lines. All these fixes have specified fix tolerance areas or factors. These tolerances are used to narrow and widen instrument approach areas as the aircraft flies to or from a facility respectively. The fixes are formed by navigational aids, by inter-section of an area and a radial from a VOR/DME facility, intersection of two radials to bearing from different navigational facilities or by identification on primary radar. The tolerances taken into account will therefore be the cone effect area while over heading a station, the intersection fix tolerance factions, or radar / DME fix accuracies.

11. **Step down fix**. A step-down fix permits additional descent within a segment by identifying a point at which a controlling obstacle has been safely over flown. Preferably, only step down fix should be established in the final approach segment, except in the case where the fix can be provided by radar or DME. The use of the step-down fix fin the final approach segment shall be limited to aircraft capable of simultaneous reception of the flight track and a crossing indication unless otherwise specified. Where a step down fix is used in the final approach segment, an OCA/H shall be specified both with and without the step down fix. A step down fix should in the initial and intermediate approach phase meet the criteria applicable to the IAF and the IF respectively and the final approach phase, the criteria applicable to the FAF.

12. **Minimum Obstacle Clearance**. The vertical cross section of each approach segment is divided into primary and secondary areas (see fig 3). The minimum obstacle clearance (MOC) is provided for the whole width of the primary area. In the secondary area, MOC is provided at the inner edges reducing to zero at the outer edges. However where no track guidance is provided, the full MOC is provided in the secondary area. This concept of primary and secondary areas does not apply to the ILS precision segments, where more complicated clearances apply.

13. **Arrival Routes**. In some cases it is necessary to designate arrival routes from the en-route structure to the initial approach fix. Only those routes which provide an operational advantage shall be established and published. These should coincide with the local air traffic flow. The length of the arrival route shall not exceed the operational service range of the facilities which provide navigational guidance. En-route obstacle clearance criteria shall apply to arrival routes.

14. **Minimum Sector Altitude**

a. **General**. Minimum sector altitudes shall be established for each aerodrome where instrument approach procedures have been established. Each minimum sector altitude shall be calculated by taking the highest elevation in the area concerned, rounded off to the next higher 50m (100ft) increment and adding a clearance of at least 300m (1000ft). (ie in the order of 100m or 300ft as appropriate) a minimum altitude applicable to all sectors may be established. A minimum altitude shall apply within a radius of 25 NM of the homing facility on which the instrument approach is based. The minimum obstacle clearance when flying over mountainous terrain should be increased by as much as 300m (100ft).

b. **Obstacles in Buffer Area**. If obstacles outside of, but within 5 NM of the boundaries of the sector concerned (buffer area) are higher than the highest obstacles within the sector, then the minimum sector altitude shall be increased by rounding off to the nearest appropriate whole number and adding a clearance of at least 300m (1000ft) over the obstacle in buffer area.

c. **Sector Orientation**. The sectors should normally coincide with the quadrants of the compass. However, when topographical or other conditions make it desirable, the boundaries of the sectors may be chosen to obtain the most favourable minimum sector altitudes.

Initial Approach Segment

15. **General**. The initial approach segment commences at the initial Approach fix (IAF). In the initial approach the aircraft is manoeuvring to enter the intermediate segment. When the intermediate fix is part of the en-route structure, it may not be necessary to designate an initial approach segment. In this case the instrument approach procedure commences at the intermediate fix and intermediate segment

criteria apply. An initial approach may be made along a VOR radial, NDB bearing, specified radar vector or a combination thereof. Where none of these is possible a DME is or a specified heading may be used. Reversal and racetrack procedures as well as holding pattern descent are initial segments until the aircraft is established on the intermediate approach track. Normally track guidance is required to except that dead reckoning tracks may be used for distances not exceeding 10 NM. Although more than one initial approach may be established for procedure, the number should be limited to that which is justified by traffic flow or other operational requirements. Where holding is required prior to entering the initial approach segment, the holding fix and initial approach fix should coincide. When this is not possible, the initial approach fix shall be located within the holding pattern on the inbound holding track.

16. **Alignment**. The angle of intersection between the initial approach track and the intermediate approach track should not exceed 120°. When the angle exceeds 120°, the use of a same track or reversal procedure or DR track should be considered.

17. **Area**. The initial approach segment has no standard length. The length shall be sufficient to permit the altitude change required by the procedure. The side of the track, and a secondary are which extends laterally 2.5 NM on each side of the primary area. Where because of an operational requirement, any portion of the initial approach is more than 37 NM (VOR) or 28 NM (NDB) from the facility providing track guidance area will splay proportionately at an angle of 7.8° for VOR or 10.3° for NDB initial approve.

18. **Obstacle Clearance**. The obstacle clearance in the initial approach primary area shall be a minimum of 300m (1000 ft). In the secondary area it reduces uniformly to zero at the outer edge. (See Fig No.3).

19. **Initial Approach Segment using a Racetrack Procedure**. Where sufficient distance is not available in a straight segment to accommodate the required descent and when entry into a reversal procedure is not practical race track procedures are used. The race track procedure has the same shape as a holding pattern but with different operating speeds and outbound timing. The inbound track normally becomes the intermediate or final segment of the approach procedure. The duration of he outbound flight of a racetrack procedure may be 1, 2, or 3 minutes to allow increased descent time. Where airspace is critical and extension is not possible, the descent may be achieved by more than one orbit in racetrack.

20. **Initial Approach Segments using a Reversal Procedure**.

a. **General**. Reversal procedures are used to establish the aircraft inbound on a intermediate or final approach track at the desired altitude. A reversal procedure consists of an outbound track followed by a turning manoeuvre in order to reverse direction into the inbound track. The procedure can be a procedure turn or a base turn and may be used when:

(1) The initial approach is initiated from a facility that is located on or near the aerodrome, or

(2) A turn of more than 70° would be required at the IF, and a radial, bearing, radar vector, DR track or DME information is not available to assist in leading the turn on to the intermediate track; or

(3) A turn of more than 120° (90° for ILS) would be required at the IF.

b. **Entry**. Entry into a reversal procedure shall be form a track within ± 30° of the outbound track of the reversal procedure. Where entry is desired from tracks which diverge more than 30° from the outbound track, suitably protected airspace must be provided to allow the pilot to manoeuvre on to the outbound track. This manoeuvring will be in accordance with the entry procedures associated with a suitably located holding pattern which must be shown on the approach chart.

c. **Types of Reversal Procedure**. The types of procedures permitted are illustrated in Figure I and are described as follows:

(1) **Base turn**. Consisting of a specified outbound track diverging at an angle Ø from the inbound track, for 1, 2 or 3 minutes, followed by a turn to intercept the inbound track. Angle Ø shall be equal to 36°/t for categories A and B aircraft and 54°/t for categories C, D and E aircraft and it is the time in minutes on the outbound leg.

d. **Procedure Turn (45°/180°)**. Consisting of one minute outbound flight from the facility or fix, a 45° turn away from the outbound track for 1.25 min (10 min for A and B category aircraft), followed by a 180° turn in the opposite direction to intercept the inbound track.

e. **Procedure Turn (80°/260°)**. Consisting of one minute outbound flight from the facility of fix, an 80°turn away from the outbound track, followed by a turn in the opposite direction to intercept the inbound track.

f. **Outbound Time**. The duration of a base turn reversal procedure may be 1, 2, or 3 minutes to allow descent time.

INTERMEDIATE APPROACH SEGMENT

21. **General**. This is the segment which blends the initial approach segment into the final approach segment. It is the segment in which aircraft configuration, speed, and positioning adjustments are made for entry into the final approach segment. There are two types of intermediate approach segments; both of which end at the FAF :

a. The segment begins at a designated IF.

b. The segment begins upon completion of DR track, a reversal or racetrack procedure. In both cases, track guidance shall be provided inbound to the FAF.

22. **Intermediate Approach Segment Based on a Straight Track Alignment**. The track to be flown in the intermediate approach segment should normally be the same as the final approach track. Where this is not practicable and the final approach fix in a non-precision procedure is a navigational facility, the intermediate track shall not differ from the final approach track by more than 30°.

23. **Length**. The length of the intermediate approach segment shall not be less than 5 NM (except as provided for in ILS and radar sections) nor more than 15 NM, measured along the track to be flown. The optimum length is 10 NM. A distance greater than 10 NM should not be used unless an operational requirement justifies a greater distance.

24. **Width**. The total width of the intermediate approach segment is determined by joining the outer edges of the initial approach segment with the outer edges of the final approach segment by means of straight lines. For obstacle clearance purposes, the intermediate approach segment is divided into a primary and a secondary area. The primary area is determined by joining the primary initial approach area with the primary final approach area by means of straight lines. The secondary area is determined by joining the respective initial approach and final approach secondary areas by means of straight lines.

25. **Obstacle Clearance**. A minimum of 150 m (500 ft) of obstacle clearance shall be provided in the primary area of the intermediate approach segment. In the secondary area, 150m (500 ft) of obstacle clearance shall be provided at the inner edge, reducing to zero at the outer edge.

26. **Intermediate Segment within a Reversal or Racetrack Procedure**. When used with the reversal or racetrack procedure, the segment its expands uniformly from the width of the final approach segment at the navigation facility to 5 NM on each side of track at 15 NM from the facility. Beyond 15 NM, the area remains 10 NM wide. Where a FAF is involved, intermediate approach area extends 5 NM each side of the intermediate track at 15 NM from the facility and tapers uniformly to the width of the final approach area at the FAF.

Final Approach Segment

27. **General**. This is the segment in which alignment and descent for landing are accomplished. The instrument part of the final approach segment begins at the final approach fix, and ends at the missed approach point (MA Pt). In an ILS approach, the final approach is deemed to commence at the final approach, point. Final approach may be made to a runway for a straight-in landing, or to an aerodrome for a circling approach. The final approach segment should be aligned with a runway whenever possible. Track guidance shall be provided for the instrument part of the final approach segment. Since the alignment and dimensions of the final approach segment and Minimum Obstacle Clearance (MOC) vary with the location and type of navigational facility applicable criteria are contained in the parts dealing with specific navigational facilities.

28. **Final Approach for Non-precision Approach with No FAF**. Where an aerodrome is served by a single facility located on or near the aerodrome and no other facility is suitably situated to form a FAF a procedure may be designed where the facility is both the IAF and the MA Pt. Descent to MDA/H is made once the aircraft is established on the final approach track. Whether or not a straight-in approach is possible will depend on the angular difference between the track and runway.

29. **Final Approach for Non-precision Approach with FAF**. The FAF is normally sited on the final approach track at a distance that permits selection of final approach configuration and descent. The optimum and maximum distances for locating the FAF are 5 NM and 10 NM from the threshold respectively. A step-down fix may be incorporated in some non- precision approach procedures, in which case two OCA/H will be published, the lower value applicable only if the step down fix is positively identified during the approach. In the case of VOR/DME several DME fixes may be depicted, each with its associated altitude.

30. **Precision Approach–ILS**. The final approach segment begins at the final approach point (FAP). This is the point in space on the centre line of localiser where the intermediate approach altitude/height intersects the nominal glide path. Generally glide path interception occurs at the heights from 300m (1000ft) to 900m (3000ft) above runway elevation. On a 3° glide path interception occurs between 3 NM and 10 NM from the threshold. The final approach area contains fixes or facilities that permit verification of the glide path/altimeter relationship. In the event of loss of glide path guidance during the approach, the procedure becomes a non-precision approach.

31. **Obstacle Clearance Altitude/ Height (OCA/H)**. Obstacle clearance altitude/ height (OCA/H)is :

a. In a precision approach procedure the lowest altitude (OCA) or alternatively the lowest height above the elevation of the relevant runway threshold (OCH), at which a missed approach must be initiated, to ensure compliance with the appropriate obstacle clearance criteria, or

b. In a non-precision approach procedure the lowest altitude (OCA) or alternatively the lowest height above aerodrome elevation or the relevant runway threshold, (if the threshold elevation is more than 2 m (7 ft) below the aerodrome elevation) (OCH), below which the aircraft cannot descend without infringing the appropriate obstacle clearance criteria, or

c. In a visual (circling) procedure the lowest altitude (OCA) or alternatively the lowest height above the aerodrome elevation (OCH) below which an aircraft cannot descend without infringing the appropriate obstacle clearance criteria.

Note. Other factors involving crew qualification/rating are also taken into account besides OCA/H while establishing operating minima (DA/H or MAD/H):

32. **Publication of OCA/H**. An OCA and/or an OCA shall be published for each instrument approach and circling procedure. For non-precision approach procedures, either value shall be expressed in 5 m (10ft) increments by rounding up as appropriate.

33. **OCA/H for Straight-in Approach**. The OCA/H for a straight-in approach shall provide he minimum required clearance (MOC) over the highest obstacle in the final approach segment. It shall also ensure that missed approach obstacle clearance is provided. A straight – in OCA/H shall not be published where final approach alignment, descent, gradient, and length criteria are not met. In this case only circling OCA/H shall be published.

34. **OCA/H for Circling Approach**. The OCA/H for a circling approach shall provide the minimum required clearance (MOC) over the highest obstacle in the final approach segment, the visual manoeuvring (circling) area and the specified missed approach segment. The circling OCA/H shall conform to the limit specified and be not less than the value for the non-precision straight-in approach.

Missed Approach Segment

35. During the missed approach phase of an instrument approach procedure, the pilot is faced with the demanding task of changing the aircraft configuration, altitude and attitude. For this reason the design of the missed approach should be kept as simple as possible and consists of three phases viz initial, intermediate and final phases (see Fig 5).

36. A missed approach procedure, designed to provide protection from obstacles throughout the missed approach manoeuvring established for each instrument approach procedure. The missed approach is assumed to be initiated not lower than the DA/H in precision approach procedures, or at a specified point in non-precious approach procedures not lower than the MDA/H. The MA Pt in a procedure may be:

a. The point of intersection of an electronic glide path with the applicable DA/H.

b. A navigational facility.

c. A fix or

d. A specified distance from the FAF.

37. If upon reaching the MA Pt, the required visual reference is not established, a missed approach must be initiated at once in order that protection from obstacles be maintained.

38. Only one missed approach procedure should be established for each approach procedure.

Missed Approach Phases

39. **General**. A missed approach procedure shall be established for each instrument approach and shall specify a point where the procedure begins and a point where it ends. The missed approach procedure is assumed to be initiated not lower than the OCA/H in precision approach procedures or at a specified point in non-precision approach procedures not lower than the OCH/H. The missed approach procedure shall terminate at an altitude/height sufficient to permit:

a. Initiation of another approach; or

b. Return to a designated holding pattern; or

c. Resumption of en-route flight.

Only one missed approach procedure shall be published.

40. **Initial Phase**. The initial phase begins at the missed approach point (MAP) and ends at the start of climb point (SOC). It includes a longitudinal tolerance applied over the full width of the missed approach area for;

a. The longitudinal tolerance of the MAPt.

b. The distance an aircraft traverses during the 15 s transition from approach to missed approach climb, and

c. Tail winds.

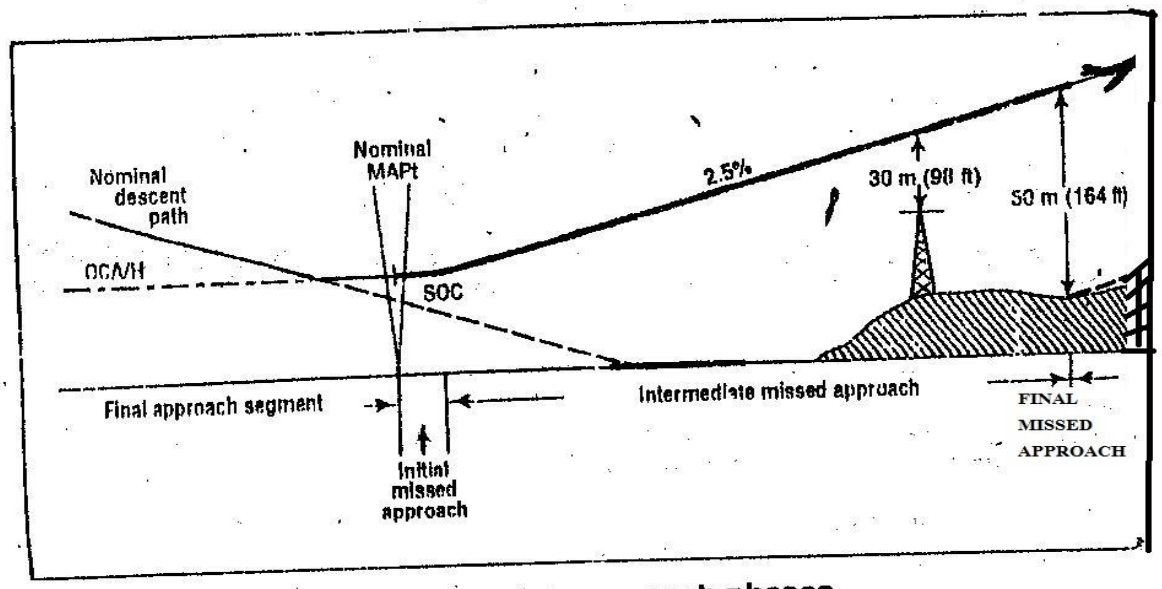
The manoeuvre during this phase necessitates the concentrated attention of the pilot especially when establishing the climb and the changes in configuration, and it is assumed that the guidance equipment cannot be fully utilized during these manoeuvres. No requirements to change the flight direction are acceptable in this phase.

41. **Intermediate Phase**. The intermediate phase is that during which the climb is continued at stabilized speeds up to the first point where 50 m (164 ft) obstacle clearance is obtained and can be maintained. Advantage may be taken of available navigational guidance. During the intermediate phase the missed approach track may be changed by a maximum of 15° from that of the initial phase.

42. **Final Phase**. The final phase begins at the point where 50 m (164 ft) obstacle clearance is first obtained and can be maintained. It extends to the point at which a new approach, holding or return to en-route flight is initiated. Turns may be carried out during this phase.

43. Acceleration and subsequent climb portions within the final phase. Within the final phase of the missed approach segment the height of a 6 NM, horizontal portion, for acceleration of the aeroplane in level flight when needed, shall be identified in which a minimum clearance of 90m (300ft) above obstacles in the primary area exists. The horizontal portion shall be followed by a climbing portion with a 1 per cent gradient representing en-route climb until an altitude at which other prescribe obstacle clearances (such as for en-route or holding) become effective. When the horizontal portion so identified is higher than 250m (800ft) above the aerodrome, in order to provide the 90m (300ft) MOC throughout this portion and the following 1 percent en-route climb portion, the procedure shall be noted "Climb to ..... (altitude/height) prior to accelerating". The identification of these portions does not affect the calculation of OCA/H (see Fig –6)

44. **Climb Gradient for Missed Approach Surface**. The nominal climb gradient



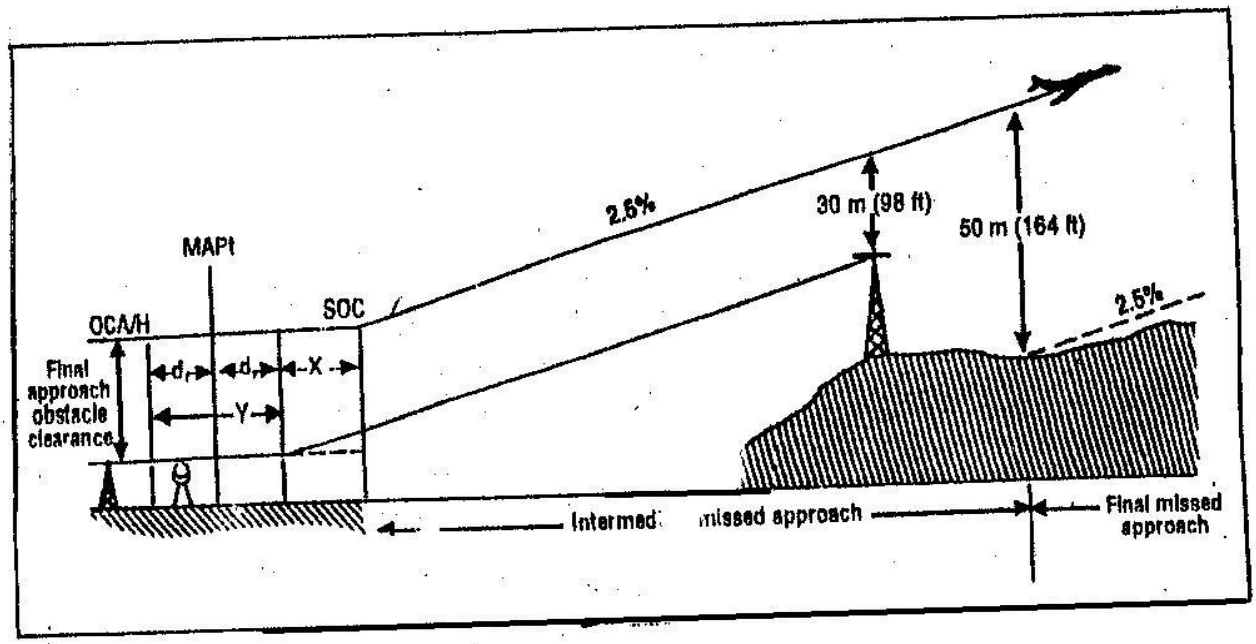
Missed approach phases

of the missed approach surface is 2.5 percent.

45. **Obstacle Clearance**. The minimum obstacle clearance to be provided in the horizontal part of the initial missed approach area shall be the same as for the last part of the final approach area except where the extension of the missed approach surface towards the missed approach point requires less clearance. (See Figures III-7-2 and III-7-3). In the intermediate missed approach phase the minimum obstacle clearance shall be 30 m (98 ft) in the primary area, and in the secondary area the minimum obstacle clearance shall be 30M (98 ft) at the inner edge and shall reduce uniformly to zero at the outer edge. In the final missed approach phase the minimum obstacle clearance shall be 50m (164 ft) in the primary area reducing linearly to zero at the outer edge of the secondary area.

Note. MOC may be obtained by increasing the OCA/H or by a longitudinal adjustment of the MAPt or both.

46. **Missed Approach Area**. The area considered for missed approach shall commence at the beginning of the longitudinal tolerance of the MA Pt at a width equal to that of the final approach area at that point. The size and shape of the area depends on the missed approach procedure including the point at which the turn is initiated if applicable, and the extent of the turn.



Clearance for final missed approach phase

47. **Visual Manoeuvring (Circling) in the Vicinity of the Aerodrome**. Visual Manoeuvring (circling) is the term used to describe the visual phase of flight after completing an instrument approach to bring an aircraft into position for landing on a runway which is not suitably located for straight-in-approach.

48. **The Visual Manoeuvring (Circling) Area**. The area for circling approach is determined for different categories of aircraft by drawing arcs cantered on each runway threshold. An example of determining radii for visual manoeuvring area is shown below (see also Fig 7).

Category of aircraft/IAS Kt	A/100	B/135	C/180	D/205	E/240
TAS at 600m (2000ft) MSL + 25 Kt wind factor	131	168	215	242	279
Radius (+) of turn (NM)	0.69	1.13	1.85	2.34	3.12
Straight segment (NM) (constant value)	0.30	0.04	0.50	0.60	0.70
Radius from threshold (NM) (25+straight segment)	1.68	2.66	4.20	5.28	6.94

49. **Obstacle Clearance**. The OCA/H is determined for each category of aircraft for visual manoeuvring as follows:

Aircraft Category	Obstacle clearance in m (ft)	Lowest OCH above aerodrome elevation m (ft)	Minimum visibility (Km)
A	90 (300)	120 (400)	1.9 (1.0 nm)
B	90 (300)	150 (500)	2.8 (1.5 nm)
C	120 (400)	180 (600)	3.7 (2.0 NM)
D	120 (400)	210 (700)	4.6 (2.5 NM)
E	150 (500)	240 (800)	6.5 (3.5 NM)

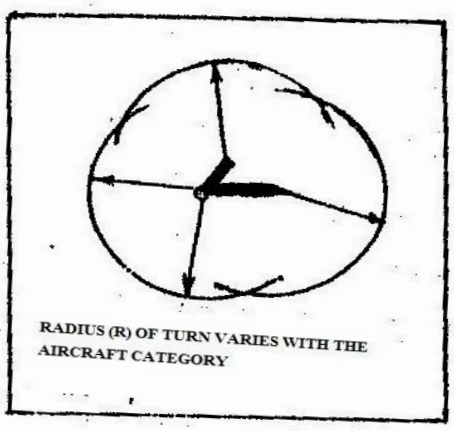


Fig – 7

50. Additional margin may be added to the above OCA/H for operational consideration in accordance with existing regulation, and MDA/H specified descent below MDA/H should not be made until :

a. Visual reference has been established and can be maintained,

b. The pilot has the landing threshold in sight, and

c. The required obstacle clearance can be maintained and the aircraft is in a position to carry out a landing.

51. **Areas that Need not be Considered for Obstacle Clearance**. It is permissible to eliminate from consideration a particular sector where a prominent obstacle exists in the visual manoeuvring area outside the instrument approach surface detailed in chapter. When this option is exercised, the procedure should prohibit circling within the sector in which the obstacle exists (see Fig 8).

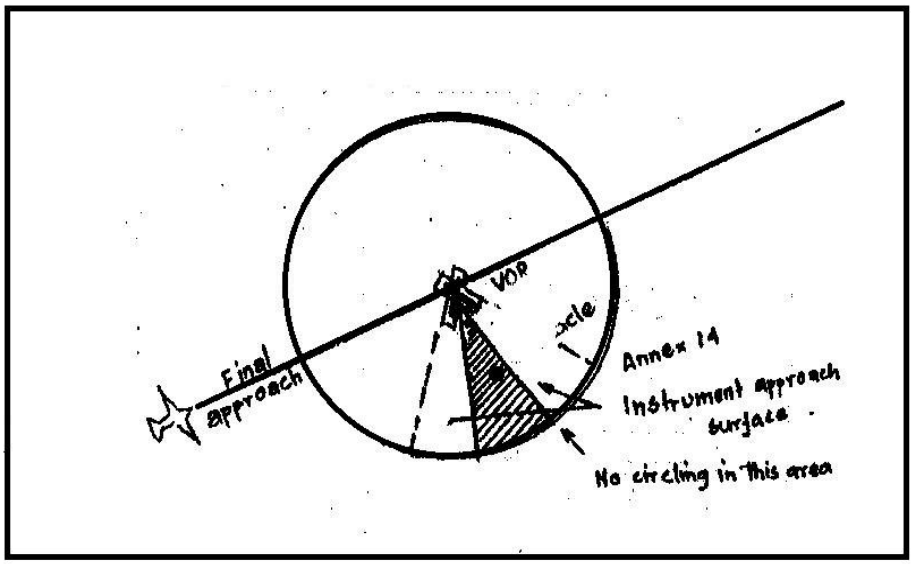


Fig- 8

52. A circling approach is a visual flight manoeuvre. It is therefore not possible to specify any single procedure that will cater for every situation, the basic requirement being that after the initial visual contact, the runway should be kept in sight while at MDA/H for circling. If visual reference is lost while circling to land from an instrument approach, the missed approach specified for that particular procedure must be followed. This will include an initial climbing turn towards the landing runway and overhead the aerodrome followed by climb on the missed approach track.

Note-1. **Instrument Runway**. One of the following type of runways intended for operation of aircraft using instrument approach procedures:

a. **Instrument Runway**. An instrument runway served by visual aids and a non-visual aid providing at least directional guidance adequate for a straight in approach.

b. **Precision Approach Runway Cat-I**. An instrument runway served by ILS and visual aids intended for operation down to 60 m (200 ft) DH and down to an RVR of 800 M (2600ft).

c. **Precision Approach Runway Cat –II**. An instrument runway served by ILS and visual aids intended for operation down to a DH of 30m (100 ft) and down to a RVR of 400 m (1200 ft).

d. **Precision Approach Runway Cat-III**. An instrument runway served by ILS to and along the surface of runway and

(1) 'A' – intended for operation down to an RVR of 200 m (700 ft) (no DH being applicable) using visual aids during the final phase of landing.

(2) 'B' – intended for operation down to an RVR of 50 m (150 ft) (no DH being applicable) using visual aids for taxing.

(3) 'C' – intended for operations without reliance on visual reference for landing or taxing.

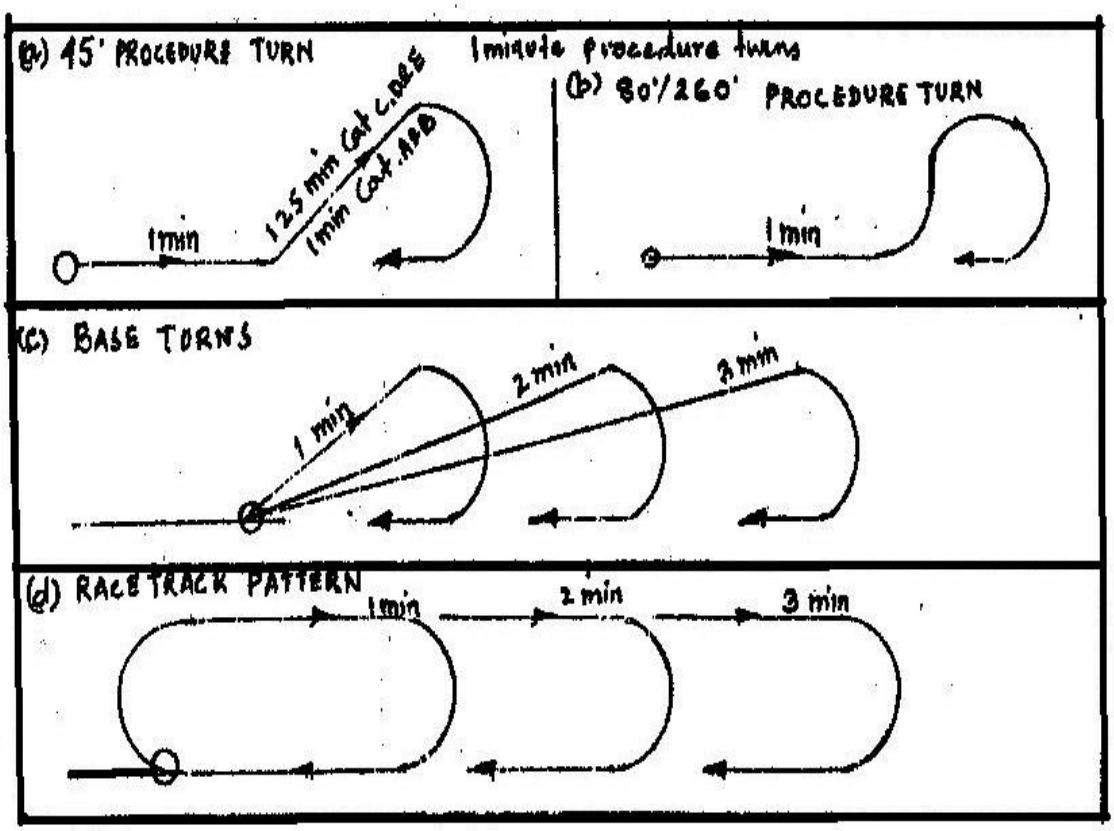


Fig - 1

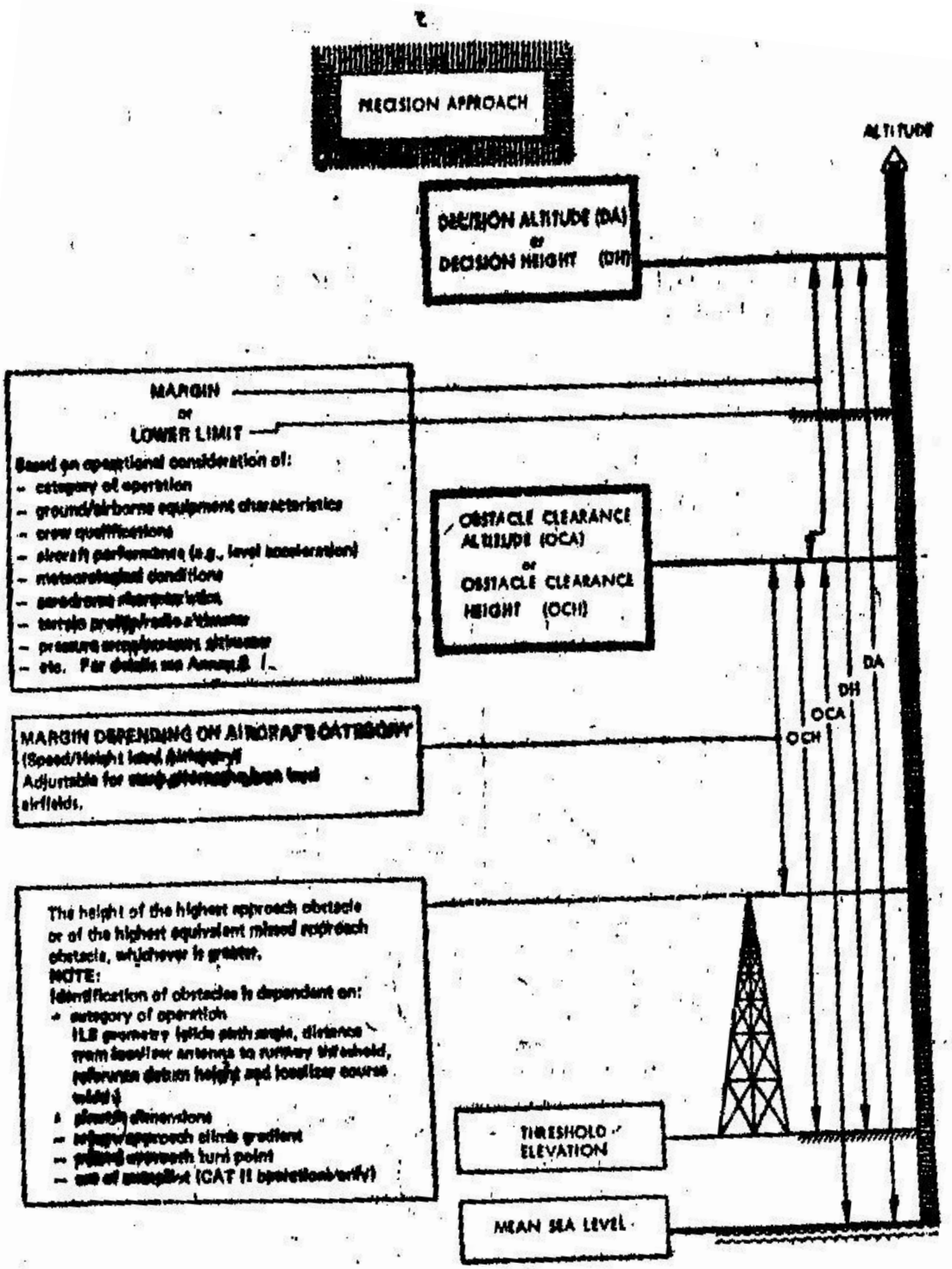

DECISION APPROACH
ALTITUDE
DECISION ALTITUDE (DA)
or
DECISION HEIGHT (DH)
MARGIN
or
LOWER LIMIT
Based on operational consideration of:
- category of operation
- ground/airborne equipment characteristics
- crew qualifications
- aircraft performance (e.g., level acceleration)
- meteorological conditions
- aerodrome characteristics
- terrain profile/radio altimeter
- pressure compensated altimeter
- etc. For details see Annex B
OBSTACLE CLEARANCE
ALTITUDE (OCA)
or
OBSTACLE CLEARANCE
HEIGHT (OCH)
DA
DH
OCA
OCH
MARGIN DEPENDING ON AIRCRAFT CATEGORY
(Speed/Height loss airborne)
Adjustable for steep gradients/high level
airfields.
The height of the highest approach obstacle
or of the highest equivalent missed approach
obstacle, whichever is greater.
NOTE:
Identification of obstacles is dependent on:
- category of operation
ILS geometry (glide path angle, distance
from localiser antenna to runway threshold,
reference datum height and localiser course
width)
- growth dimensions
- missed approach climb gradient
- missed approach turn point
- use of autopilot (CAT II operations only)
THRESHOLD
ELEVATION
MEAN SEA LEVEL

Fig - 2

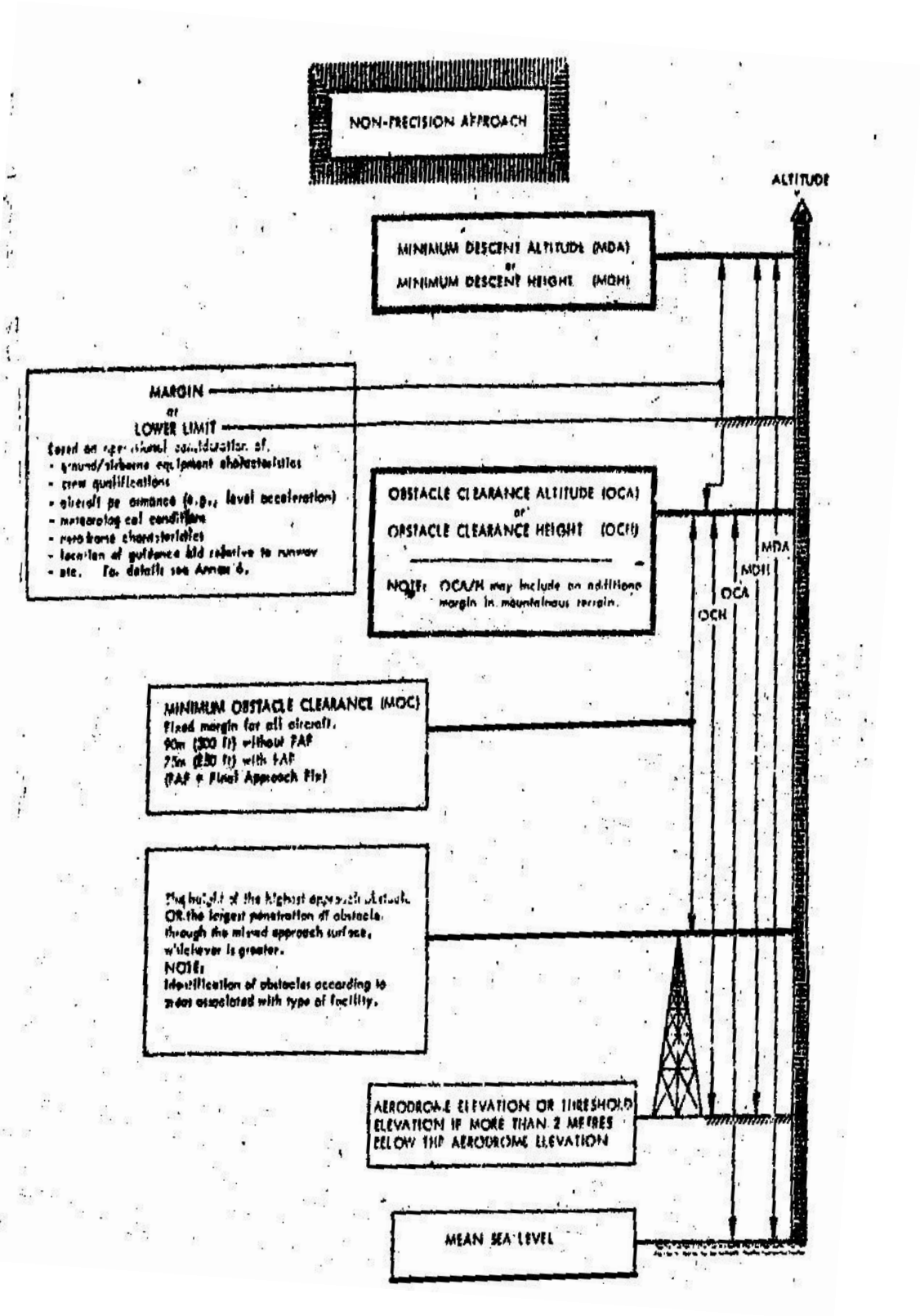

NON-PRECISION APPROACH
ALTITUDE
MINIMUM DESCENT ALTITUDE (MDA)
or
MINIMUM DESCENT HEIGHT (MDH)
MARGIN
or
LOWER LIMIT
- ground/airborne equipment characteristics
- crew qualifications
- aircraft performance (e.g., level acceleration)
- meteorological conditions
- runway characteristics
- location of guidance aid relative to runway
- etc. For details see Annex 6.
OBSTACLE CLEARANCE ALTITUDE (OCA)
or
OBSTACLE CLEARANCE HEIGHT (OCH)
NOTE: OCA/H may include an additional margin in mountainous terrain.
MDA
MDH
OCA
OCH
MINIMUM OBSTACLE CLEARANCE (MOC)
Fixed margin for all aircraft.
90m (300 ft) without FAF
75m (250 ft) with FAF
(FAF = Final Approach Fix)
The height of the highest approach obstacle
OR the largest penetration of obstacle
through the mixed approach surface,
whichever is greater.
NOTE:
Identification of obstacles according to
areas associated with type of facility.
AERODROME ELEVATION OR THRESHOLD
ELEVATION IF MORE THAN 2 METRES
BELOW THE AERODROME ELEVATION
MEAN SEA LEVEL

Fig - 3

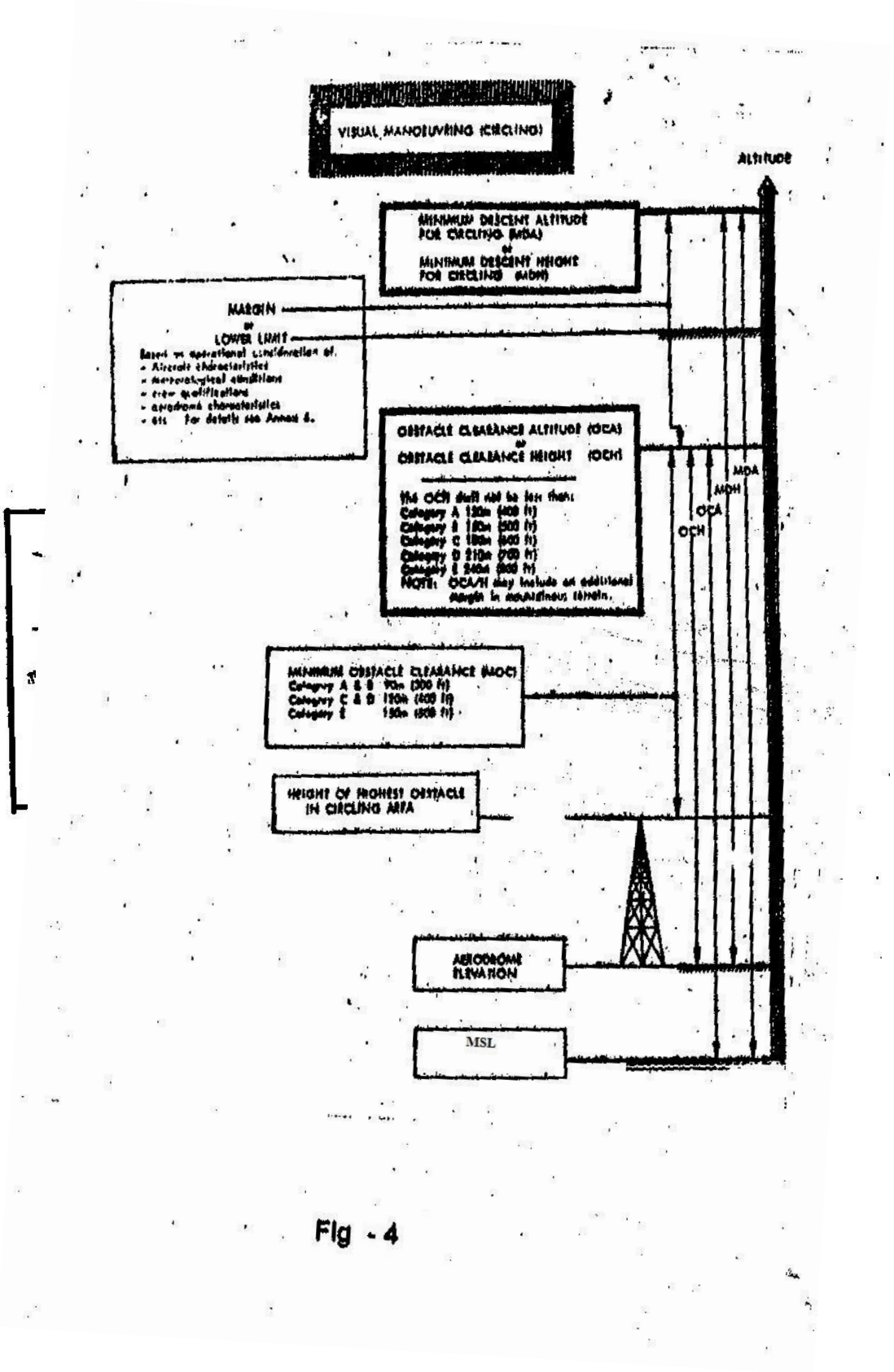

VISUAL MANOEUVRING (CIRCLING)
ALTITUDE
MINIMUM DESCENT ALTITUDE FOR CIRCLING (MDA)
or
MINIMUM DESCENT HEIGHT FOR CIRCLING (MDH)
MARGIN
or
LOWER LIMIT
OBSTACLE CLEARANCE ALTITUDE (OCA)
or
OBSTACLE CLEARANCE HEIGHT (OCH)
MDA
MDH
OCA
OCH
MINIMUM OBSTACLE CLEARANCE (MOC)
HEIGHT OF HIGHEST OBSTACLE IN CIRCLING AREA
AERODROME ELEVATION
MSL

Fig - 4

NDB on Aerodrome with no Final Approach Fix

53. The general criteria described in the following specifications should be applied to procedures based on the “NDB on aerodrome”. An “on Aerodrome” facility is one which is located within 1 NM of the nearest portion of the usable landing surface.

54. **Initial Approach Segment**. The IAF is received by over heading the navigational facility. The initial approach is a reversal or racetrack procedure.

55. **Intermediate Segment**. This procedure has no intermediate segment. Upon completion of the reversal or racetrack procedure, the aircraft is on final approach.

56. **Final Approach Segment**. The final approach begins where the reversal or racetrack procedure intersects the final approach track inbound.

57. **Alignment**. The alignment of the final approach track with the runway centreline determines whether a straight-in or a circling approach may be established.

58. **Straight-in-Approach**. For a straight-in-approach, the angle formed by the final approach track and the runway centre line shall not exceed 30°, and the distance between the runway threshold and the point at which the final approach track intersects the centreline shall not be less than 900m (3000 ft). A final approach track which does not intersect the extended centreline of the runway may also be established, provided such track is within 150m (500 ft)laterally of the runway centreline at a point 900m outward from the runway threshold (See Fig A).

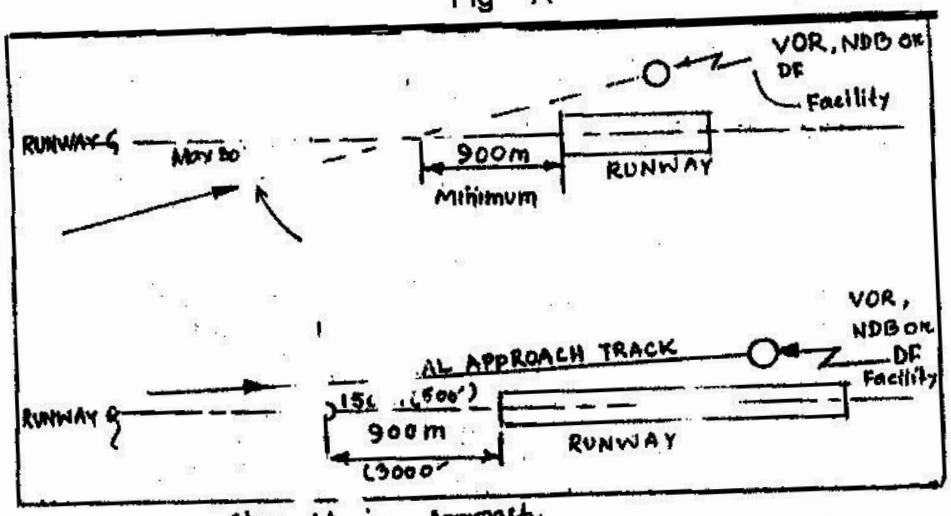
59. **Circling Approach**. When the final approach track alignment does not meet the criteria for a straight-in landing, only a circling approach shall be authorised, and the track alignment should ideally be made to the centre of the landing area (See Fig-B).

60. **Fig**. Illustrate the final approach primary and secondary areas for a VOR, which is similar. In the case of NDB the values given below are to be used. The area is longitudinally centred on the final approach track. For NDB on-aerodrome with no FAF, a reversal or racetrack procedure must be executed before the final approach, and the approach area shall extend to the boundary of the area for reversal or racetrack procedure. The area is 2.5 Nm wide at the facility and expands at the rate of 103°. A secondary area, comprising 25 percent of the total width lies on each side of the primary area, which comprises 50 percent of the total.

Note: The area for reversal/racetrack procedure is to be constructed in aerodrome with ICAO PANS-OPS DOC 8168 Volume II.

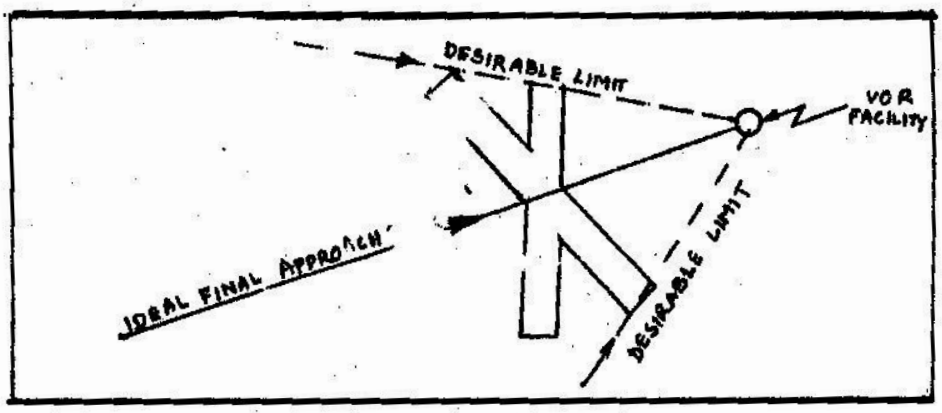
61. **Obstacle Clearance**. MOC in the primary area is 90m (300 ft). In the secondary area 90m (300 ft) of obstacle clearance shall be provided at the inner edge, reducing uniformly to zero at the outer edge.

Fig – A



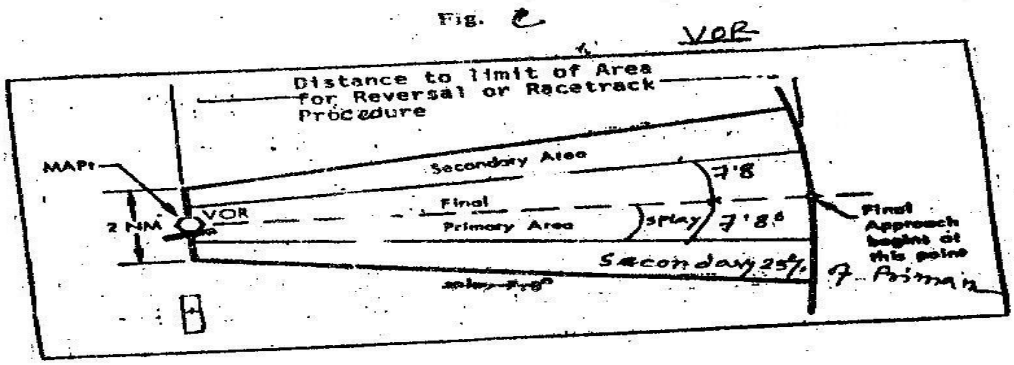
Strenght in Approach

Fig – B



Circling Approach

Fig. 2



62. The use of a step down fix is permitted. Where a step down fix is provided so that the distance from the fix to the MAPt does not exceed 4 Nm, the obstacle clearance may be reduced to 75m (250ft) between the stepdown fix and the MAPt, Considering the obstruction on the misused approach area.

63. The MAPt is located at the facility or defined by an adequate fix. The missed approach area shall commence at the MAPt.

<u>NDB with Final Approach Fix (FAF)</u>

64. The criteria are the same as those contained in Paras 46 to 55 except for the final approach area and obstacle clearance, which are contained in ICAO DOC 8161 as modified by relevant Air Force Orders.

CONSOLIDATION EXERCISE – 9

Q1. What are the factors should be considered before design of a particular instrument approach procedure?

Q2. Define Missed Approach Area.

ANSWER TO CONSOLIDATION EXERCISE – 9

A1. Following are the factors should be considered before design of a particular instrument Approach Procedure:

a. The terrain surrounding an aerodrome.
b. The type of operations contemplated.
c. The type of aircraft to be accommodated.
d. The siting of navigational aids, and
e. The airspace available for operations.

A2. **Missed Approach Area**. The area considered for missed approach shall commence at the beginning of the longitudinal tolerance of the MA Pt at a width equal to that of the final approach area at that point. The size and shape of the area depends on the missed approach procedure including the point at which the turn is initiated if applicable, and the extent of the turn.

TASK-10

METEOROLOGY

Atmosphere

1. The word 'Atmosphere' is derived from the Greek Words "atoms" which means vapour and "Sphaira" which means sphere. It is now used to denote the gaseous sphere surrounding the earth.

Layers

2. The atmosphere is divide into five layers with each layer giving certain features. The names of the layers are as follows:

a. Troposphere

b. Stratosphere

c. Mesosphere

d. Thermosphere

e. Exosphere

Temperature

3. Two temperature scales are commonly used in communicating weather information Fahrenheit (F) and Celsius (C) (Centigrade). The freezing point of water is 32° on the Fahrenheit scale (32°F) and zero on the Celsius scale (0°C) and the boiling point of water is 212°F and 100°C at sea level.

Standard Atmosphere

4. Several values assigned to the atmosphere have been mentioned, but in order to measure a change from the normal, we have to establish a standard. Conditions throughout the world for all latitudes and all seasons have been averaged, to arrive at a specific surface temperature, surface pressure, and rate of change of temperature and pressure with height for given layers within the atmosphere. The following is a partial list of values assigned to the STANDARD ATMOSPHERE:

a. A surface temperature of 15°C (59°F) at Sea level.

b. A surface pressure of 1013.2 milliards (29.92) inches of mercury at sea level.

c. A lapse rate (decrease of temperature with height) in the troposphere of approximately 2°C per thousand ft.

d. A tropopause of approximately 36,000ft.

e. A temperature at the tropopause of –55°C.

Lows

5. Regions of low pressure develop where air lies over land or water surface that are minor than the surrounding areas.

Highs

6. Regions of high pressure develop where air lies over surfaces that are cooler than the surrounding area, and where air en-route from the equator to the poles is forced to descend.

Wind Patterns

7. Wind flows from high pressure to low pressure. In the northern Hemisphere wind is deflected to the right of its course by the earth's rotation. Air moving outward from a "High" flows in a clockwise spiral around to "High" centre and air moving a "Low" flows in a counter clockwise spiral around the "Low" centre.

Isobars

8. The pressure at each station is recorded in the weather map and lines called isobars are drawn to connect the points of equal pressure. Many of these lines make complete circles and surround areas marked H (high) or L (low). Isobars indicate amount of pressure and steepness of pressure gradients. If the gradient (slope) is steep, the isobars will be close together and the wind will be strong. If the gradient is gradual, the isobars will be far apart and the wind is gentle.

Buys Ballot's Law

9. The Dutch Meteorologist, Buys Ballot, described a relationship which exists between the wind direction and the isobars. This relationship is known as Buys Ballot's Law. It says, if an observer stands with his back to the wind, the lower pressure is on his left in the northern hemisphere, and on the right in the southern hemisphere.

Gust Wind

10. A gust is a rapid increase in the strength of the wind relative to its mean value over a period of time. It is of shorter duration than a squall, and is followed by a lull.

Squall Wind

11. A squall is a strong wind that commences suddenly, lasts for some minutes, and then dies away comparatively suddenly. It is more specifically defined as a sudden increase in wind speed by at least 16 knots, the speed increasing to 22 knots or more and lasting for at least one minute.

Visibility

12. Meteorological visibility is defined as the greatest distance at which a prominent object, unlighted by day and lighted by night can be seen and identified with un-aided normal eye.

a. Visibility may be expressed as :

(1) Horizontal ground visibility.

(2) Slant or oblique visibility.

(3) Flight visibility.

(4) Vertical visibility.

b. Weather conditions that can reduce ground visibility.

(1) Fog/Mist.
(2) Smoke pollution/Industrial Haze
(3) Sand and Dust.
(4) Rain and Snow.

Fog

13. Fog causes atmospheric obscurity of horizontal visibility of less than 1000 meters. Fog consists of water particles condensed on to nuclei of dust, smoke or salt particles. It may be considered as cloud on the ground. There are three main types of fog :

a. Radiation fog.
b. Advection fog.
c. Hill fog.

Mist

14. Fog and Mist differ only in the extent to which visibility is affected. In both, the deterioration is caused by suspended water droplets at the surface.

Fog = Visibility less than 1000 meters.
Mist = Visibility 1000 meters or more.

Clouds

15. **Cloud Formation**. Moist air is cooled below its dew point by adiabatic expansion as it rises. Clouds are formed by the resulting condensation. The shapes and forms of clouds are really expression of the way in which the air has risen to fashion them. The various types of vertical motion that lead to the formation of clouds are as follows :

a. Mechanical turbulence (or frictional).
b. Convection (or thermal turbulence).
c. Oragraphic ascent.
d. Slow widespread ascent (Frontal cloud)

Divisions of Clouds

16. Clouds are divided into three classes (Family) according to the height range in which they occur :

a. **High Clouds**. Lower limit 20,000' ft, upper limit 40,000' ft. These clouds are composed of ice crystals.

b. **Medium Clouds**. Lower limit 7,000' ft and upper limit 20,000' ft.

c. **Low Clouds**. Lower limit near the earth's surface, upper limit 7,000' ft.

d. **Clouds with Vertical Development**. Base 1500 and top upto 55,000' ft.

Cloud Genera

17. Ten main groups of clouds can be distinguished. Each is a **Genus**, the plural being denoted by the word **Genera**.

a. Clouds are grouped into the ten following Genera :

(1) Cirrus.
(2) Cirrocumulus.
(3) Cirrostratus
(4) Altocumulus.
(5) Altostratus.
(6) Nimbostratus.
(7) Stratocumulus.
(8) Stratus.
(9) Cumulus.
(10) Cumulonimbus

Thunderstorm

18. Thunderstorms constitute one of the most dramatic of the atmospheric phenomena. To aviation they present flight conditions which must be considered carefully.

a. **Requirements for Thunderstorm Development**. In order for a well developed thunderstorm to form, the following conditions must be present :

(1) Unstable air to high levels.
(2) High relative humidity.
(3) Some lifting agency to set the air in motion.

b. **Structure and Development of Thunderstorm**. The thunderstorm appears to be made up of separate cells in various stages of development with considerable convection cloud between. Since the cell is the centre of the activity of the storm its development is described in detail. The life history of a thunderstorm cell can be divided into three stages:

(1) The Growing or Cumulus stage.
(2) The Mature stage.
(3) The Dying or Dissipating stage or anvil stage.

Nor' Westers

19. These are severe type of thunderstorms which occur over Bangladesh in the pre-monsoon hot weather months from March to June. Their activity ceases in June when monsoon establishes. The squall generally occurs from North West and is accompanied by the appearance of low bank of dark clouds in that direction. In severe Nor' Westerns, squalls wind speeds of 80 to 100 m.p.h. are reached and very heavy rain and hail occur. They generally occur in the afternoon or evening and do not last long.

20. **Causes of Nor' Westers**. During summer months (March to Jun.) the lower layer of the atmosphere (3000 ft. to 7000) is heated and a low pressure area lies over the Gangatic plane. As a result the moist air from Bay of Bengal blows towards low pressure area as South Westerly or Southerly wind in the lower layer (3000-7000 ft) of atmosphere. Above this level of the atmosphere over this area dry and cold, air blow from west or Northwest. These conditions create latent instability, which is favourable for development of Cb clouds. These Cb clouds are carried with the North Westerly wing at the upper level and causes thunderstorm over different areas in Bangladesh.

Climatology of Indo-Bangladesh Sub-Continent

21. In a year there are mainly four different seasons or periods in Indo-Bangladesh Sub-continent:

a. Pre-monsoon period (Hot weather period) - March to May.
b. Monsoon or Southwest monsoon period - June to September.
c. Post monsoon period - October to November.
d. Winter period (North East Monsoon) - December to February.

22. **Pre-Monsoon Period (March to May)-Hot Season**. In this period, due to position of the sun, low pressure creates over North India (Gangetic plane) and high pressure over the Indian Ocean, Bay of Bengal. Such a pressure gradient causes winds to blow from sea to land, violent local storms (dust storms or thunder storms) occur owing to interaction of humid sea air and dry land air. In Bangladesh this is the season of Nor' Westers.

23. **South-West Monsoon Period (June to September) Rainy Season**. The pressure distribution is similar as in hot season but in more well marked with steeper pressure gradient. The lowest pressure occurs over Pakistan and the trough of low pressure extends from Punjab to West Bengal. South-West monsoon sets in the first week of June in Bangladesh and continues upto the middle or and of September.

24. Depressions occasionally form in North Bay of Bengal and travel W to NW-wards along the trough of low extending from Bangladesh to Punjab. These depressions cause considerable rainfall and thunderstorms along their track.

25. Orography of places plays an important part. Due to Khasi and Gharo hills monsoon rainfall is very heavy in part of Bangladesh.

26. **Post Monsoon Period (October to November)**. In this period pressure distribution is reversed with high pressure over Pakistan and North India and low pressure in the south. In Bangladesh and Western half of South India such rain occurs.

27. **North-East Monsoon Period (December to February)**. In winter, interior of Asia becomes excessively cold, resulting in the development of an anticyclone. Over the warmer seas, pressure is lower. This causes winds to blow from land to sea. They blow from Northeast and being dry cause no weather.

Codes of Meteorological Information

28. Messages are received at the aviation Meteorological offices in coded form. Some of the most commonly used code forms are as follows :

a.	SYNOP	-	Surface report from land station.
b.	METAR	-	Aviation routine weather report.
c.	SPECI	-	Aviation selected special weather report.
d.	TAE	-	Aerodrome forecast.
e.	ARFOR	-	Area forecast for aviation.
f.	ROFOR	-	Route forecast for aviation.

Meter Reporting Procedure

29. Weather report for aviation are raised hourly or as required and sent to Air Traffic Control for transmission to the aircraft. The existing weather in accordance with the amount of cloud are reported as follows :

a. **Fair**. Clear Sky or cloud amount less than 1 octa.

b. **Partly Cloudy**. Cloudy amount 1-3 octas.

c. **Cloudy**. Cloud amount 4-7 octas but no Cb exists.

d. **Over East.** Sky is completely obscured by cloud.

e. **Thunderstorm**. Whenever Cb cloud exists at an airfield and the cloud amount exceed 3 octas.

30. **Selected Special Weather Report (SPECI)**. SPECIs are issued by the meteorological observation stations whenever a change of weather phenomena takes place from the reported METAR. The following weather phenomena are considered for issue of SPECI:

a. Lowest cloud Base.

b. Visibility.

c. Surface winds.

d. Present weather.

Weather Warning

31. Whenever a weather deterioration is expected or eminent meteorological Sections issue met warning for use of the aviation. There are two types of warning existing in BAF.

a. **Yellow Met Warning (YMW)**. The following Phenomena are considered for issuing YMW.

(1) **Poor Visibility**. When visibility is expected to reduce 5 Km or less but not below 1.5 Km.

(2) **Low Cloud**. When the height of base of lowest clouds of an amount greater than 4 octas is expected to lower between 450-150m (1500-500ft).

(3) **Strong Wind/Gale**. When the mean wind speed is expected to exceed 15 Kts but not to exceed 28 Kts.

(4) **Gusty Wind**. When the wind is expected to be gusty and wind force in individual gusts is expected to reach 15-28 Kts.

(5) **Thunderstorm**. When a thunderstorm not accompanied by squall is expected to occur.

b. **Red Met Warning (RMW)**. RMW are issued considering the following weather phenomena :

(1) **Poor Visibility**. When visibility is expected to reduce to less than 1.5 Km.

(2) **Low Cloud**. When the height of base of lowest cloud of an amount greater than 4 octas is expected to lower below 150m (600) AGL.

(3) **Gusty Wind**. When the wind is expected to be gusty and the wind force in individual gusts is expected to exceed 28 Kts.

(4) **Strong Wind/Gale**. When the mean windspeed is expected to exceed 28 Kts.

(5) **Thunder Storm**. When thunderstorm accompanied by squall is expected to occur.

(6) **Squall/Nor'Wester**. When Squall/Nor'wester is expected to occur.

(7) **Hail**. When Hail is expected.

(8) **Heavy Rain**. Intensity 2” per hour or more is expected.

(9) **Dust Storm/Sand storm**. When expected.

CONSOLIDATION EXERCISE – 10

Q1. When an aircraft changes from QNH to standard setting and vice-versa?

Q2. What are the differences between cloud, Fog and Mist?

Q3. Write down the name of Ten main groups of clouds Genera.

Q4. a. What are the conditions to be present for a well developed thunderstorm to form?

b. What are the stages of thunderstorm?

ANSWERS TO CONSOLIDATION EXERCISE – 10

A1. a. **Departing Aircraft**. Report altitudes (on aerodrome QNH) until reaching the transition altitude when they change to 1013.2 mbs and thereafter report in flight levels.

b. **Arriving Aircraft**. Descend on 1013.2 mbs until reaching the transition level when they change altimeter setting to aerodrome QNH, and thereafter, descend and land maintaining vertical distance as altitude.

c. Aircraft are not normally 'held' or flown in level within the transition layer.

A2. a. Moist air is cooled below it's dew point by adiabatic expansion as it rises. Clouds are formed by the resulting condensation. Fog may be considered as cloud on the ground.

b. Fog and Mist differ only in the extent to which visibility is affected. In both the deterioration is caused by suspended water droplets at the surface.

Fog = When visibility is less than 1000 meters.
Mist = When visibility is 1000 meters or more

A3. Clouds are grouped into the ten following General :

a.	Cirrus	b.	Cirrocumulus
c.	Cirrostratus	d.	Altocumulus
e.	Altostratus	f.	Nimbostratus
g.	Stratocumulus	h.	Stratus
j.	Cumulus	k.	Cumulonimbus

A4. a. (1) Unstable air to high levels.

(2) High relative humidity.

(3) Some lifting agency to set the air in motion.

b. (1) The growing or cumulus stage.

(2) The mature stage.

(3) The dying or dissipating stage or anvil stage.

TASK -11

AIR LEGISLATION

General

1. An operator shall ensure that his implores when abroad know that they must comply with the law regulations and procedures of the states in which his aeroplanes are operated. An operator or his designated representatives shall have responsibility for operational control.

2. If an emergency situation which endangers the safety of the aero plane or persons necessitates the taking of action which involves a violation of local regulation or procedures the pilot-in-command shall notify the appropriate local authority without delay .If required by the state in which the incident occurs , the pilots- in- command shall submit a report on any such violation to the appropriate of such state , in that event, the pilots- in-command shall also submit a copy of it to the state of registry . Such reports shall be submitted as soon as possible and normally within ten days.

FLIGHT OPERATION

Operating Facilities

3. An operator shall ensure that a flight will not be commenced unless he has ascertained by every reasonable means at his disposal that the ground and/or water facilities available and directly required on such flight, for the safe operation of the aeroplane and the protection of the passengers, are adequate for the type of operation under which the flight is to be conducted and are adequately operated for this purpose. An operator shall ensure that any inadequacy of facilities/ observed/in the course of operation is reported to the authority responsible for them, without undue delay.

4. Subject to their published conditions of use, aerodromes and their facilities shall be kept continuously available for flight operations during their published hours of operations, irrespective of weather conditions.

Operations Manual

5. An operator shall provide, for the use and guidance of operations Personnel concerned operations Manual. The operations Manual shall be amended or revised as necessary to ensure that the information contained therein is kept up to date. All such amendments or revisions shall be issued to all personnel that are required to use the manual.

6. An operator shall provide the State or Registry with a copy of his operations Manual together with all amendments and/ or revisions to it and shall incorporate in it such mandatory material as the State of Registry may require.

Minimum Flight Altitudes

7. An operator shall be permitted to establish minimum flight altitude for those routes flown for which minimum flight altitudes have been established by the state flown over , provided that they shall not be less than those established by that state , unless specifically approved by that state.

8. An operator shall specify the method by which it is intended to determine minimum flight altitude for operations conducted over routes for which minimum flights altitude have not been established by the state flown over or the responsible state, and shall indicate this method in the operational manual. The minimum flight altitudes determined in accordance with the above method shall not be lower than specified in Annex 2.

Aerodrome Operating Minima

9. The state of the operator shall require that operator establish aerodrome operating minima for each aerodrome to be used in operations, and shall approve the method of determination of such minima. Such minima shall not be lower than any that may be established for such aerodromes by the state in which the aerodrome is located, except when specially approved by the state.

10. The state of the operator shall require that in establishing the aerodrome operating minima which will apply to any particular operation, full account shall be taken of:

a. The type, performance and handling characteristics of the aeroplane.

b. The composition of flight crew, their competence and experience.

c. The dimensions and characteristics of the runways which may be selected for use.

d. The adequacy and performance of the available visual and non-visual aids.

e. The equipment available on the aeroplane for the purpose of navigation and/or control of the flight path during the approach to landing and the missed approach.

f. The obstacle in the approach and missed approach areas and the obstacle clearance altitude/height for the instrument approach procedure.

g. The means used to determine and report meteorological conditions; and

h. The obstacles in the climb-out areas and necessary clearance margin.

11. Category II and category III instrument approach and landing operations shall not be authorized unless RVR information is provided.

12. **Crew**. For each flight, the operator shall designate one pilot to act as pilot-in-command.

Passengers

13. An operator shall ensure that passengers are made familiar with the location and use of:

a. Seat belt.

b. Emergency exits.

c. Life jackets, if the carriage of life jackets is prescribed.

d. Oxygen dispensing equipment, if the provision of oxygen for the use of passengers is prescribed; and

e. Other emergency equipment provided for individual use, including passenger emergency briefing cards.

14. The operator shall inform the passengers of the location and general manner of use of the principal emergency equipment carried for collective use.

15. In an emergency during flight, passengers shall be instructed in such emergency action as may be appropriate to the circumstances.

16. The operator shall ensure that, during take-off and landing and whenever, by reason of turbulence or any emergency occurring during flight, the precaution is considered necessary, all passengers on board an aeroplane shall be secured in their seats by means of the seat belts or harnesses provided.

Alternate Aerodromes

17. A take-off alternate aerodrome shall be selected and specified in the operational flight plan if the weather conditions at the aerodrome of departure are at or below the applicable aerodrome operating minima or it would not be possible to return to the aerodrome of departure for other reasons.

18. The take-off alternate aerodrome shall be located within the following distance from the aerodrome of departure:

a. **Aeroplanes having two power-units**. Not more than a distance equivalent to a flight time of one hour at the single-engine cruise speed; and

b. **Aeroplanes having three or more power-units**. Not more than a distance equivalent to a flight time of two hours at the one-engine inoperative cruise speed.

19. For an aerodrome to be selected as a take-off alternate the available information shall indicate that, at the estimated time of use, the conditions will be at or above the aerodrome operating minima for that operation.

20. En-route alternate aerodromes, required for extended range operations by aeroplanes with two turbans power-units shall be selected and specified in the operational and air traffic services (AIS) flight plans.

21. **Destination Alternate Aerodromes**. For a flight to be conducted in accordance with the instrument flight rules, at least one destination alternate aerodrome shall be selected and specified in the operational and ATS flight plans, unless:

a. The duration of the flight and the meteorological conditions prevailing are such that there is reasonable certainty that, at the estimated time of arrival at the aerodrome of intended landing, and for a reasonable period before and after such time, the approach and landing may be made under visual meteorological conditions; or

b. The aerodrome of intended landing is isolated and there is no suitable destination alternate aerodrome.

Weather Conditions

22. A flight to be conducted in accordance with the visual Flight Rules shall not be commenced unless current meteorological reports or a combination of current reports and forecasts indicate that the meteorological conditions along the route or that part of the route to be flown under the Visual Flight Rules will, at the appropriate time, be such as to render compliance with these rules possible.

23. A flight to be conducted in accordance with Instrument Flight Rules shall not be commenced unless information is available which indicates that conditions at the aerodrome of intended landing or, where a destination alternate is required, at least one destination alternate aerodrome will, at the estimated time of arrival

Fuel and Supply

24. **All Aeroplanes**. A flight shall not be commenced unless , taking into account both the meteorological conditions and any delays that are expected in flight, the aeroplane carries sufficient fuel and oil to ensure that it can safely complete the flight. In addition, a reserve shall be carried to provide for contingencies.

Fuelling of Aircraft

2**5**. Following procedures are to be followed:

a. No aircraft shall fill or replenish its fuel tanks from vehicles or vessels carrying petroleum in bulk unless from specially constructed tank vehicles of a type approved by the chief inspection o explosives Bangladesh for the purpose .

b. Before the commencement or refueling the aircraft its fuel tanks and all metallic parts of the fuel dispensing apparatus shall be electrically connected and efficiently earthed.

c. No smoking and no fire or other source heat or light capable of igniting inflammable vapour shall be permitted within 100ft. or any aircraft while it is being or about to be fuelled

d. All aircraft engines within the distance specified in sub-rule (iii) above shall be stopped so long as fuelling is in progress.

e. No electric motor shall be used inside the aircraft during refuelling

f. During the fuelling of aircraft used for the conveyance of passengers the passengers may be permitted to remain the cabin of the aircraft provided that :

(1) There is no smoking in the aircraft

(2) An employee of the operator is stationed in the entrance to the passenger cabin and remains alert for any emergency until refuelling is completed.

g. Fuel tanks shall not be allowed be allowed to overflow except through special pipes incorporated in the system which will prevent the fuel from running on the e aircraft surface the ground or the water

h. All engine fuel filler caps shall be closed while refuelling.

j. All electric switches and all electric circuits controlled by a master switch or switches shall remain in off position.

Fuel Dumping

26. An aircraft in an emergency or other urgent situations may need to dump fuel so as to reduce to maximum landing mass in order to effect a safe landing.

27. When an aircraft operating within controlled airspace needs to dump fuel,, the flight crew shall advise ATC. The ATC unit should then coordinate with the flight crew for the following:

a. The route to be flown, which if possible, should be clear of cities and towns, preferably over water and away from areas where thunderstorm have been reported or are expected.

b. The level to be used, which should not be less than 1800 m (6000 ft); and

c. The duration of fuel dumping.

28. **Separation**. Other known traffic should be separated from the aircraft dumping fuel by:

a. At least 19 km (10 nm) horizontally, but not behind the aircraft dumping fuel.

b. Vertical separation if behind aircraft dumping fuel within 15 minutes flying time or at a distance of 93 km (50 nm) by:

(1) At least 300 m (1000 ft) if above the aircraft dumping fuel; and

(2) At least 900 m (3000 ft) if below the aircraft dumping fuel.

Note. *The horizontal boundaries of the area within which other traffic requires appropriate vertical separation extend for 19 km (10 nm) either side of the track flown by the aircraft which is dumping fuel, from 19 km (10 nm) ahead, to 93 km (50 nm) or 15 minutes along track behind it (including turns).*

Carriage of Documents in Aircraft

29. A Bangladesh registered aircraft shall when flying carry the following:

a. Its certificate of registration

b. Its certificate of airworthiness

c. Its maintenance release ant other document approved fro use as an alternative for the maintenance release

d. The licenses of the operating crew

e. The flight manual for the aircraft.

f. Any license in force with respect to the radio equipment in the aircraft

g. If the aircraft is carrying passengers a last or the names places of embarkation and places of destination of the passengers.

h. If the aircraft is carrying cargo the bill for landing of and manifests for the cargo.

j. The records kept with the aircraft.

k. If the aircraft complies with noise certification standards appropriate attesting documents.

30. An aircraft operating wholly within Bangladesh is not required when flying to carry the document s specified in paragraphs (a) (g) (h) and (j) above.

31. The chairman may exempt an aircraft from carrying the flight manual referred in para (e), if he is satisfied that the aircraft carries an operations manual or placards or other documents that provide the pilot in command with all the data contained in the fling manual for the aircraft.

Refueling with Passenger on Board

32. An aeroplane shall not be refuelled when passengers are embarking on board or disembarking unless it is properly attended by qualified personnel ready to initiate and direct an evacuation of the aeroplane by the most practical and expeditious means available.

33. When refuelling with passengers embarking, on board or disembarking, two-way communication system or other suitable means between the ground crew supervising the refuelling and the qualified personnel on board the aeroplane.

Oxygen Supply

34. A flight to be operated at altitude at which the atmospheric pressure in personnel compartments will be less than 700 hPa shall not be commenced unless sufficient stored breathing oxygen is carried to supply:

a. All crew members and 10 percent of the passengers for any period in excess of 30 minutes that the pressure in compartments occupied by them will be between 700 hPa and 620 hPa; and

b. The crew and passengers for any period that the atmospheric pressure in compartments occupied by them will be less than 620 hPa.

35. A flight to be operated with a pressurized aeroplane shall not be commence unless a sufficient quantity of stored breathing oxygen is carried to supply all the crew members and a proportion of the passengers, as is appropriate to the circumstances of the flight being undertake, in the event of loss of pressurization, for any period that the atmospheric pressure in any compartment occupied by them would be less than 700 hPa.

AEROPLANE INSTRUMENTS, EQUIPMENT AND FLIGHT DOCUMENTS

Operating in Accordance with the IFR

36. All aeroplanes, when operated in accordance with the instrument flight rules, or when the aeroplane cannot be maintained in a desired attitude without reference to one or more flight instruments, shall be equipped with:

a. A magnetic compass.

b. An accurate time piece indicating the time in hours, minutes and seconds.

c. Two sensitive pressure altimeters with counter drum-pointer or equivalent presentation.

d. An airspeed indicating system with means of preventing malfunctioning due to either condensation or icing.

e. A turn and slip indicator.

f. An altitude indicator [artificial horizon]

g. A heading indicator [directional gyroscope]

h. A means of indicating whether the power supply to the gyroscopic instrument is adequate

j. A means of indicating in the flight crew compartment the outside air temperature

k. A rate-of-climb and descent indicator.

l. Such additional instruments or equipment as may be prescribed by the appropriate authority.

All Aeroplanes when Operated at Night

3**7**. All aeroplanes, when operated at night shall be equipped with:

a. All equipment specified in para 36 above.

b. The lights required by Annex 2 for aircraft in flight or operating on the movement area of an aerodrome.

c. Two landing lights.

d. Illumination for all instruments and equipment those are essential for the safe operation of the aeroplane those are used by the flight crew.

e. Lights in all passenger compartments; and

f. An electric torch for each crew member station.

All Aeroplanes Operated as VFR Flights

3**8**. All aeroplane, when operated as VFR flights shall be equipped with:

a. A magnetic compass.

b. An accurate time piece indicating the time in hours, minutes and seconds.

c. A sensitive pressure altimeter.

d. An airspeed indicator. A turn and slip indicator.

e. Such additional instruments or equipment as may be prescribed by the appropriate authority.

3**9**. VFR flights which are operated as controlled flights shall be equipped in accordance with Para 32 above.

Journey Log Book

40. The aeroplane journey log book should contain the following items and the corresponding roman numerals.

a. Aeroplane nationality and registration

b. Date

c. Name of the crew members

d. Duty assignments of the crew members

e. Place of departure

f Place of arrival

g. Time of departure

h. Time of departure

j. Hours of Flight

k. Nature of flight (private, aerial work, scheduled or non-scheduled)

l. Incidents, observations, if any

m. Signature of person in charge

41. Entries in the journey log book should be made currently and in ink or indelible pencil.

42. Completed journey log books should be retained to prove a continuous record of the last six months' operations.

CONSOLIDATION EXERCISE – 10

Q.1. What all are the points shall be taken into consideration while establishing aerodrome operating minima?

Q.2. Why fuel dumpoing is reqr? What are the seperation while dumping fuel?

ANSWER TO CONSOLIDATION EXERCISE –10

A.1. The state of the operator shall require that in establishing the aerodrome operating minima which will apply to any particular operation, full account shall be taken of:

a. The type, performance and handling characteristics of the aeroplane.

b. The composition of flight crew, their competence and experience.

c. The dimensions and characteristics of the runways which may be selected for use.

d. The adequacy and performance of the available visual and non-visual aids.

e. The equipment available on the aeroplane for the purpose of navigation and/or control of the flight path during the approach to landing and the missed approach.

f. The obstacle in the approach and missed approach areas and the obstacle clearance altitude/height for the instrument approach procedure.

g. The means used to determine and report meteorological conditions; and

h. The obstacles in the climb-out areas and necessary clearance margin**.**

A.2. An aircraft in an emergency or other urgent situations may need to dump fuel so as to reduce to maximum landing mass in order to effect a safe landing.

Separation. Other known traffic should be separated from the aircraft dumping fuel by:

a. At least 19 km (10 nm) horizontally, but not behind the aircraft dumping fuel.

b. Vertical separation if behind aircraft dumping fuel within 15 minutes flying time or at a distance of 93 km (50 nm) by:

(1) At least 300 m (1000 ft) if above the aircraft dumping fuel; and

(2) At least 900 m (3000 ft) if below the aircraft dumping fuel

TASK-12

MISCELLANEOUS

Introduction

1. It is not imperative for Air Traffic controllers to know how to fly an aircraft but as you handle the aircraft with different performances it would be easier to handle them if you know their performances. This task deals with some of the ac performances and other matter related to ATC not mentioned in the previous tasks.

Fuel Consumptions

2. Jet aircraft has extremely high rates of fuel consumption especially at low altitude. Fuel consumption decreases with the increase in the altitude. Try not to hold a Jet aircraft at low altitude unless it is known that sufficient fuel is on board. In order to conserve the fuel of Jet aircraft on IFR flight, the ATC clearance is to be issued to the pilots before engine starts.

Rates of Climb

3. The rate of climb & descent of different aircraft are:

   a. **Conventional Aircraft**. The rate of climb and descent of conventional aircraft are 500 to 2000 ft per minute.

   b. **Jet Aircraft**. The rate of climb and descent of Jet aircraft are 3000 to 4000 ft for normal rate and 5000 to 6000 ft for fast rate per minute.

Drag Chute

4. Drag chute is nearly a ribbon type parachute which is fastened to the aircraft and ejected from tail section after the touch down is complete. This is done for rapid reduction of speed to reduce the pressure on the landing wheels.

Fuel Calls

5. **Drops Dry**. This is to be made when a pilot observes his “Tanks Empty” light is steadily ‘ON’ and the fuel quantity shows a drop.

6. **TAXACO**. This call is to be made when fuel has been consumed to the specific pre briefed fuel quantity gauge reading. It is a fuel quantity which allows, with normal safety margin aircraft is to return to base from the farthest point reached during a mission.

7. **Bingo**. When remaining fuel quantity reaches 750 lbs, this call is to be made. After “Bingo” call landing is to be made as soon as possible.

8. **Minimum Fuel**. This call is to be given when fuel remaining is 600 lbs. Priority is to be given and an immediate landing is to be made.

Air Test Flight

9. Test flights after periodic servicing, major modification on airframe or engine and change of major components are to be carried out by pilots posted as Test pilot or Quality control Officer. Test pilots are to meet one of those requirements:

a. Held an appointment equivalent to Flight commander or above.

b. Have a minimum of 150 hours solo in command of the type.

10. **Weather Minima for Test Flight**. Test flight after periodic servicing or rectification on engine, flight controls, flight instruments, radio and navigation equipment or, after change of a major component, are to be restricted to the following weather minima :

a. Airfield Category green.

b. VMC at the operating height.

c. At least 4/8 ground visible from the operating height.

11. **Exception**. When weather conditions remain marginal for prolonged period, and are likely to remain. So, resulting in accumulation of aircraft awaiting air test to an extent which is likely to upset the flying and servicing schedule of the base. Officer Commanding base is to use his discretion and authorize air test when airfield category is ‘Yellow’.

12. **Distance from the Airfield**. Air Tests are to be performed over the airfield. If this interferes with local flying and air traffic then the air tests are to be performed over a suitably designated area within easy gliding distance of the airfield.

Border Flying

13. No aircraft is to fly within 15 NM of Bangladesh-India and Bangladesh-Myanmar border unless authorised by Air Headquarters. The restriction does not apply to aircraft :

a. Engaged in take-off and landing at airfields in the Proximity of the border when so authorised.

b. Engaged in commitments or operational missions.

c. Operating with GCI stations on an interrogation mission in which case the controller is to take the aircraft under radar surveillance up to 10 NMs from the border.

14. Whenever a pilot suspects that he has violated the border of another country he is to make a written report to his officer Commanding immediately after landing giving the time, place and circumstances leading to it.

Flight by Jet Aircraft

15. For cross country flight over 200 NM and involving landing away from the base the following conditions are to apply:

a. The Captain of Jet aircraft are to held valid instrument rating regardless of weather.

b. The actual weather of destination be checked not sooner than 1 hour before take-off.

c. During cross country flights, all fighters are to be flown in formation of at least two aircraft except in the following cases when single aircraft can fly in VMC:

(1) Ferry flights by operational pilots.

(2) Communication flights by the officer of the rank of squadron leader having 100 hrs of flying on the type.

d. The following types may fly singly:

(1) Reconnaissance.

(2) Aircraft fitted with dual controls.

(3) Twin engine aircraft.

(4) Dual seater aircraft having both seats occupied.

Aircraft Lighting

16. During the period 30 min before official sunset until 30 min after official sunrise or any time the visibility is less than 3NM, an aircraft in flight or on ground and likely to cause hazard is to show standard position lights, when installed the anti collision light is also to be on except when flying through clouds, Formation flights are exempted from the above.

Minimum Crash and Let Down Facilities

17. **Crash Facilities**. Normally two serviceable crash tenders are to be available for full scale flying by Jet aircraft except:

a. Outgoing and incoming aircraft can make one take-off and one landing with one crash tender.

b. Depending on the urgency of flying officer Commanding base may allow flying with one serviceable Crash Tender. Authority to take this decision is not to be delegated.

18. **Navigational Letdowns**. Jet aircraft are not to operate under IMC unless either a TACAN/DME/NDB or UHF/VHR is available at or within 25 miles of :

a. Departing airfield.

b. Airfield of intended landing.

c. Alternate airfield.

Breaches of ATC Regulations

19. A breach of ATC regulation by BAF operations wing while it is done by Civil Pilots is to be sent to chairman Civil Aviation on the set proforma.

VVIP Flight Air Traffic Facilities

20. **Landing at Disused Airfields**. BAF aircraft carrying VVIP is not to land at disused/unmanned airfield without prior permission from Air HQ, such permission can be given only if the airfield has been inspected and subject to following conditions :

a. Availability of crash rescue equipments.

b. R/T Control.

c. First aid.

21. **Manned Civil Airfields**. The following procedure shall be in force at all airports in Bangladesh for VVIP/President flights:

a. **Aerodrome Control**. No aircraft shall be allowed to land or depart from the aerodrome for the period indicated below:

(1) Five minutes before ETA till Door open time.

(2) Door close time till Five minutes after take-off.

(3) Air Traffic may be delayed on ground or air to facilitate unrestricted climb and descent to VVIP flight.

b. **Controlled Airspace**

(1) No VFR operation within controlled airspace.
(2) Vertical separation is to be provided and the vertical separation minima shall be 2000 ft.

c. **Uncontrolled Airspace (Enroute)**. During the VVIP flight within the FIR no aircraft shall operate within 2000 ft above and below the cruising level and 25 NM on either side of the intended route of the VVIP flight.

22. **BAF Airfield**.

a. **Aerodrome Control**. The following restriction shall be applicable for operating VVIP flights:

(1) Prohibit all local flying within 10 NM of the airfield up to 5000 ft and ensure that the circuit is cleared from 15 min before ETA until it has landed and cleared the runway.

(2) Prohibit all local flights within 10 NM of the airfield up to 5000 ft and ensure that the circuit is cleared form 15 min before ETD until it has obtained airfield clearance.

b. **Control Airspace**.

(1) No VFR operation within controlled airspace.

(2) Vertical separation is to be provided and the vertical separation minima shall be 2000 ft.

c. **Uncontrolled Airspace (Enroute)**. During the VVIP flight within the FIR no aircraft shall operate within 2000 ft above and below the cruising level and 25 NM either side of the intended route of the VVIP flight.

Air Traffic Control Order Book

23. SATCO is responsible to maintain an Air Traffic Control order book, orders/ instructions/ rules concerning air traffic regulations contained in Base Standing Orders, Base flying order or other manuals and APs are to be supplemented in this book, SATCO is to ensure that these orders are upto date and all the personnel of the Squadron read and are conversant with them before taking over the watch.

Accident Prevention and Flight Safety

24. SATCO is to maintain a close liaison with the Base Flight Safety Officer and promulgate order in conformity with accident prevention. In addition SATCO is to attend all Flight Safety meetings and his staff are fully conversant with the discussions of the meetings.

Crash & Incident Report

25. Duty air traffic control officers are responsible for preparing reports in all cases of aircraft crashes or incident taking place during their period of watches. Their reports are to contain all relevant details of incidents as witnessed by duty controller and member of his control staff including weather reports by met section.

Duties – ATC Officers

26. Air Traffic Control Officers employed on ATC duties are not to be detailed for any other duties, however they may be detailed as members of the board of Officers concerning all.

Duties - ATCOs

27. **Operational, Responsibilities of the ATCO.**

a. To control aircraft safety and efficiently, both in the air and on the manoeuvring area.

b. To report breaches of air traffic regulations.

c. To ensure that standard R/T phraseology is used.

d. To inspect mark and record bad ground and obstructions in manoeuvring area, and to warn all concerned.

e. To record and notify the sections concerned of any un-serviceability of the manoeuvring area, radio, radar and lighting aids.

f. Constant supervision and control of vehicles and Pedestrians in the manoeuvring area.

g. To consult the current and forecast weather and warm all concerned of deterioration, in weather surface wind conditions and meteorological warnings etc.

h. To notify and cooperate with the parent ATCC regarding airmiss reports sonic boom flights and over- due aircraft (if necessary search and rescue authorities).

j. To initiate and co-ordinate action in the event of a crash.

k. To record and notify all concerned of any work in progress, on the manoeuvring area.

l. To command and supervise all personnel of his watch in particular:

(1) The runway controller.

(2) The control tower staff.

(3) The Crash crews.

28. **Administrative Duties of DATCO**

a. To read all relevant orders including classified documents and any orders or information, on taking over watch and to notify interested sections as necessary.

b. To remain in the control tower during the tour of his duty unless properly relieved.

c. To assist the trade training of the control tower staff.

d. To remain watch-keeping and aerodrome inspection log, and the Work progress Book.

e. To maintain a high standard of discipline and cleanliness in the control tower.

f. To report, in writing any failure in the air traffic control organisation or procedures which endanger an aircraft.

g. To maintain efficient and safe custody of all classified materials, and valuable and attractive items.

h. To supervise the maintenance and serviceability of all night flying equipment.

CONSOLIDATION EXERCISE – 11

Q1. What procedure to be followed at Civil airfield for operation of VVIP Flight?

Q2. What is the minimum crash let down facilities for a full fledged Jet Flying?

Q3. What are the administrative duties of DATCO?

ANSWERS TO CONSOLIDATION EXERCISE – 11

A1. The following procedure shall be enforced at all airports in Bangladesh for VVIR/President flights:

a. **Aerodrome Control**. No aircraft shall be allowed to land or depart from the aerodrome for the period indicated below:

(1) Five minutes before ETA till Door open time.

(2) Door close time till Five minutes after take-off.

(3) Air Traffic may be delayed on ground or air to facilitate unrestricted climb and descent to VVIP flight.

b. **Controlled Airspace**

(1) No VFR operation within controlled airspace.

(2) Vertical separation is to be provided and the vertical separation minima shall be 2000 ft.

c. **Uncontrolled Airspace (Enroute)**. During the VVIP flight within the FIR no aircraft shall operate within 2000 ft above and below the cruising level and 25 NM on either side of the flight.

A2. Normally two serviceable crash tenders are to be available for full scale flying by Jet aircraft except:

a. Outgoing and incoming aircraft can make one take-off and one landing with one crash tender.

b. Depending on the urgency of flying officer Commanding base may allow flying with one serviceable Crash Tender. Authority to take this decision is not to be delegated.

A3. These are following administrative duties of DATCO :

a. To read all relevant orders including classified documents and any orders or information, on taking over watch and to notify interested sections as necessary.

b. To remain in the control tower during the tour or his duty unless properly relieved.

c. To assist the trade training of the control tower staff.

d. To remain watch-keeping and aerodrome inspection log, and the Work Progress Book.

e. To maintain a high standard of discipline and cleanliness in the control tower.

f. To report, in writing any failure in the air traffic control organisation or procedures which endanger an aircraft.

g. To maintain efficient and safe custody of all classified materials, and valuable and attractive items.

h. To supervise the maintenance and serviceability of all night flying equipment.

ENRICHMENT – 1
(STUDENT MAY KNOW IT)
ATS ROUTES

Introduction

1. Ideally, aircraft want to fly on the most direct route between their points of departure and their destination because the medium in which aircraft operate makes this possible, except when severe weather phenomena are encountered. However, because of the many conflicting demands made on the use of airspace by its many different users and because of environmental and security considerations, it is frequently not possible to fly the most direct route. Therefore it is necessary to find a reasonable compromise between this desirable objective and reality.

2. A further point is that, as soon as any degree of control is exercised over air traffic aircraft (and this applies to all types), it is inevitable that it must be channelled into a defined pattern whose extent and complexity must not exceed the intellectual and physical capabilities of the person or persons charged with controlling such traffic. Control must be possible with a mental and physical effort, as far as presentation, analysis and resolution of conflicts is concerned, which can be sustained over prolonged periods of time, since otherwise the continuity in control assured by one person is lost. It is therefore essential that the various individual intentions of those participants making up the traffic are presented in such a manner that they can be related to other, possibly conflicting intentions.

3. In short, large amounts of air traffic are generally only manageable if they follow pre-established patterns which are arranged not only to facilitate the detection of possible conflicting intentions at an early stage, but which also lend themselves to resolution of such conflicts. At the same time, these pre-established patterns must also provide for the retention of the most direct routes for the majority of air traffic, if they are not to conflict with the need for economy and efficiency of flight operations.

4. Experience gained in areas where large amounts of air traffic are handled has shown that the most satisfactory manner to meet the genera considerations mentioned above is by way of an air traffic services (ATS) route network

Establishment of an ATS Route Network

5. The establishment of an actual ATS route network follows, in most cases, an approximate pattern outlined below:

a. Operators identify their actual and anticipated requirements for routes between those aerodromes which they use.

b. The sometimes widely diverging demands of individual operators are then consolidated into a reasonably coherent pattern of route requirements.

c. These requirements are then measured against other demands made on the airspace traversed by these routes (military areas, avoidance of over flying sensitive

installations on the ground, etc.) and alternative proposals for the exact alignment of individual routes are developed.

d. These alternatives are then presented to and negotiated with the operators concerned until a reasonable compromise is achieved:

e. In the comparatively few cases where the offers which can be made to operators are found to be unacceptable, it should be agreed that the original requirement should be retained for further consideration by all parties concerned until such time as more favorable circumstances permit an alignment which comes reasonably close to that requested by operators.

6. Experience has shown that adoption of the method described above has generally produced satisfactory results, especially as regards meeting those demands by operators which could not be initially met.

7. The establishment of a detailed ATS route network can follow two distinct patterns depending on the composition of the air traffic it is intended to serve. In those cases where national operations constitute the bulk of the traffic which is to be accommodated, States should give priority to satisfying these needs. However, adequate arrangements should be made to meet the needs of international operations through appropriate trunk routes and development of these trunk routes must be co-ordinate on at least a regional basis. Where international operations constitute the majority of the traffic, establishment of an ATS route network needs to be undertaken from the outset on at least a regional basis.

8. From this it follows that, to a lesser or greater extent, isolated action by States in developing an ATS route network is only possible with respect to ATS routes serving strictly national purposes since such action will, in most cases, have direct and noticeable effects on the traffic flow beyond the area of responsibility of the State concerned. There is evidence available showing that changes made to ATS routes in one limited area can affect air traffic for a considerable distance and traffic which never even intends to operate into the area where the change was made.

9. Taking the above into account, it would appear that the detailed establishment or review of individual ATS routes, forming the ATS route network, should proceed along the following lines :

a. First establish or review the main trunk routes, serving the major traffic flow within a given area as well as those extending beyond that area;

b. Establish or review those routes required to provide access to these trunk routes from and to locations not directly served by them;

c. Establish or review those supplementary routes required to accommodate secondary traffic flows or which are required to alleviate the traffic load on the major trunk routes;

d. Establish or review those routes of a more local nature which are required to satisfy either specific national needs or those of a specific user group (e.g. helicopter routes, visual flight rules (VFR) routes, military low-level routes, night flying, etc.) and determine if these local routes need to be integrated into the over-all route network.

10. Once the route network has been established or reviewed in accordance with the above, the detailed ATS route network should be reviewed as a whole to evaluate its coherence. Changes to the network should be made only after they have been co-ordinated with all parties concerned.

11. The majority of the ATS routes so established will be permanently available; however, there will be cases:

a. When routes are required only for specific periods of the year (seasonal routes) in order to accommodate transit traffic during the holiday season; or

b. Where specific routes can be made available only during weekends because they traverse areas which, during the week, are reserved for other activities; or

c. Where routes whose use depends on special coordination procedures can only be effected on an ad hoc basis for the specific flights involved and depending on the circumstances as they prevail at that time.

12. Such non-permanent routes should also be included in the ATS route network, however with a clear indication of the limitations imposed on their use. Such an indication will then serve as a reminder that these routes should be reviewed at frequent intervals with a view to changing their status whenever the use made of them requires.

13. ATS routes over the high seas should be established only if traffic density warrants a channelling of air traffic in order to ensure its safety and only for such times when traffic density justifies their establishment. In addition, since flight operations over the high seas are more dependent on prevailing meteorological conditions (especially winds aloft) with respect to specific routing, and thus their economy, than is the case for shorter routes over land, it is essential that this be taken into account in the route alignment. Therefore, frequent adjustments should be made, either on a daily basis, as it is now done in the case of the North Atlantic route structure, or at such intervals as are required to take account of significant changes in the operating environment.

14. The status given to individual ATS routes, either as controlled ATS routes (generally in the form of airways) or as advisory routes or as uncontrolled routes, is primarily determined by the amount and type of traffic which is using the route as well as other relevant factors.

15. After the alignment and status of the ATS routes have been established or reviewed, it will be necessary to determine the use of flight levels on each of those routes which are to be established as controlled ATS routes. To this extent a series of flight levels are prescribed (normally “ODD” and “EVEN”) which should be used in relation to the direction of flight on the route concerned. The principles governing such arrangements of flight levels include the following considerations:

a. The majority of air traffic operating along a controlled ATS route or portion thereof, should, while in level flight, be permitted to remain at its assigned flight level without a need for changing levels simply because the orientation of the route in relation to compass direction changes.

b. At intersections of more than two controlled ATS routes, the likelihood that aircraft, operating on any of these routes and approaching the intersection, find themselves at the same level is kept to a minimum, thus avoiding the need for systematic control interventions in order to restore adequate separation between them.

16. Experience has shown that, in the case of more complex ATS route networks (e.g. European (EUR) region) this latter objective can only be achieved if the assignment of flight levels on certain routes is reversed at certain points along the route, depending on the situation at different intersections affecting the route in question. In this case, it is important that a change in flight level be established at a location well away from a flight information region (FIR) or control area (CTA) boundary or a transfer of control point (if different from the boundary) or at such a location where traffic along the route is least dense, thus permitting the change in level without undue difficulties to either the aircraft or ATS.

17. On ATS routes carrying a particularly high load of traffic, it may be advisable to establish one-way routings for each direction of flight between the points determining the terminals of such routes. In this case consecutive flight levels may be used on each of the two one-way routes, except when this is not feasible for the reasons stated in 15b. above.

18. The world-wide designation of ATS routes is governed, in general, by provisions contained in Annex 11, Appendix 1. There are, however, a number of aspects involved in this matter which need more detailed consideration. These are:

a. Regard for flight planning and description of the route of flight required for air traffic control (ATC) clearances.

b. Avoidance of unnecessary complications in the coordination involved in the assignment of designator.

c. Taking into account the effects of the use of automation.

19. With respect to flight planning and ATC clearances, the system, used to assign designators to individual ATS routes within an ATS route network, should be arranged primarily so that the large number of repetitive air transport operations (scheduled and non-scheduled commercial flights, certain routine military operations), are able to indicate, in their flight planning, the route of flight with the least number of designators. Fewer designators also permit ATC to keep clearances short and concise and to clear such flights with the least amount of effort. In addition, different designators, which in air-ground communications could be mistaken for each other, should be assigned so that, even when they are misunderstood, the error becomes obvious immediately by the difference in location of their assignment. In this respect account should also be taken of differences in pronunciation by pilots with different mother tongues.

20. In order to avoid duplication of designators, it will be necessary to co-ordinate their assignment on at least a regional basis. It is essential that the method chosen for doing this is as simple as possible, does not require excessive co-ordination and is done with the assistance of the regional office of ICAO concerned. It must also provide for ample capacity to accommodate future requirements for designators without requiring a change of the system itself.

21. Finally, the assignment of designators should be made so tat changes to individual designators are kept to a minimum. This consideration is particularly important in those cases where ATC units providing service along the routes in question are using automatic ATC equipment, primarily because experience has shown that modifications to the computer programmes introduce considerable delays in bringing the changed designators into effect.

Establishment of Significant Points

22. Significant points along ATS routes and/or in terminal control areas (TMAs) are normally established at those geographical locations where an event in the conduct of a flight takes place which is either significant to the pilot or to ATS or to both, i.e. a change in the alignment of an ATS route or of a routing in a TMA, an intersection of the centre lines of two or more ATS routes, a transfer of control point, etc. In many cases such points are also marked by the site of a ground-based radio aid to navigation (see Chapter 5 below) or with reference to navigational guidance derived from one or more such aids (intersection of two radials form different VHF omni-directional radio ranges (VORs) or a point on a VOR radial determined by its distance form that VOR by means of the associated distance measuring equipment (DME)). In other case, such points are established by reference to geographical co-ordinates only and navigation to and form these points will be made by reference to area coverage type navigation aids (e.g. OMEGA) or by the use of self-contained navigation means (e.g. inertial navigation system (INS)). In this case they are frequently referred to as “way-points”.

23. As already mentioned, significant points can be sub-divided into four types according to the operational purpose they serve. They are:

a. Those points which are of interest to the pilot only in the conduct of his navigation, i.e. a change in the alignment of a route, change-over between successive radio navigation aids, etc.

b. Those points which are of interest to both the pilot and ATS because they:

(1) Define the intentions of pilots as to the route of flight to be followed (in flight plans); or

(2) Permit ATS to provide proper service to aircraft (obtain position reports, begin or terminate service rendered to an aircraft); or

(3) Allow ATC to define changes to the route of flight when required by the over-all traffic situation (re-clearance of flights as to route and/or level between specified points, etc);

c. Those points which are of interest to both the pilot and ATS but only for limited periods of time and specific phases of flight. These points normally do not form part of the data exchanged between ATS units and are usually used only to define specific flight paths to be followed when ad hoc clearances are issued by ATC (e.g. points along routings in a TMA, points where an aircraft can expect to be cleared to change levels or where a clearance to conduct the flight in a specific manner begins, or ends);

d. Those which are of interest to ATS only such as transfer of communication and/or control points, exit and entry points into specified portions of controlled airspace, etc. Generally, these points are established only for use between two adjacent ATC units. Information regarding the flight progress in relation to these points will be confined to the two units in question.

24. The designation of such points is covered, in general terms, in Annex 11, Appendix 2. Much of what has already been said above, on some of the supplementary aspects regarding the designation of ATS routes also applies to establishment of significant points. In fact, world-wide experience with the administration of designators for significant points not marked by the site of a radio navigation and (name codes) seems to indicate that establishment of significant points should be reserved for those significant points mentioned in 23b above while the designation of all other points, mentioned in 23a and c should be kept to local or, if necessary, regional arrangements. This limitation in application to cases mentioned in 23b above appears possible in view of the fact that the original requirement stipulated for the uniqueness of such name codes on a world-wide scale no longer seems valid.

Routings in Terminal Control Areas

25. In accordance with the relevant provisions in standard departure (SID) and standard arrival (STAR) routes may be established, when require, to facilitate:

a. The maintenance of a safe, orderly and expeditious flow of air traffic;

b. The description of the route and procedures in ATC clearances.

26. From this it follows that such routings in TMAs will normally be required only at the busier aerodromes where the initial departure and/or arrival routing may be complex in view of the use made of runways and/or the variable relationship between the departure and arrival patterns used under different meteorological and/or traffic conditions.

27. Once the requirement for such routes has been determined it should be ensured that their alignment is such that flight along them does not require excessive navigational skill on the part of pilots nor should they put the aircraft into a state which approaches its minimum safe operation with regard to speed and/or changes of direction. Such considerations are essential because, when using these routes, pilots find themselves in a critical phase of their flight and the cockpit workload is already heavy after take-off or when preparing for a landing. Material relating to the establishment of standard departure and arrival routes and associated procedures is given in Appendix A to this chapter.

28. The need to take into account noise abatement at certain aerodrome has become an important issue. Appropriate SIDs and STARs should be reviewed in the context of special noise abatement procedures and/or manoeuvres to ensure that they are fully integrated and constitute a coherent operational entity serving both purposes. In addition, noise abatement procedures should not jeopardize the safe and efficient conduct of the aircraft flight phase in question.

29. The question of designation of SIDs and STARs is covered in Annex 11, Appendix 3. However, in selecting designators in accordance with these provision, care must be taken to ensure that no confusion will arise in their practical use in voice communications because of close similarities between different designators. It may also be necessary to consider pronunciation problems caused by the fact that pilots with different mother tongues may pronounce designators differently in their voice communications with the ATC unit assigning a SID or STAR.

APPENDIX – A
MATERIAL RELATING TO THE ESTABLISHMENT OF STANDARD DEPARTURE AND ARRIVAL ROUTES AND ASSOCIATED PROCEDURES

General

1. Standard departure and arrival routes should :

a. Segregate traffic operating along different routes, and such traffic from traffic in holding patterns;

b. Provide for adequate terrain clearance (see PANS-OPS (Doc 8168), Volume II;

c. Be compatible with established radio communication failure procedures;

d. Take account of noise abatement procedures;

e. Provide for the shortest practical tracks;

f. Provide, to the extent possible, for uninterrupted climb or descent to operationally advantageous levels with a minimum of restrictions;

g. Be compatible with the performance and navigation capabilities of aircraft;

h. If possible, be designed so as to derive maximum economic and operational benefit from high performance and advanced navigation capabilities of aircraft.

2. The routes should involve a minimum of air-ground radio communications and reduce as much as possible cockpit and ATC workload.

3. Standard departure and arrival routes should normally be completely contained within controlled airspace.

4. For routes requiring navigation with reference to ground-based radio navigation facilities, the following should apply:

a. They should relate to published facilities only;

b. The number of facilities should be kept to the minimum necessary for navigation along the route and for compliance with the procedure;

c. They should require navigational reference to no more than two facilities at the same time.

5. The routes should normally be designed for use by aircraft operating in accordance with IFR. Separate routes designed for use by controlled flights operating in accordance with VFR may be established.

6. The number of standard departure and arrival routes to be established at an aerodrome should be kept to a minimum.

Standard Departure and Arrival routes – Instrument

7. Standard instrument departure routes should link the aerodrome or a specified runway of the aerodrome with a specified significant point at which the en-route phase of a flight along a designated ATS route can be commenced.

8. Standard instrument arrival routes should permit transition from the en-route phase to the approach phase by linking a significant point on an ATS route with a point near the aerodrome from which:

a. A published standard instrument approach procedure can be commenced; or

b. The final part of a published instrument approach procedure can be carried out; or

c. The final part of a published instrument approach procedure can be carried out; or

c. A visual approach to a non-instrument runway can be initiated; or

d. The aerodrome traffic circuit can be joined.

9. Each standard instrument departure and arrival route should be established and published as an integral route. Any deviation of a permanent nature should be published as a separate route.

10. Standard instrument departure and arrival routes should be designed so as to permit aircraft to navigate along the routes without radar vectoring. In high density terminal areas, where complex traffic flows prevail due to the number of aerodromes and runways, radar procedures may be used to vector aircraft to or from a significant point on a published standard departure or arrival route, provided that :

a. Procedures are published which specify the action to be taken by vectored aircraft in the event of radio communication failure. and

b. Adequate ATC procedures are established which ensure the safety of air traffic in the event of radar failure.

11. The routes should identify the significant points where :

a. A departure route terminates or an arrival route begins;

b. The specified track changes;

c. Any level or speed restrictions apply or no longer apply.

12. Where the route requires a specified track to be followed, adequate navigational guidance should be provided.

13. Significant points of standard instrument departure and arrival routes requiring navigation with reference to ground-based radio navigation facilities, particularly points where a change of track is specified, should, whenever possible, be established at positions marked by the site of a radio navigation facility, preferably a VHF aid. When this is not possible, the significant points should be established at positions defined by:

a. VOR/DME; or

b. VOR/DME and a VOR radial; or

c. Intersections of VOR radials.

The use of NDB bearings should be kept to a minimum, and fan markers should not be used.

14. Significant points established at positions defined by VOR/DME should relate to a VOR/DME facility defining the track to be flown.

15. The radio navigation facility to be used for initial track guidance on a standard instrument departure route should be identifiable in the aircraft prior to take-off.

16. Taking into account that the period immediately after take-off is one of high cockpit workload, the first significant point of a standard instrument departure route which requires reference to a radio navigation facility should, if possible, be established at a distance of a least 2 NM from the end of the runway.

17. Level restrictions, if any, should be expressed in terms of minimum and/or maximum levels at which significant points are to be crossed.

18. The designation of significant points as reporting points (compulsory or on request) should be kept to a minimum.

19. Standard instrument departure and arrival routes should be established in consultation with the representatives of the users and other parties concerned.

Standard Departure and Arrival Routes – Visual

20. Visual departure routes should link the aerodrome or a specified runway of the aerodrome with a specified significant point at which the en-route phase of a flight can be commenced.

21. Visual arrival routes should link a specified significant point where the en-route phase of a flight is terminated with a point where the aerodrome traffic circuit can be joined.

22. Significant points defining visual routes should be established at geographical locations which can be readily identified by visual reference to prominent landmarks. The locations of radio navigation aids may also be used as significant points, if practical.

ENRICHMENT – 2
(STUDENT MAY KNOW IT)

NEED FOR AIR TRAFFIC SERVICES

Introduction

1. As for any other form of transportation, there is an internet need to provide certain services to air traffic so that it can be conducted in a safe and orderly manner. There are, however, two aspects of air traffic which impose specific requirements on these services and these are:

a. The fact that, once air traffic is under way, it cannot be held en-route for prolonged periods of time and can only be brought to a halt by a landing:

b. The worldwide scope of aviation activities is dictated more by considerations of an international character than any other form of transport.

2. In addition, air transport, and more particularly that conducted at the international level, has now assumed such a role in the economic development of our civilization that its disturbance generally results in consequences which are not restricted only to the area where they occur, but can also have repercussions which extend far beyond that area.

3. The planning for and the execution of air traffic services (ATS) is essentially a national responsibility unless agreements have been concluded amongst States to conduct this planning as a joint effort for a defined area covering more than one State, or for areas where no sovereign rights are exercised (e.g. the high seas). It is, therefore, of prime importance that both the planning and execution of ATS be done so that optimum uniformity is maintained to the largest possible extent. While this objective is normally pursued by ICAO through its efforts in world-wide standardization and in regional planning of air navigation services, it should, for the reasons given, be supplemented by bilateral or multilateral co-ordination among States. This bilateral or multilateral co-ordination should cover those generally more detailed aspects, which have not been covered by the efforts made within the framework of ICAO.

4. In many States, the military services constitute a rather important part of the airspace users. In some States, military authorities have therefore established their own ATS in parallel with the civil ATS system in order to provide for their specialized operations (e.g. fighter training, interceptions, low-level missions, special air exercises, etc.) as well as for those flight operations which are conducted in a manner similar to those of civil users (e.g. air transport, liaison and navigation training flights). The co-existence of a civil as well as a military ATS has, in many cases, resulted in competition and an inefficient use of the airspace. For this reason, in a number of States where these problems became particularly acute, it was decided to create an integrated ATS system to provide for both the civil and military needs. Experience gained by these States seems to indicate that this solution offers promising results regarding the equitable and efficient sharing of the airspace and avoids many of the problems created by the co-existence of two competing services.

5. The cost-effectiveness aspect of ATS, which has become much more important since user charges have been established by a large number of States, is a further consideration to be taken into account in determining the need for ATS. It has been found that not everything that is desirable is also necessary and that a balance must therefore be reached between the requirements put forward for the improvement of the ground services and the cost involved in putting them into effect. In establishing the needs for ATS, their users should therefore be given an opportunity during the planning stage to express their views and these views should receive due consideration.

6. Furthermore, the close interrelationship between national services of adjacent States, as mentioned above, makes it necessary that, once a basic air traffic service has been established, its development and improvement should be pursued in close co-ordination with affected adjacent States. Isolated action, especially as far as en-route services are concerned, will frequently deprive the State concerned from achieving the expected results if other affected national services do not follow with consequential and timely improvements of their services. As a consequence, situations may arise where States will be required to improve their services, not because there is an urgent national requirement to do so, but in order to ensure that other, more or less adjacent States, being confronted with such needs, are not deprived of the benefits of their efforts.

7. In summary, it would appear that the need for ATS at and in the vicinity of specific aerodromes can, to a large extent, be determined on a local or national level and in consultation with operators concerned up to the point when these services will have consequences on the en-route flow of air traffic over a wider area. The need for ATS en-route traffic will, however, in the majority of all cases require the closest possible co-ordination amongst all those participating in the provision of such services over a wide area (generally an ICAO region).

Objectives of ATS

8. The objectives of the ATS as specified in Annex 11, 2.2 are briefly:

a. To prevent collisions between aircraft and between aircraft on the ground and obstructions.

b. To maintain an orderly and expeditious flow of air traffic.

c. To provide aircraft with advice and information required for the safe and efficient conduct of flights.

d. To notify those involved in search and rescue of aircraft in need of this service and assist them in this task.

9. From these objectives, it follows that the emphasis of the ATS is placed on the word "service". This emphasis means that ATS should, to the optimum extent, be at the disposition of its users and that any action on its part which is likely to interfere with the intention of any of its individual users, will only be justified if the results in improved services apply to the majority of users of the services there. In no case should it be permissible for ATS to take action affecting its users, which is motivated by the convenience of ATS only.

10. In addition, since ATS is normally the only ground service which is in direct contact with aircraft in flight, care must be taken in assigning additional responsibilities emanating from other national requirements to ATS (i.e. diplomatic authorization to operate over the territory of a State), operational supervision of flights, etc. (i.e. national security), so as not to dilute the service provisions of ATS to a point where it will become difficult for controllers to draw a clear line in distinguishing the different capacities in which they are expected to act. In general, experience seems to indicate that the less additional responsibilities that are given to ATS the better it is able to meet its primary objectives.

11. Similar considerations apply with respect to the provision of information by ATS to aircraft not directly derived from the activities of ATS (e.g. information on the status of other than ATS facilities and services, meteorological information, etc.). Such information should be provided to ATS for onward transmission in a manner and form which requires the least amount of interpretation and/or responsibility for the accuracy and timeliness of the information in question.

Establishment of Authority

12. While the ICAO Convention specifically recognizes the sovereignty of each State within the airspace over its territory, ICAO also recognizes that the provision of air navigation services should primarily be dictated by operational considerations inherent in air navigation. Therefore, while in most cases the provision of ATS by a State will be confined to the airspace over its territory, there are nevertheless numerous cases, especially in areas where the political configuration was well established before aviation became a significant factor in world development, where the political boundaries do not lend themselves as evident operational dividing lines between the areas of responsibility of adjacent national ATS services.

13. For this reason, Annex 11, 2.1 makes specific provisions for arrangements whereby adjacent States are encouraged to conclude mutual agreements which allow for the delegation of responsibility for the provision of ATS from one State to another, on the understanding that this will in no way affect the question of sovereignty over the airspace so delegated.

14. As regards the provision of services over the high seas or other areas where no sovereign rights are exercised (i.e. Antarctica), ICAO has envisaged that ATS services shall be established in accordance with regional air navigation agreements whereby the totality of interested States in a particular region entrust a State, or a selected number of States, with the provision of air navigation services and more especially ATS, in a specified portion of such airspace (typical examples are those in the North Atlantic (NAT) and the Pacific (PAC) regions). In this respect it should be noted that the assumption of such delegated responsibility by a State, by virtue of a regional air navigation agreement, does not imply that this State is then entitled to impose its specific rules and provisions in such airspace at its own discretion. In fact, conditions of operation therein will be governed by applicable LCAO provisions of a world-wide and supplementary regional nature and specific national provisions may only be applied to the extent that these are essential to permit the State the efficient discharge of the responsibilities it has assumed under the terms of the regional air navigation agreement.

15. A further problem, which concerns ATS over the high seas, has recently come to light in relation to oil exploration activities in the seabed. In a number of cases, the division of oil exploration areas among States, bordering on the sea bed in question, bears no relationship to the airspace division made for the same area. Therefore, while this airspace divisions may be found satisfactory to cater for the needs of en-route operations by aero planes, it generally does not cover the case of helicopter (and aero plane) operations conducted specifically in support of the oil exploration activities. Experience already gained in some complex cases (e.g. the North Sea and the Gulf of Mexico) indicates that the solution to these specific problems should not be sought so much by re-organizing the airspace in question, but rather by concluding special arrangements between States concerned, following appropriate consultation with operators, covering the delegation of responsibility for the provision of specific services in accordance with the operational needs and relevant cost effectiveness consideration, both for the ground services and for the operators concerned. An example for such arrangements is the agreement concluded between Norway and the United Kingdom covering North Sea helicopter operations. If desired, copies of their latest agreement may be obtained on request to any ICAO regional office.

16. Experience seems to show that the establishment of an ATS authority on a national level should best be done so that it can operate with an optimum of flexibility, both on the internal level and with adjacent ATS authorities. Flexibility is essential if ATS authorities are to be able to keep pace with the dynamic development of air navigation and respond to resulting new operational requirements in an efficient and timely manner. In practice, this would imply that, while national ATS authorities will obviously be required to operate within the legal, administrative and budgetary confines applicable to all national administrative and budgetary confines applicable to all national administrations they should be given optimum autonomy as regards their handling of operational and technical matters without being excessively inhibited in their activities by non-technical supervisory agencies.

Division of ATS

17. In accordance with Annex 11, 2.3, the air traffic services are sub-divided into the following three services; air traffic control (ATC) service, flight information service (FIS) and alerting service. It should, however, be clearly understood that the provision of alerting service is not an isolated function but is rather incorporated in the provision of flight information and/or ATC service. The same condition applies for the provision of flight information service whenever an ATC service has been established, except in those cases where, due to traffic density and workload considerations, flight information service may be provided by personnel specifically designated for this task.

18. The ATC service is sub-divided into three parts, depending on the stage of flight to which it is applied. At and in the vicinity of aerodromes, ATC is normally provided by the aerodrome control service, which operates from a control tower, hence its abbreviation (TWR) aerodrome control tower. Approach control service (APP) is also provided in the vicinity of aerodromes, but it is a service which is mainly concerned with flights operating on an instrument flight rules (IFR) flight plan and in instrument meteorological conditions (IMC). Area control service (ACC) is that part of the ATC service which is provided to control flights while they are en route and is normally done from an ACC.

19. The division of responsibilities between TWR and APP and between APP and ACC cannot be rigidly defined because the responsibilities depend very much on local conditions which vary from location to location. They must therefore be determined in each case and with due regard to traffic conditions, its composition, the airspace arrangements, prevailing meteorological conditions and relative workload factors. However, arrangements governing the division of responsibilities between these different parts of the ATS service, should not result in increased requirements for co-ordination and/or an undesirable inflexibility in the use of airspace, nor in an increased workload for pilots because of unnecessary transfers of control and associated radio communication contacts.

20. It should also be noted that, depending on traffic conditions, the provision of certain parts of the ATC service may be restricted to those times or periods when the service in question is actually required and that, outside these times or periods a more limited type of service (e.g in the case of an APP, only aerodrome control or aerodrome flight information service (AFIS)) may be provided. Resorting to such arrangements presupposes, however, that this will, under no circumstances, result in a decrease of flight safety, or result in other consequences having an unduly detrimental effect upon flight operations conducted under this condition.

21. The division of responsibilities between APP and ACC requires particularly careful consideration because it can have a significant effect on the capacity of the ATC system at the location concerned, especially as regards the requirement for co-ordination and the workload imposed on both controllers and pilots. It has, for instance, been found that at some rather busy major aerodromes, the arrangement whereby departing traffic is transferred directly from the aerodrome control tower to a departure control position in the associated ACC, or only that part of arriving traffic which has been brought into a position where it no longer constitutes traffic to other departing or over flying traffic is released to APP by the associated ACC has contributed to an optimum flow of considerable amounts of air traffic while keeping the workload within manageable proportions. It should, however, be noted that such arrangements depend specifically on the local situation and that they should only be applied after careful consideration of all relevant factors by all parties concerned.

22. In numerous cases it has also been found that arrangements between APP and ACC, which leave the transfer of control of departing as well as arriving traffic between them to ad hoc agreements made in the light of the over-all traffic situation, have worked well whenever the will on both sides to obtain results has prevailed over the thinking in pure categories of competence.

Progressive Development of ATS

23. From the above, it follows that, initially, the simplest from of providing ATS is to establish a flight information center (FIC), covering a given area, which provides flight information and alerting service to en-route traffic; see Chapter 2, 2.2 below regarding flight information regions (FIRs). At the same time, at those aerodromes where air traffic tends to concentrate, it would then be appropriate to establish an AFIS which, in addition to alerting service and normal FIS, will provide aircraft with detailed information regarding other traffic operating in the vicinity of the aerodrome in question, so as to permit the pilots to arrange their flights so that a safe and expeditious flow of air traffic results.

24. In most cases, fairly early in the development of traffic at specific aerodromes, the point will be reached where the responsibility for the arrangement of such a safe and expeditious flow of traffic can no longer be left to the discretion of individual pilots. This case applies particularly when IFR operations of a commercial nature are conducted at such an aerodrome. However, experience has also shown that, if the traffic at a specific aerodrome is composed largely of pilots who are thoroughly familiar with the local conditions and their operations consist primarily of visual flight rules (VFR) flights, the decision to establish an aerodrome control may not need to be taken as early as would otherwise be needed.

25. The establishment of an aerodrome control service does not necessarily imply the immediate provision fo a special ATC facility (control tower) but it is rather intended to mean that the service will be provided by adequately qualified ATC personnel, having means and facilities at their disposal appropriate for the given situation. These means and facilities can range form relatively simple arrangements to a complete system of ATC services, including radio voice communication and electronic data processing and display equipment.

26. The area of responsibility for control of such a tower should, in addition to aerodrome traffic, also consider all traffic operating within a reasonable distance of the aerodrome. While no precise limitations can be imposed because the distance will vary in accordance with the traffic handled at the moment, experience seems to show, however, that it should normally not exceed 25 NM. Where only VFR traffic is controlled, the designation of a controlled airspace is not necessary and also not generally desirable. However, if the density of VFR traffic reaches proportions, which would make the traffic pattern of departing and arriving aircraft difficult because of over flying aircraft, an aerodrome traffic zone may be established to permit the control tower either to exercise control over aircraft not intending to land at the aerodrome in question or to make them avoid that zone.

27. It should be mentioned here that an aerodrome traffic zone may also be established around uncontrolled aerodromes when the activities conducted at those aerodromes (i.e. flying school, specific military activities) make it undesirable for other aircraft, not engaged in these activities, to penetrate or otherwise disturb the traffic pattern. In this case, the aerodrome traffic zone is primarily reserved for use by aircraft participating in the activities having caused the zone to be established.

28. When further developments determine that it is necessary for an aerodrome to also be available to traffic operating under IFR, it will be necessary to protect such traffic by extending control to such traffic by imposing such restrictions on VFR flights as are necessary to ensure the safety of both types of operations while operating in the same general area. To accomplish this, sufficient controlled airspace should be established to encompass the arrival, departure and, where necessary, the holding flight paths of the IFR flights. To achieve this in the most efficient manner, it will generally suffice to establish a comparatively small control zone (which, by definition extends from the ground upwards) and to superimpose on it a control area (which, again by definition, extends form a given lower limit above the ground upwards) of a size sufficient to contain the flight paths of departing, holding and arriving IFR flights. In doing so, the lateral extent of the control zone must be determined in relation to the lower limit of the superimposed control area so that average flight trajectories during departure and arrival are fully contained within the totality of the controlled airspace formed by the control zone and the control area. In addition, care should be taken in establishing the control zone and associated control area, that unnecessary restrictions are not imposed on other VFR air traffic wishing to operate in airspace close to the controlled aerodrome but not wishing to use that aerodrome itself (see also Appendix A to Part-I, Section-2, Chapter-3).

29. Further increases in the number and frequency of IFR traffic at an aerodrome will lead to the need to establish an APP as a separate service which, while closely co-operating with the control tower, may occupy a different location on the aerodrome in question and be administered as a separate ATS unit. The requirement for means and facilities for the provision of this service depend very much on the amount of IFR traffic to be handle, the type of traffic and the complexity of operations, the meteorological and topographical conditions at and around the aerodrome and workload considerations. It may also be possible, depending on demands for this type of service, to limit its availability to those periods of the day where it is likely to be required.

30. Normally in parallel with the development of air traffic at and around aerodromes, the requirement for the control of air traffic operating between such aerodromes also increases and the need to provide area control service is mainly determined by the assessment of the risk involved in the fact that a number of aircraft operate simultaneously in the same portion of airspace in IMC. If, in addition, a number of these aircraft are engage in commercial air transport, safety considerations involved in this assessment become even more pressing. However, if such en-route traffic is composed of VFR flights of a non-commercial nature only, it can reach very appreciable proportions before it becomes necessary to institute any type of control over such en-route flights.

31. In planning ATS it must therefore be ensured that early and timely provisions are made for this eventual increase in traffic because the lead times required for the initial implementation of an area control service, both as regards staffing and training of personnel and the provision of adequate means and facilities, especially communication, are significantly different from those required for the development and improvement of aerodrome control and APP, which tend to progress along much more envisageable and thus predictable lines. It is for this reason that ICAO has recognized the progressive development of ATS in its provisions of air traffic advisory service as a temporary, intermediate stage in the progression from flight information to area control service in order to permit an orderly transition from a service which is primarily informative in nature to one which requires the assumption of increase responsibilities by controllers for the safety of flight operations.

32. In providing control areas for area control service, their shape and extent will be dictated primarily by the flow of air traffic requiring control. At present, control areas are mainly formed by terminal control areas (TMAs) around major aerodromes connected with each other by air routes. Channeling of air traffic along routes has, however, the advantage that intersections of flight paths will be kept to manageable numbers and that their presentation to controllers on appropriate displays remains within normal limits of human perception.

33. Other, more liberal forms of organization of the traffic flow, such as the provision of an area control service based on an area type control combined with the possibility of pilots planning their flights along the most direct flight path have been found to be very difficult to accept by controllers. Such arrangements create an instant and continually changing ad hoc route system, determined by the individual intentions of pilots, require an inordinate amount of additional work by controllers in recording and updating flight progress strips, and also seem to render effective control much more difficult because possible conflicts between the intentions of individual flights cannot be projected on to well-established geographical locations but have to be worked out for each case individually.

34. The development of ACC should, however, provide for the case that, while pilots may still be required to plan their flights along a published route structure, ACC will clear them to fly the most direct route between any two points whenever this is possible at the time the flight comes under the control of the ACC concerned. Such a method of control will have to depend to a large measure on the discretion of the controller concerned without the obligation on his part to apply it systematically on each and every occasion. In addition, it must also be ensured that the navigation guidance provided, or the monitoring of flight progress by radar, is adequate to permit pilots to fly such direct routes with the degree of accuracy upon which separation between aircraft is based.

35. Finally, the establishment of an ATS route network to support the provision of area control service also offers the possibility of accommodating the various, often diverging interests regarding the channeling of air traffic. It is therefore essential that, in its establishment, ample opportunity is offered to all airspace users, including the military, as well as other interested parties (e.g. those concerned with the safeguarding of installations on the ground) to participate in the development process and make their views known so that acceptable compromises can be found.