GOVERNMENT OF INDIA

OFFICE OF THE DIRECTOR GENERAL OF CIVIL AVIATION

OPP. SAFDARJUNG AIRPORT, NEW DELHI – 110 003

CIVIL AVIATION REQUIREMENT
SECTION 8 – AIRCRAFT OPERATIONS
SERIES 'C' PART I
ISSUE I, DATED _____ **EFFECTIVE: FORTHWITH**

Subject: AWO (All Weather Operations)

1. INTRODUCTION

Aerodrome Operating Minima are established in order to ensure the desired level of safety in Aeroplane Operations at an Aerodrome by limiting these operations in specified weather conditions. The values of aerodrome operating minima for a particular operation must ensure that at all times the combination of information available from external sources and the aeroplane instruments and equipment is sufficient to enable the aeroplane to be operated along the desired flight path. This CAR lays down Aerodrome operating Minima for Scheduled, Nonscheduled and General Aviation operators (Aeroplane and Helicopters) and the procedure for obtaining approval of Aerodrome Operating Minima. The procedures of approval outlined in this document are not applicable to ILS Cat-II and Cat-III Operations.

This Civil Aviation Requirement (CAR) is issued under Rule 133A of the Aircraft Rules, 1937 and lays down the requirements by the operator & individuals for operation in All weather.

2. APPLICABILITY :All Operators

This CAR is applicable to all operators and individuals for All Weather Operations.

3. DEFINITIONS

Aerodrome Operating Minima

The weather limits of usability of an aerodrome for either take-off or landing are usually expressed in terms of visibility or runway visual range and decision altitude, minimum descent altitude (decision height, minimum descent height).

Categories of Aeroplanes

The following five categories of aeroplanes have been established based on the stall speed in the landing configuration at maximum certificated landing mass:

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 (141kts) IAS.
Category D: 261 km/h (141 kts) or more but less than 301 km/h (166 kts) IAS.
Category E: 301 km/h (166 kts) or more but less than 391 km/h (211kts) IAS.

Straight-in Approach

Definition of straight-in approach is an approach with the final approach track aligned within 15 degrees for Category 'C' and 'D' aircraft and within 30 degrees for Category 'A' and 'B' aircraft of the extended centerline of the runway of intended runway.

Circling Approach*

An extension of an instrument approach procedure, which provides for visual circling of the aerodrome prior to landing.

*Operator Authorisation Required.

Obstacle Clearance Altitude/Height (OCA/H)

The lowest altitude (OCA) or alternatively the lowest height above the elevation of the runway threshold or above the aerodrome elevation as applicable (OCH) used in establishing compliance with appropriate obstacle clearance criteria.

Decision Altitude/height (DA/H)

A specified altitude or height in a precision approach at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note: Decision altitude (DA) is referenced to mean sea level (MSL) and decision height (DH) is referenced to the threshold elevation.

Minimum Descent Altitude /Height (MDA/H)

A specified altitude/height in a non-precision approach or circling approach below which descent may not be made without the required visual reference.

Runway Visual Range (RVR)

The range over which the pilot of an aircraft on the center line of a runway can see the runway surface markings or the light delineating the runway or identifying its centerline.

Visibility

The visibility, as determined by atmospheric conditions and expressed in units of distance to see and identify prominent unlighted objects by day and prominent lighted objects by night.

4. **Requirements**

To enable the Scheduled, Non-scheduled and General Aviation Operators of aeroplane and helicopters to operate safely at an Aerodrome under limiting weather conditions, the following Aerodrome Operating Minima are being promulgated.

There are two sets of Aerodrome Operating Minima for Indian Airports; Normal Aerodrome Operating Minima and Restricted Aerodrome Operating Minima as given in Annexure-4.

Conversion of Reported Meteorological Visibility to RVR

Because runway visual range and meteorological visibility are established differently, a ratio can be established between the two. Effect of lighting intensities and background luminance play a role when establishing a runway visual range. The table in Annexure 4 indicates the relation between light intensity and day or night condition.

An operator should ensure that a meteorological visibility to RVR conversion is not used for takeoff, for calculating any other required RVR minimum less than 800, or when reported RVR is available.

When converting meteorological visibility to RVR in all other circumstances than those in subparagraph above, an operator should ensure that Table in Annexure 4 is used:

Note.— If the RVR is reported as being above the maximum value assessed by the aerodrome operator, e.g. "RVR more than 1500 metres", it is not considered to be a reported value for the purpose of this paragraph.

Normal Aerodrome Operating Minima – Landing

Normal Aerodrome Operating Minima are calculated based on the present information available regarding airport facilities and OCAs. The Airports Authority of

India (NAD) and Scheduled Airlines should keep updating these minima for the new facilities and the latest OCAs. These minima should be calculated as per ICAO All Weather Operations Manual (latest edition of DOC 9365 AN/910). Guidelines for calculation of these minima
is given at Annexure-1 with amplification of the procedure to be adopted in cases where DH value is more than 300 feet for Precision Approach Procedures.

Normal Aerodrome Operating minima as contained in Annexure-1 are for the use of all Scheduled Indian and International Airlines operating at India Airports.

The Scheduled Operators who have well established capabilities to calculate the Aerodrome Operating Minima will be given approval on application the method of calculation of the Aerodrome Operating Minima as per the Manual of All Weather Operations DOC 9365/AN/910.

Restricted Aerodrome Operating Minima – Landing

The Restricted Aerodrome Operating Minima is calculated as per the procedure for calculation of "Restricted Aerodrome Operating Minima" given in Annexure-2. The minima is for the use of all Operators who have not applied to DGCA and received approval for lower Minima than the Restricted Aerodrome Operating Minima.

Low Visibility Take-off Operations (LVTO)

Normally, the Aerodrome Operating Minima for landing at the airport will be the Aerodrome Operating Minima for take-off. However, under the conditions outlined in Annexure-3, the Aerodrome Operating Minima for take-off lower than the Aerodrome Operating Minima for landing can be authorized by DGCA. Only those Operators who are authorized by DGCA shall be allowed to carry out LVTO. Operator intending to carry out LVTO shall submit details of training programme to DGCA for approval. The same shall subsequently be incorporated in operator's Training/Operations Manual.

Foreign Air Operators Operating at Indian Aerodromes

Foreign Scheduled Air Operators are to be authorized by the State of the Operator for the use of the Aerodrome Operating Minima in accordance with requirements. In no case may they operate at Indian Aerodromes at less than the Normal Aerodrome Operating Minima as outlined in Annexure-1.

Foreign Operators who are authorized by their State Regulatory Authority for LVTO, shall submit requisite documents to DGCA for approval of LVTO at Indian Aerodromes.

Approach ban: *An approa*ch to land may not be commenced to arriving aircraft when weather conditions are reported to be below landing minima. This policy is intended to facilitate the regularity of instrument approach operations, to prevent a landing/go-around decision at a low altitude and in a vulnerable condition, and to minimize unnecessary instrument approach operations where a successful landing would be highly unlikely. This approach ban limits aircraft from proceeding beyond the IAF, unless weather is reported at or above a specified minima. If weather

deteriorates after an aircraft has passed the approach ban point, the aircraft already on approach may continue to DA(H) or MDA(H).

Conditions for Operation with these Aerodrome Operating Minima

1. Aeroplane, its Equipment and Airport Facilities

a) The aeroplane and its equipment for such use should be indicated by appropriate entries in the Flight Manual, Operations Manual or a similar document. Any limitations or procedures necessary for the safe use of the system must be identified.

b) The minimum airborne equipment which must be available before an approach in limited visibility conditions may be planned and carried out.

c) The equipment operating procedures such as use of the automatic flight control and automatic landing systems, if installed, and use of the flight instrument system, operating sequences etc.

d) Detailed performance data which may differ from or be additional to normal, such as loss of height during missed approach procedure etc.

e) Any other factors affecting the use of the aeroplane in limited visibility conditions, such as the procedures to be followed when the aeroplane's climb performance after take-off or during a missed approach is reduced with an engine inoperative.

f) Facilities and Procedures approved at each aerodrome are promulgated through the Aeronautical Information Services.

5. Flight Crew Qualifications

a) The Pilot-in-Command and Co-pilot must hold an instrument rating. All flight crew members should be qualified and trained for take-off, non-precision and Cat-I approaches, as described in ICAO All Weather Operations Manual DOC 9365-AN/910 Para 4.3 and Para 5.7

b) Appropriate flight crew members should have completed all necessary proficiency checks including demonstration of proficiency using the applicable instrument approach limits.

c) That the Operations Manual instructions are appropriate to the operation and reflect the mandatory procedures and/or limitations contained in the Flight Manual.

d) That the air operator must have gained sufficient experience with the system in operational service in weather minima higher than those proposed.

e) The Pilot-in-Command should have achieved the 100 hour in the relevant aeroplane type with restricted (higher) minima as given below before being certified to use the lower approved minima:

i) DA(H) or MDA(H) + 100 ft.
ii) Approved VIS/RVR + 400 meters.

f) The Operator should maintain a system of records to ensure that the necessary qualification of the flight crew members are being met on a continuing basis.

ADVERSE WEATHER - MONSOON OPERATIONS

(*OPERATIONS CIRCULAR 9 of 2010)*

Background

The meteorological term Monsoon is traditionally defined as a seasonal reversing wind pattern accompanied by seasonal changes in precipitation. It is now also used to describe seasonal changes in atmospheric circulation and precipitation. The major monsoon systems of the world include the West African and Asia-Australian monsoons. The North and South American monsoons, however, comprise an incomplete wind reversal.

In hydrology, monsoon rainfall is considered to be that which occurs in any region that receives the majority of its rain during a particular season. This allows other regions of the world to qualify as monsoon regions as well.
The term "monsoon" being used in the context of this circular refer to the big seasonal winds that blow from the Arabian Sea and Bay of Bengal in the southwest bringing heavy rainfall to the area. India experiences a Monsoon season every year which, due to the country's geographical location and geological characteristics, is unique in extent, intensity and coverage.

The season usually lasts from June to September and is dominated by the humid southwest summer monsoon, which slowly sweeps across the country beginning in May or early June. Monsoon rains begin to recede from North India at the beginning of October.

The actual dates of arrival and departure of the Indian Monsoon are forecast each year by the India Meteorological Department (IMD) of the Ministry of Earth Sciences. These can be perused on the website of IMD.

Purpose:

Despite the annual occurrence and predicted regularity of the Indian Monsoon, aviation incidents/ accidents occur every year Analysis has shown that most of the incidents and accidents, that have occurred, were not generally attributable to inadequacies in aircraft performance but occurred mostly due to various deficiencies/shortcomings of the human element.

Operating techniques applicable to each aircraft, under various generic adverse weather conditions, exist in flight manuals and must be adhered to. However, to ensure an enhanced level of safety, the reinforcement of these operating practices in the context of the Indian Monsoon with relevant, specific and mandatory regulatory guidelines is essential.

Ground School for All Pilots prior to the Monsoon Season:

All Operators are to provide Ground School training to all their Pilots irrespective of the fact that they may have flown during previous/ earlier monsoon periods. This ground training shall cover, but not be limited to:

- Aircraft Performance during Take-off and Landing with specific emphasis on wet and contaminated runway conditions.

- Calculation of Take-off and Landing field lengths and impact of individual failure events, specific to aircraft type.

- Indian Monsoon climatology

- Techniques of Weather Avoidance.

- Use of Weather Radar (type specific)

- ALAR & Adverse Weather Tool Kit (earlier issued by DGCA). Additionally, Operators not in possession of this shall seek this information through the Flight Safety Foundation's website. It is mandatory for all pilots to be given training on this tool-kit and be individually issued the course contents and the CD by the Operator. The module of ALAR Tool- kit shall be reviewed alongwith recent experiences of related exceedances and incidents, every year in the course of annual technical refresher.

- Detailed briefing on CANPA approaches and procedures.

4. Release of New Commanders during Monsoons All Operators are required to comply with the following requirements prior to release of New Commanders to operate as PIC in monsoon conditions. Release of Commanders who have operated as PIC in monsoons on any other type prior to being released on subsequent type will also be governed by this Circular.

5. Pilots who have obtained command rating for the first time:

Pilots who have obtained command rating for the first time are required to be subjected to adverse weather/monsoon training and a check before being released to fly as PIC in actual or forecast, adverse weather/ monsoon conditions.

Note: Pilots, who have obtained their command rating on Jet Transport aircraft for the first time, will fall under this category, even if they have flown earlier in Turbo-prop aircraft.

The following additional criteria must be fulfilled:

(i) Should have operated as a P2 during a minimum of one monsoon season prior to obtaining PIC rating on a new type.

(ii) Should have at least 100 hours PIC experience before being taken up for Simulator training.
In cases where a PIC is short of the 100 hours requirement or his endorsement has been obtained prior to or during adverse weather/monsoons, the PIC may continue to fly from LHS with Examiners/Instructors/Check Pilots during the monsoons till they achieve 100 hours.

Note: *For the purpose of this circular, 100 hours of PIC must include actual time in the left seat and NOT include hours logged as a cruise captain.*
Such flying would maintain his continuity and could be covered as "P1 Performance Monitoring". On completion of 100 hours in such cases, the pilot will comply with (iii) below.

(iii) (a) Two hours simulator session (in the form of LOFT) for adverse weather operations covering all aspects of adverse weather conditions likely to be encountered en-route and in terminal areas covering aircraft performance related to wet/ contaminated runway conditions combined with MEL dispatch. Increased emphasis on landing performance should be given including assessment of landing distance required in reduced braking effectiveness vs. actual Landing Distance Available (Safety Margins). This will be followed by a check of two hours in the simulator. Training and check for adverse weather conditions to cover pre-monsoon, monsoon and post monsoon period.

(b) Aircraft not having Simulator: Pilots of such Operators will undergo Ground Training as given in Para 3 above. This training should be arranged as close as possible to the onset of Monsoon season as forecast by the Indian Meteorology Department.

(iv) (a) In case of any adverse remarks during Simulator Check (Route Check if applicable), Operators must arrange ground classes as given in Para 3 above and simulator adverse weather training followed by a Simulator Check (Route Check) by Instructor/Examiner, before being cleared to operate independently in adverse weather conditions/ monsoon period.

(b) Operators are to ensure that only pilots qualified as per this circular are detailed for flights into adverse weather/ monsoon affected regions.

(c) Aircraft not having simulators: Who have complied with para 5 iii (b) above, should carry out two sector Route Check on aircraft. The check has to be done in ACTUAL adverse weather/ rain conditions for landing.

(d) Operators who do not have any Training Captains must detail their qualified and experienced Pilots having a minimum of 500 Hrs PIC experience on type, to act as Co-pilots to Non-Monsoon qualified Pilots and give guidance and help making

decisions for at least two sectors, actual adverse weather/monsoon conditions (en-route and departure/ arrival airfield).

6. <u>Pilots who have operated as PIC in Monsoons on another type</u>:

Pilots with previous experience as PIC in Monsoons who have newly obtained PIC rating on another type, must, after Ground Training as per Para 3 above, comply with the following:

(i) Two hours simulator session (in the form of LOFT) for adverse weather operations covering all aspects of weather conditions likely to be encountered in monsoon (with related weather radar operations to negotiate weather) including Aircraft Performance related to wet/contaminated runway condition combined with MEL Dispatch. The Pilots shall review the ALAR and Adverse Weather Tool Kit issued by DGCA. . This training should be arranged as close as possible to the onset of Monsoon season as forecast by the Indian Meteorology Department. This will be followed by a 2 hours check in the Simulator by Instructor/Examiner.

(ii) For Aircraft not having Simulator, two route checks to be carried during the period as 5 (iv) (c) above.

7. <u>General Conditions</u>:

(i) Minimum total cockpit experience level of the PIC and the Co-Pilot should not be less than 500 hours on type.
(ii) No supervised take-offs and landings in actual adverse weather/monsoon conditions.
(iii) Approach briefing prior to Top of Descent shall include wet/contaminated Landing Distance Required calculation. Scheduled Operators shall prepare a quick analysis table for wet/contaminated LDR in view of the high cockpit work-load environment.
(iv) A list of newly released commanders is forwarded to Flight Standards Directorate, DGCA Hqrs., by all the Operators, by 15th of May of every year. The names of Commanders released subsequent to this date till the onset of pre-monsoon shall also be forwarded at the earliest.
(v) ILS approaches are to be preferred to non-precision approaches. In case of non-precision approaches, emphasis must be given on Constant Angle Non-Precision Approaches (CANPA) Ref. Operations Circular 1 of 2005. Operators who have not introduced/ adopted CANPA in their flight procedures are required to do so, alongwith flight crew training, at the earliest.
(vi) Greater emphasis on stabilized approaches (Refer Operations Circular No. 1 of 2003 on "ALAR India Training Tool Kit and Circular No.9 of 2009 – Standard Operating Procedures).
(vii) PANS OPS procedures for speed control in terminal areas must be followed.
(viii) Flight Manual limitations and Company SOPs must be strictly adhered to.
(ix) Go around procedure in case of wind shear, stall and recovery must be reviewed as per Operations Circular 2 of 2001.
(x) All Operators are required to follow a non-reprisal policy for Go around and Diversion,

(xi) Documentation about upset recovery technique for specific airplane must be reviewed.

(xii) Full flap landing and adequate usage of Reverse thrust and consideration of extra en-route/ terminal fuel computation shall be adhered to. (Type specific manufacturer's guidance accepted)

8. MEL Requirements

(i) The following equipment shall be serviceable during adverse weather/monsoon conditions operations in Indian Airspace.:

(a) (i) For aircraft requiring transponder and TCAS, both must be serviceable.
(ii) GPWS/EGPWS must be serviceable.
(iii) All deceleration devices including Thrust reversers must be serviceable.
(iv) Anti-skid system must be serviceable.
(v) Wind shield wipers on both sides must be serviceable.
(vi) Anti – icing and de-icing must be serviceable.
(vii) At least one Weather RADAR system must be serviceable.
(viii) Groove on tyres must be visible out of base stations.

The following items even though un-serviceable, could be accepted "to return direct to base station for maintenance" (i.e. one landing only) subject to acceptable weather conditions at departure and destination station".

(b) (i) Transponder/TCAS (not in RVSM airspace)
(ii) GPWS/EGPWS – subject to all other instrumentation (to co-relate position) being serviceable and flight crew to have satisfactory terrain awareness.
(iii) One Thrust reverser provided other decelerating devices are serviceable – Subject to additional margin of minimum 1000 feet to field length requirement for take-off and landing.
(iv) Anti-Skid system – Subject to performance limitations.
(v) Wind-shield Wipers – Subject to the PIC side (LHS) being serviceable.
(vi) Anti-icing and De-icing – Subject to performance limitations.

Note: Clubbing of 8 b (iii) & (iv) is not permitted. So also, any system degradation causing impact on Flight Controls/Thrust Reversal/Anti-skid must be carefully weighed.

The above waivers to the MEL restrictions will in any case never be applied if the MEL/ other regulatory requirements are not permitting the same for any other specific operations.

For Simulator Monsoon Training and checks: the ADL must be revised to reflect the following functions must be operative:

• Weather Radar.

• Appropriate Hi-Fidelity Special Effects for weather, turbulence/ windshear, wet/contaminated runway etc. as applicable.

ILS CATEGORY II and III Operations:

Categories of Precision approach and landing operations

Category-II (Cat-II) Operation : A precision instrument approach and landing with:

a) Decision Height lower than 200 ft (60m) but not lower than 100 ft (30m);

And

b) a Runway Visual Range not less than 300m.

Category-IIIA (Cat-IIIA) Operation : A precision instrument approach and landing with:

a) a Decision Height lower than 100 ft (30m), but not lower than 50 ft (15m);

and

b) a Runway Visual Range not less than 175 m.

Category-IIIB (Cat-IIIB) Operation: A precision instrument approach and landing with:

a) No Decision Height or a Decision Height lower than 50 ft (15 m).

b) Runway Visual Range less than 175 m but not less than 50 m.

The DGCA may grant authorisation for a specified period to any pilot/ Operator of equivalent status approved as such by any Contracting State for carrying out Cat-II or Cat-III operations.
Detailed information is provided in CAR Section 2 Airworthiness – Series 'O' pt XIV-*Airworthiness and Maintenance Requirements for Cat II and Cat IIIA operations* and CAR Section 7 - Flight Crew Standards, Training and Licensing Series X Pt I -*Pilot Authorisation for ILS Category II and Category III Operations*

At present the CAR on ILS Cat-II/III Pilot Authorization requires ILS Cat-II/III practice approaches including autoland where applicable at or above Cat-I weather minima. These may be carried out on any Cat-I certified airport where autoland is permissible and which has been approved after flight trials by the operator. All the operators must maintain a periodically updated list of approved airports where practice Cat-II/III approaches/autoland may be carried out. These include the, under supervisions/checks, 1st and last practice approaches as required.

Guidance material on training is provided in Annexure 6

ANNEXURE 1

CALCULATION OF NORMAL AERODROME OPERATING MINIMA

Precision Approach Category – I

Decision Altitude/Decision Height (DA / DH)

- Note OCA for the Instrument Approach Procedure as notified by AAI.

- Add any margin considered necessary to OCA to determine DA.

- Determine DH by subtracting threshold elevation from Decision Altitude.

VISIBILITY / RVR Minima

- Check availability of Approach Lighting System (Basic, Intermediate or Full facilities) Refer Appendix 'A' to this Annexure.

- Refer Table 6-5 (ICAO DOC 9365) to extract Minimum Visibility/RVR Value under the type of ALS available for DH Values between 200 feet and 250 feet.

- For DH Values between 250 and 300 feet, the RVR/Visibility Value in the table should be increased by 100 metres.

- In case DH Value is more than 300 feet, calculate the horizontal distance between the beginning of the runway and the point above which the Glide Slope intersects the Decision Height using the following:

$$\frac{(\text{DH in feet} - 50 \text{ feet}) \times 60}{\text{GS Angle} \times 3.2808} \text{ Metres}$$

This horizontal distance (rounded off to the next higher 100 metres) would be the Visibility/RVR Minima with Basic facilities ALS. Using the above method, when DH increases beyond a certain value, Visibility/RVR Minima for a Precision Approach Procedure could become more than that of Non-Precision Approach Procedure for the corresponding value of MDH. In such a case, Visibility/RVR Minima for the Non-Precision Approach Procedure with Basic Facilities ALS corresponding to the DH shall be applicable. Reduce this value by 400 metres for intermediate facilities ALS and 800 metres for full facilities ALS. This reduced value should not fall below a minimum Visibility/RVR of 1000 metres.

Non-Precision Approach

Minimum Descent Altitude/Minimum Descent Height (MDA/MDH).

- Note OCA for the Instrument Approach Procedure as notified by AAI.

- Add any margin considered necessary to OCA to determine MDA and round it off to the next higher 10 feet.

- Calculate MDH by:

- Subtracting the airfield elevation from MDA in case the threshold elevation not more than 7 feet below the airfield elevation

OR

- Subtract threshold elevation from MDA in case the threshold elevation is more than 7 feet below the airfield elevation.

Full Facilities

- Precision Approach Cat-I Lighting System with minimum length of 740 metres.
- Runway threshold lights
- Runway edge lights.
- Runway end lights.
- Runway markings.

Intermediate Facilities

- High Intensity Simple Approach Lighting System of minimum length 420 metres.
- Runway edge lights
- Runway threshold lights
- Runway end lights
- Runway markings.

Basic Facilities

- Low Intensity Simple Approach Lighting System

OR

No Approach Lighting System

- Runway edge lights
- Runway threshold lights
- Runway end light
- Runways markings.

PROCEDURE FOR CALCULATION OF RESTRICTED AERODROME OPERATING MINIMA

Precision Approach Cat-I – Aircraft Category 'A' and 'B'

Calcuation of Decision Altitude/Decision Height (DA/DH)

- Note OCA for the Instrument Approach Procedure

- Add 100 ft to OCA to determine restricted DA.

- Determine Restricted DH by subtracting threshold elevation from Restricted Decision Altitude.

Calculation of VIS/RVR Minima

- Determine whether Basic, Intermediate or Full facilities ALDs are available (refer Appendix – A)

- For DH Value between 250 feet and 300 feet, the Visibility/RVR value given in Table 6.5 (ICAO DOC 9365) should be increased by 100 metres.

- For DH Value more than 300 feet calculate the horizontal distance between the beginning of the runway and the point above which the Glide Slope Intersects the Decision Height using the following formula:

$$\frac{\text{(Restricted DH in ft – 50 ft) x 60}}{\text{GS Angle x 3.2808}} \text{ metres}$$

This horizontal distance would be the Restricted Visibility Minima with Basic facilities ALS.

Using the above method, when DH increases beyond a certain value, visibility/RVR Minima for a Precision Approach Procedure could become more than that of Non-Precision Approach Procedure for the corresponding valued of MDH. In such a case, Visibility/RVR Minima for the Non-Precision Approach Procedure with Basic facilities ALS, corresponding to the DH shall be applicable.

Reduce this value by 400 metres for intermediate facilities ALS and 800 metres for full facilities ALS. This reduced value should not fall below a minimum visibility/RVR of 1000 metres.

Example
Hyderabad ILS Runway 27 (GS angle = 3 degrees) – Aircraft Category 'A'
Normal OCA = 1915 feet

Restricted DA 1915 + 100 = 2015 feet
Subtract Threshold Elevation = 1713 feet

Restricted DH = 302 feet

Restricted Visibility/RVR
= (302 – 50) x 60
---------- = 1536 metres
3 x 3.2808 rounded off to 1600 mtrs (W/o ALS – Basic Facilities)
For full facilities ALS Restricted Visibility/RVR Minima = 1600 – 800 = 800 metres
This vale is below 1000 metres
So, Restricted Visibility/RVR Minima = 1000 metres
(for Full facilities ALS)
Precision approach Cat-I – Aircraft Category 'C' & 'D'
Calculation of Decision Altitude/Decision Height (DA/DH)
- Note OCA for the Instrument Approach Procedure
- Add 50 ft to OCA to determine Restricted DA.
- Determine Restricted DH by subtracting threshold elevation from Restricted Decision Altitude.

Calculation of VIS/RVR Minima
- Determine whether Basic, Intermediate or Full facilities ALDs are available (refer Appendix-A).
- For DH Value between 250 feet and 300 feet, the Visibility/RVR value given in Table 6.5 (ICAO Doc 9365) should be increased by 100 metres.
- For DH Value more than 300 feet calculate the horizontal distance between the beginning of the runway and the point above which the Glide Slope Intersects the Decision Height using the following formula:

(Restricted DH in ft – 50 ft) x 60
---------- metres
GS Angle x 3.2808
This horizontal distance would be the Restricted Visibility Minima with Basic facilities ALS.
Using the above method, when DH increases beyond a certain value, visibility/RVR Minima for a Precision Approach procedure could become more than that of Non-Precision Approach Procedure for the corresponding valued of MDH. In such a case, Visibility/RVR Minima for the Non-Precision Approach Procedure with Basic Facilities ALS corresponding to the DH shall be applicable.
Reduce this value by 400 metres for intermediate facilities ALS and 800 metres for Full facilities ALS.
This reduced value should not fall below a minimum visibility RVR of 1000 metres.

Example
Calcutta ILS DME Runway o1 R (GS Angle = 3 degrees) – Aircraft Category 'C'
Normal OCA = 400 feet
Restricted DA 400 + 50 = 450 feet
Subtract Threshold Elevation = 19 feet

Restricted DH = 431 feet

Restricted Visibility/RVR
(431 – 50) x 60
= ---------- = 2323 metres
3 x 3.2808 rounded off to 2400 metres
(W/o ALS – Basic Facilities)
Runway 01 R has Full facilities ALS
So, Restricted Visibility/RVR Minima = 2400 – 800 = 1600 metres
Non-Precision Approach (For all categories of Aircraft)
Calculation of Normal MDA/MDH
- Note OCA for the Instrument Approach Procedure
- Consider MDA = OCA : If OCA Value is not given in steps of 10 ft.
Determine MDA by rounding off OCA to the next higher 10 ft.
- Calculate Normal MDH by :
- subtracting the airfield elevation from MDA in case the threshold elevation is not more than 7 feet below the airfield elevation
OR
- subtract threshold elevation from MDA in case the threshold elevation is more than 7 feet below the airfield elevation.
Calculation of Normal VIS/RVR Minima
- Determine whether Basic Intermediate or full facilities are available (refer Appendix-A)
- Refer Table 6-3 in case MDH is not more than 320 feet.

Note: So far there is no Instrument Approach Procedure for Non- Precision Approach which has MDH less than 320 feet in India. So, practically this tale is of no use at present.

- Refer Table 6-2 and extract VIS/RVR Value in case MDH is 320 feet or more.
- The extracted value from Table 6-3 or Table 6-2 is normal RVR/VIS Minima with Full facilities.
- In case Intermediate facilities are available, add 400 metres to the value extracted from Table 6-2 or Table 6-3.
- In case only Basic facilities are available, add 800 metres to the value extracted from Table 6-2 or Table 6-3.
Calculation of Restricted MDA/MDH..
- Add 100 feet to the normal MDA/MDH to get the values of Restricted MDA/MDH.
Calculation of Restricted VIS/RVR
- Add 400 metres to the VIS/RVR Minima value calculated for normal MDH.
- Calculate VIS/RVR Minima for Restricted MDH.
- Higher of these two values should be taken as Restricted VIS/RVR Minima.

Note: Minimum visibility for Circling Approach and NDB Approach for all category of Aircraft is 3600 metres.

Example 1

Hyderabad LOC GS (INOP) RWY 27 (Aircraft Category 'C')
Normal OCA = 2300 feet

Normal MDA = 2300 feet
Airfield Elevation = 1741 feet
Threshold Elevation Rwy 27= 1713 feet

Subtract 1713 ft from MDA to get MDH

Normal MDH = 2300 – 1713 = 587 feet

Normal VIS/RVR = 2400 Metres (with ALS – Full Facilities)= 2400 + 800 = 3200 metres (W/o ALS – Basic Facilities)

Restricted VIS/RVR Minima

- VIS/RVR for restricted MDH = 3200 Metres (with ALS – Full Facilities)
- VIS/RVR for Normal MDH+400 M = 2400 + 400 = 2800 metres (with ALS - Full Facilities)
- Higher of these two values should be taken as Restricted VIS/RVR Minima

So, Restricted VIS/RVR Minima = 3200 Metres
(with ALS - Full Facilities)
= 3200 + 800
= 4000 metres
(W/o ALS - Basic Facilities)
Since Rwy 27 at Hyderabad has Full Facilities ALS Restricted Minima will be as given below:

Restricted MDA(MDH) (in feet)	VIS/RVR with ALS (in Mtrs)	VIS/RVR W/o ALS (in Mtrs)
LOC (GS INOP) RWY 27	2400 (687)	3200 4000

Example – 2
Amritsar VOR/DME RWY 16 (Aircraft Category 'C')
Normal OCA = 1160 feet
Normal MDA = 1160 feet
Airfield Elevation = 752 feet
Threshold Elevation Rwy 16 = 755 feet
Subtract 752 ft from MDA to get MDH
Normal MDH = 1160 – 752 = 480 feet
Normal VIS/RVR = 2000 Metres (with ALS – Full Facilities)
= 2000 + 800 = 2800 metres (W/o ALS – Basic Facilities)
Restricted MDA = 1160 + 100 = 1260 feet
Restricted MDH = 408 + 100 = 508
Restricted VIS/RVR Minima
- VIS/RVR for restricted MDH = 2000 Metres (with ALS – Full Facilities)
- VIS/RVR for Normal MDH+400 M = 2000 + 400
= 2400 metres (with ALS – Full Facilities)

- Higher of these two values should be taken as Restricted VIS/RVR Minima
So, Restricted VIS/RVR Minima = 2400 Metres
(with ALS - Full Facilities)
= 2400 + 800
= 3200 metres
(W/o ALS - Basic Facilities)
Since Rwy 16 at Amritsar has Full Facilities ALS Restricted Minima will be as given below:

Restricted MDA(MDH) (in feet)	VIS/RVR with ALS (in Mtrs)	VIS/RVR W/o ALS (in Mtrs)
VOR DME RWY 16	1260 (508)	--- 3200

Example – 3
Port Blair VOR DME RWY 04 (Aircraft Category 'C')
Normal OCA = 760 feet
Normal MDA = 760 feet
Airfield Elevation = 20 feet
Threshold Elevation Rwy 04 = 12 feet
Subtract 12 ft from MDA to get MDH
Normal MDH = 760-12 = 748 feet
Normal VIS/RVR = 3600 Metres (with ALS – Full Facilities)
= 3600 + 800 = 4400 metres (W/o ALS – Basic Facilities)
Restricted MDA = 760 + 100 = 860 feet
Restricted MDH = 748 + 100 = 848 feet
Restricted VIS/RVR Minima
- VIS/RVR for restricted MDH = 4000 Metres (with ALS – Full Facilities)
- VIS/RVR for Normal MDH+400 M = 3600 + 400
= 4000 metres (with ALS – Full Facilities)
- Higher of these two values should be taken as Restricted VIS/RVR Minima. In this case both the values are same.
So, Restricted VIS/RVR Minima = 4000 Metres (with ALS - Full Facilities)
= 4000 + 800
= 4800 metres
(W/o ALS - Basic Facilities)
Since Rwy 04 at Port Blair has Full Facilities ALS Restricted Minima will be as given below:

Restricted MDA(MDH) (in feet)	VIS/RVR with ALS (in Mtrs)	VIS/RVR W/o ALS (in Mtrs)
VOR DME RWY 04	860 (848)	--- 4800

Full Facilities

- Precision Approach Cat-I Lighting System with minimum length of 740 metres.
- Runway threshold lights
- Runway edge lights
- Runway end lights
- Runway markings

Intermediate Facilities

- High Intensity Simple Approach Lighting System of minimum length 420
- Runway edge lights
- Runway threshold lights
- Runway end lights
- Runway markings

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Basic Facilities

- Low Intensity Simple Approach Lighting System

OR

No Approach Lighting System

- Runway edge lights
- Runway threshold lights
- Runway end light
- Runways markings.

Annexure 3

Low Visibility Take Off Operations

All weather operations mean any taxi, take-off and landing operations in conditions where visual reference is limited by weather conditions. In view of the complex nature of aeroplane operations there is a need to address the subject of all-weather operations with the concept of a total system in mind. The major component are the ground i.e. aerodrome facilities and airborne elements i.e.aircraft and its equipment & flight crew capabilities, and flight procedures. This CAR lays down the minimum requirements for training and grant of authorization to pilots for all weather operations.

This does not apply for Monsoon Operations.

Aerodrome facilities i.e. Air traffic services;

a) Surface Movement Guidance and Control System, commonly referred to as a Low Visibility Operational Plan (LVOP*)[Including airport plan of Secondary power supply and multi-circuit design/ electrical multi-looping for applicable runway]*

b) Visual and non-visual aids and the adequacy of performance;

c) Runway, markings, lighting, navigational equipment.

d) Taxiway centerline lights;

e) Runway/taxiway, runway/ runway intersection stop bars

f) Runway high intensity edge lights

g) Runway centre-line lights.

h) Road holding position lights.

i) Illuminated signs

j) Obstacles in the take-off climb, approach surface and missed approach. The IAL procedures and obstacle clearance altitude/height etc.

Meteorological facilities;

a) Availability of meteorological information and RVR facilities i.e.

touch down zone RVR, Mid RVR and End (rollout) RVR[or Manual RVR]. The real time RVR reading should be available in the ATC unit for immediate dissemination of information to the crew.

b) Low Visibility Take-off (LVTO): A take-off where the RVR is less than 400 meters but not less than 200 meters.

c) The pilot must be in visual reference with the runway Centre-line lights and runway edge lights to maintain the smooth and safe operations.

Note: The governing RVR shall be the lowest of the reported RVRs

I. **CONDITIONS FOR APPROVAL OF LOW VISIBILITY TAKE-OFF OPERATIONS (LVTO):**

a) Where the conditions of (b) below, cannot be met normally, minima determined for approach and landing will be applicable for take-off. Take-off minima shall be greater than or equal to the applicable landing minima. State minima, if higher shall supercede the company minima

b) The following criteria will be applicable to use take-off minima (LVTO) when the Visibility/ RVR is lower than landing minima:

i) Visibility/RVR for the runway shall not be lower than the landing minima except LVTO minima specified hereunder.

ii) Wherever multiple RVR observations are reported for the runway, the lowest value of RVR will be the determining factor for the purpose of take-off minima. The RVR shall not be less than 125 metres whenever multiple RVRs are available. If only Touchdown RVR is available then the LVTO minima shall be 400 metres.

iii) Suitable designated take-off alternate airport should be available and filed with the ATC as a take-off alternate for departure, within one hour of flying time for two engine aircraft and within two hours of flying time for more than two engine aircraft based on the specified one engine inoperative speed in still air conditions.

iv) Designated Take–Off Alternate Aerodrome for departure aerodrome shall be available for operation from the departure time to one hour after the latest expected time of arrival. Weather conditions at the designated take-off alternate airport should not be less than the following minima for a period of one hour before the earliest expected time and up to one hour after expected time of arrival at the takeoff alternate airport.

(v) PIC should be in possession of accurate weather, Notam and other safety information for departure and alternate airports before carrying out the Low Visibility Take-off.

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vi) If the Visibility is less than 500 metres (RVR 400 mtrs), the Takeoff Runway shall be equipped with serviceable and functioning High Intensity Runway Lights and Runway Centre-line Lights. If the visibility is 500 metres (RVR 400 metres) or more, the takeoff runway shall be equipped with serviceable and functioning High Intensity Runway Lights and Runway Centre-line Lights or Runway Centre-line Markings are clearly visible throughout the take-off run.

If the visibility/ RVR is 800 m or more (Day only), the take-off runway shall be equipped with runway and centre-line markings which are clearly visible throughout the take-off run.

Approved Low Take-off Minima (Commercial Transport Aeroplanes)

Take-off RVR/Visibility❹	
Facilities	**RVR/VIS** **Cat A, B, C & D**
Adequate Visual reference ❶ (Day only)	500m
Runway edge lights or Runway centreline markings ❷	400m
Runway edge lights and Runway centreline markings ❷	300m
Runway edge lights and Runway centreline lights	200m
Runway edge lights and Runway centreline lights and relevant RVR information ❸	TDZ 150m MID 150m Roll-out 150m
High intensity Runway edge lights and Runway centreline lights (spacing 15 m or less) ❸	TDZ 125m MID 125m Roll-out 125m

❶ Adequate Visual reference means, that a pilot is able to continuously identify the take-off surface and maintain directional control.

❷ For night operations at least runway edge lights or centreline lights and runway end lights are available.

❸ The required RVR is achieved for all relevant RVRs

❹ The TDZ RVR/VIS may be assessed by the pilot.

(vi) Inclement weather conditions such as (but not limited to)
Thunderstorm and or wind-shear activity are not likely to be encountered at the airport during take-off.

(vii) Full thrust shall be used for Take-off

(viii) The Aircraft System Equipment listed, as applicable/ installed, below which are critical for Low Visibility Take-off and Landing shall be fully serviceable:

(a) Wind-shield wipers for both Pilot and Co-pilot stations.
b) Window heat for all heated cockpit windows.
c) Anti-skid System.
d) Thrust Reversers for all engines.
e) All Flight Director Systems, Auto-Pilot, Radio Altimeter.
f) Weather Radar.
g) At least two VHF Com Sets.
h) At least two VHF Nav Sets.

ix) PIC should have undergone specific training for low visibility takeoff and landing as per training syllabi.

x) PIC should have a minimum of 300 hours of Command experience on type and be current.

xi) Prior to commencement of low visibility take-off, the PIC shall ensure that sufficient visual reference guidance is available to control the aero-plane in both the situations i.e. discontinued takeoff in adverse circumstances and a continued take-off after failure at critical speeds.

xii) PIC should inform ATC and Flight Despatch if applicable, of his intention to use Low Visibility Take-off Minima for that particular take-off.

xiii) Supervised take-off and landing not be permitted in low visibility conditions.

Designated Take-Off Alternate Minima

For dispatch, the Take-off Alternate weather (actual and forecast) shall not be less than the applicable landing minima and shall not be less than ILS Cat-I Minima even for airfield certified for CAT-II/III operations

For approved Scheduled Operators only the LVTO minima may be authorized as 125 mtrs.

All other operators may seek authorization to LVTO minima of 200 mtrs

II. TRAINING PROGRAMME FOR LOW VISIBILITY TAKE-OFF (LVTO) OPERATIONS

A. Ground Training

This training programme outlines the procedures and techniques, conditions and requirements (like MEL, Special Weather phenomenon etc.) for reduced visibility take-off under weather conditions below landing minima. Emphasis should be given on
taxiing in low visibility conditions; CRM for Low Visibility Operations; R/T procedures and avoidance of runway incursions.

B. Simulator Training

a) The pilots will be subjected to adequate simulator training (minimum 2 hours) to cover the following and any other relevant maneuvers:

i) Take-offs under simulated conditions of 125 metres

ii) Landing under simulated condition of 125 metres RVR or less including one engine inoperative during approach and landing as per applicable procedure i.e Cat III/ autoland.

These Simulator exercises will cover procedures for aborted take-off due to engine failure at low speed and high speed and action to be taken in case visibility reduces during the take-off run. Including for Jet aircraft, critical engine seizure at Low Speed, V1, VR, between V1 & VR and on Lift-off. And also an exercise of diversion to the filed designated Take-off alternate from Engine Failure/Fire at V1 including climb-out to planned en-route airway and landing at Take-off Alternate at landing minima.

b) These simulator exercises will cover procedures for aborted take-off due to engine failure at low speed and high speed and action to be taken in case visibility reduces during the take-off run.

c) Simulator check of not less than two hours covering the above to assess the proficiency.

d) Pilots will be required to undergo the above minimum training once prior to approval and thereafter checked during yearly proficiency checks as per the recency requirements.

On successful completion of the above training and checks, the Pilot's proficiency to carry out Take-off under visibility conditions lower than landing minima will be recorded in his/her log book. The air operator is required to indicate in the Operations Manual
the airfields along with their designated take-off alternate(s) for each of the aerodromes at which LVTO Operations would be carried out.

The Pilot-in-Command shall satisfy that:

a) Status of visual and non-visual facilities at the departing aerodrome prior to commencing a Low Visibility Take-off (LVTO).
b) The LVP is in force by Air Traffic Services and the aerodrome operator is
ready in all respect for such operations prior to commencing a Low Visibility Take-off (LVTO).
c) The flight crew are properly qualified, including currency of training prior to commencement of Low Visibility Take-off (LVTO).

Safety assessment:

In view of the major change in procedure the safety assessment need to be conducted both by the aerodrome operator and the airline operator.

Aerodrome:
In some conditions of limited visibility, air traffic controllers may no longer be able to see the whole movement area of the aerodrome but pilots will still have the capability to see other traffic in their vicinity and to avoid it if necessary. In worse conditions it may well be that neither the controller nor the pilot will be able to see the other traffic, and it may then become essential to have a system which effectively ensures the separation of aeroplane from aeroplane or aeroplane from vehicles.
Guidance on such systems is given in the *Manual of Surface Movement Guidance and Control Systems (SMGCS)* (Doc 9476 of ICAO). The first practical step towards achieving this involves a comprehensive safety assessment of the aerodrome which requires examination of all the relevant factors such as layout of the movement area and aeroplane and vehicle routings, relevant existing instructions and rules, meteorological records, movement statistics, records of runway intrusions, existing security procedures, etc. The action arising from such an assessment will be dependant upon the characteristics of the movement area and the type of operation and will need to include consideration of the following:

a) Training of ground personnel;

b) Maintainance of records by ATS of persons and vehicles on the maneuvering
area;

c) Non-essential personnel and vehicles to be withdrawn from movement areas
when limited visibility weather conditions prevail or are impending;

d) Essential vehicles permitted to enter the movement area in limited visibility conditions to have R/T communication with ATS;

e) Patrols where necessary in areas of intensive vehicle movement where there
is no traffic control point between those areas and the runway;

f) Unguarded aerodrome entrances to be locked and inspected at frequent intervals;

g) Procedures to warn airlines and other organizations with movement area access of the commencement of the more restricted measures; and

h) Development of appropriate emergency procedures.

Airline Operator:

A safety assessment should be undertaken prior to commencement of Low Visibility Take-off operations by the airlines and demonstrate that acceptable level of safety needs to be ensured by considering human, equipment and procedure to introduce the perceived risk associated with a Hazardous event which depend upon the likelihood of occurrence of event and severity of its consequences. Both these factors may be addressed in the risk management process by initiation of adequate steps which are as follows:

1. Development of complete description of Low Visibility Take-off operation,
2. Identification of hazards,
3. Estimation of severity of the consequences of a hazard occurring,
4. Estimation of likelihood of a hazard occurring,
5. Evaluation of risk,
6. Mitigation of risk, and
7. Development of safety assessment documentation for LVTO.
8. Identify after the above, airports authorized to be used for LVTO, incorporate the same into the Operations Manual under intimation to the DGCA. The flight crew needs to be briefed with regard to the process of Low Visibility Take-off operations and the same shall be recorded.

CONVERSION OF REPORTED METEOROLOGICAL VISIBILITY TO RVR

An operator should ensure that a meteorological visibility to RVR conversion is not used for takeoff, for calculating any other required RVR minimum less than 800 m, or when reported RVR is available.

When converting meteorological visibility to RVR in all other circumstances than those in sub-paragraph above, an operator should ensure that Table below is used:

Note.— If the RVR is reported as being above the maximum value assessed by the aerodrome operator, e.g. "RVR more than 1500 metres", it is not considered to be a reported value for the purpose of this paragraph.

Conversion of Meteorological visibility to RVR

Lighting elements in operation	RVR = Reported Meteorological. Visibility x	
	Day	Night
HI approach and runway lighting	1·5	2·0
Any type of lighting installation other than above	1·0	1·5
No lighting	1·0	Not applicable

Continuous Descent Final Approach (CDFA)

A CDFA is a specific technique for flying the final-approach segment of an instrument approach procedure as a continuous descent, without level-off, from an altitude / height at or above the Final Approach Fix altitude / height to a point approximately 50ft above the landing runway threshold or the point where the flare maneuver should begin for the type of aeroplane flown. A CDFA technique is recommended where possible to reduce the risk of CFIT. For those cases where the CDFA technique is not applied, e.g. if a step-down approach technique has been used, there is a need for additional visibility/RVR. If the approach is not stable at a critical moment, the pilot may need additional reaction time for the vertical maneuver. When executing an approach without using a CDFA technique, the visibility/RVR minima is increased by 200 m for CAT A and B aircraft, and increased by 400 m in case of CAT C and D to aid the visual transition to landing. This Annexure highlights some of the advantages of the use of a CDFA technique for existing approaches that do not otherwise use a VNAV or ILS glide path.

For approaches that do not use VNAV or an ILS glideslope or glide path, a CDFA technique is recommended. When electronic or a pre-stored computed vertical guidance is not used, vertical speed or flight path angle may be used to achieve a CDFA profile.

Compared to the traditional descent approach technique, where the aircraft descends step-by-step prior to the next minimum altitude, the CDFA technique has safety and operational advantages, such as standardization of procedures, simplification of the decision process (one technique, one decision at one point), increased height above obstacles, use of a stable flight path, reduced noise and reduced fuel burn. The CDFA technique can be flown on most published approach when VNAV or ILS is not available.

In case of the application of the CDFA technique, on many procedures the DDA(as given in Ops Circular 1 of 2005) may be used safely as a decision altitude provided the go-around maneuver is initiated not later than the DDA. Any height-loss associated with the missed approach climb should be minimized through instruction and training including strict adherence to path and speed and decision making ensuring immediate actions at the MDA. It is required that flight crews add a prescribed altitude increment to the MDA depending on type of aircraft, (minimally 50') to determine the altitude at which the vertical transition to the missed approach should be initiated in order to prevent descent below the MDA or transgression below the OCH passed the MAPt In such cases, there is no need to increase the RVR or visibility requirements for the approach. Any turning maneuver associated with the missed approach should be initiated no earlier than the MAPt. Approach procedures are designed to include additional safety buffers. Delay in the initiation of the missed approach manoeuvre may result in infringement of these buffers. Flight crews should always be prepared in advance to initiate a missed approach procedure if necessary.

The operator should ensure that, prior to conducting CDFA, each flight crewmember intending to fly CDFA profiles undertakes training appropriate to the aircraft, equipment, and instrument approach procedures to be flown.

ANNEXURE 6

Guidance Material for Low Visibility and ILS CAT I/II/III Training

An all-weather operations ground training programme should provide instruction for all flight crew members appropriate to their designated duties. The approved format of any training programme should be designed to fit the particular operation. It should cover the following items where applicable:

a) characteristics of visual and non-visual approach aids;

b) aeroplane-specific flight systems, and instrumentation and display systems and the associated limitations:

c), changes, if any, to aerodrome operating minima necessitated by inoperable or unserviceable instruments or systems;

d) approach and missed approach procedures and techniques;

e) use of visibility and RVR reports, including the various methods of assessing RVR, and the limitations associated with each method, the characteristics of fog and its effect on the relationship of RVR to the pilot's visual segment and the problems of visual illusions;

f) influence of wind shear, turbulence and precipitation;

g) the pilot's tasks at DA/H, MDA/H or MAPt, the use of visual cues, their availability and limitations in reduced RVR and various glide path angles, pitch attitudes and cockpit cut-off angles, the heights at which various cues may be expected to become visible in actual operations, procedures and techniques for transition from instrument to visual reference, including the geometry of eye-height, wheel height, antenna position and pitch attitude with reference to various pitch attitudes;

h) action to be taken if the visibility deteriorates when the aeroplane is below DA/H or MDA/H, and the techniques to be adopted for transition from visual to instrument flight;

i) action in the event of equipment failure, both above and below DA/H or MDA/H;

j) significant factors in the calculation or determination of aerodrome operating minima, including height loss during the missed approach manoeuvre and obstacle clearance;

k) effect of system malfunction on auto-throttle or autopilot performance (e.g. engine failure, pitch trim failure);

l) procedures and techniques for reduced visibility take-offs including rejected take-off and action to be taken if the visibility deteriorates during take-off run; and

m) such other factors as are considered to be necessary

The all-weather operations programme for initial and recurrent training should provide simulator and/or in-flight training on the particular aeroplane type for all flight crew members. The

All-weather operations training should cover the following items, as appropriate:

a) take-offs in reduced visibility, including system failures, engine failures and rejected take-off.

b) system failures during approach, landing and missed approach;

c) instrument approaches with all engines operating, and with the critical engine inoperative, using the various flight guidance and control systems installed in the aeroplane, down to the specified operating minima and transition to visual reference and landing;

d) instrument approach with all engines operating and with the critical engine inoperative, using the various flight guidance and control systems installed in the aeroplane, down to the specified operating minima, followed by a missed approach, all without external visual reference;

e) instrument approaches using the aeroplane's automatic flight control system, followed by reversion to manual control for flare and landing;

f) procedures and techniques for reversion to instrument flight and the execution of a balked landing and subsequent recovery resulting from loss of visual reference below DA/H or MDA/H.

The frequency of system malfunctions introduced in the all-weather operations training programme should not be such so as to undermine the confidence of flight crews in the over-all integrity and reliability of the systems used.

The recurrent training required, to maintain pilot proficiency on an aeroplane type, together with that required to maintain and renew the instrument rating, will normally be sufficient to ensure continued qualification to conduct instrument approaches. However, as a minimum, the recurrent training should include take-offs in reduced visibility and all types of instrument approaches which the pilot is authorized to carry out. These approaches should be flown to the specified operating minima, and the pilot should demonstrate the level of proficiency required by Flight Standards Directorate. Consideration should be given to a recency requirement, i.e. that pilots should carry out a minimum number of practice or actual instrument approaches each month (or other suitable period) to maintain their instrument flying qualification. This recency requirement is in no way a substitute for recurrent training.Further, recurrency in Cat III Operations does not constitute as recurrency in Cat II Operations.

It is understood that the precise nature and scope of the operations manual with respect to all weather operations will vary from operator to operator and among different aeroplanes with different equipment. The following items should always be included:

a) Standardized flight crew procedures for instrument approaches applicable to the aeroplane in question, including the allocation of flight crew duties in the operation of aeroplane equipment, and allocation of responsibility for cross-monitoring during approach and landing. These procedures should ensure that:

1) one pilot continues to monitor the instruments during the visual phase at and below DA/H or MDA/H;
2) standardised callouts include verbal recognition of critical altitudes or fixes, including an approaching minima call at a height of, for example 100 ft above the MDA(H)/DA(H) in order to prevent inadvertent descent below the applicable descent limit;
3) the need is emphasized for strict adherence to the minimum crossing altitudes of step-down fixes along the final approach path for approach procedures other than ILS
4) it is preferable to use a continuous descent final approach technique with emphasis on the importance of being stabilized at the required height above the runway threshold;

b) Minima for take-off;

c) Minima for each type of approach;

d) Any increments to be added to the minima in the event of airborne or ground system deficiencies or failures;

e) Any increments to be added to the minima for use by the pilot-in-command recently converted to type, together with the period during which the increased minima should apply;

f) Authority for the pilot-in-command to apply higher values of minima as judged to be required by circumstances;

g) Action to be taken when weather conditions deteriorate below minima;

h) Guidance on the visual references required for continuation of the approach below DA/H or MDA/H;

i) requirements for a take-off alternate when conditions at the departure aerodrome are below landing minima;

j) checks for satisfactory functioning of equipment both on the ground and in the air;

k) a list of aeroplane equipment allowable deficiencies; and

l) identification of aeroplane system or equipment failures requiring abnormal or emergency actions.

The transition from flight on instruments to flight using visual references is not an instantaneous occurrence. Assuming a stable approach path in limited visibility conditions,

the first visual contact with the visual aids or on identifiable features in the approach area for approaches other than ILS may do no more than indicate to the pilot that the aeroplane is in the final approach area; a pilot will generally need to keep visual contact for a period of several seconds in order to assess the aeroplane position relative to the approach centreline as well as any cross track velocity. Of more importance is the assessment of the expansion of the visual scene that occurs during this period. Since this assessment should occur before the pilot makes a decision to continue the approach, it follows that visual contact normally should occur above either the decision altitude (height), or the minimum descent altitude (height). The visual scene would normally be expected to expand as the aeroplane descends. To assist the transition into visual conditions, the pilot's scan pattern may still include reference to the aeroplane instruments below decision altitude (height), or minimum descent altitude (height).

Low weather minima operations call for special procedures and instructions to be included in the operations manual, but it is desirable that any such procedures should also be used as the basis for all operations, in order to provide the same operating philosophy for all categories of operations. These procedures cover all foreseeable circumstances so that flight crews are fully-informed as to the correct course of action which should be followed. This is particularly true for the last part of the approach and landing where limited time is available for decision making. Possible modes of operation include:

a) manual take-off;

b) manual approach and landing;

c) coupled approach down to DA(H), manual landing thereafter;

d) coupled approach to below DA(H), but manual flare and landing;

e) coupled approach followed by auto-flare and auto-landing; and

f) coupled approach followed by auto-flare, auto-landing and auto-rollout.

The precise nature and scope of procedures and instructions should be a function of the airborne equipment used and the flight deck procedure applied. Flight crew member duties during take-off, approach, flare, roll-out and missed approach are to be clearly delineated in the operations manual. Particular emphasis should be placed on flight crew responsibilities when transitioning from non-visual conditions to visual conditions, and on procedures to be used in deteriorating visibility or when failures occur. Special attention should be paid to the distribution of flight deck duties to ensure that the workload of the pilot making the decision to land or to execute a missed approach enables the pilot to concentrate on supervision and decision-making.

The following areas are emphasised:

a) checks for satisfactory functioning of equipment, both on the ground and in flight;

b) effects on minima caused by changes in the status of the ground installations;

c) use and application of RVR reports from multiple runway positions and sensors;

d) pilot assessment of aircraft position and monitoring of the performance of the automatic flight control system, the effects of the failure of any required portion of the automatic flight control system or instruments used with the systems, and action to be taken in the event of inadequate performance or failure of any portion of either the system or the associated instruments;

e) actions to be taken in case of failures, such as engines, electrical system, hydraulics, and flight control systems;

f) allowable aeroplane equipment deficiencies;

g) precautions necessary when making practice approaches where full ATC procedures to support Category III operations are not in force, or when ILS ground equipment of a lower standard is used for Category II or III operations;

h) operating limitations resulting from airworthiness certification; and

i) information on the maximum deviation allowed from the ILS glide path and/or localizer from the region of the decision altitude (height) down to touchdown, as well as guidance regarding the visual reference required.

Experience has demonstrated that it is useful for operators to establish procedures for the gradual introduction of low weather minima operations. This suggests a conservative approach to the implementation of all weather operations through a gradual reduction in meteorological criteria commensurate with experience Such procedures are normally aimed at:

a) the practical evaluation of airborne equipment before commencing actual operations.

b) accumulation of experience with the procedures discussed above before commencing actual operations and, if necessary, the adjustment of those procedures;

c) accumulation of actual operating experience with aerodrome operating minima within the authorized category of operation, but not as low as the lowest limit of the category;

d) accumulation of operating experience using Category II operations minima before proceeding to Category III operations minima;

e) providing, for analysis purposes, a means of pilot reporting on ground and airborne system performance;

f) accumulation of flight crew experience; and

g) accumulation of experience in the maintenance of particular equipment.

Ground training

Flight crews should make full use of ground and airborne equipment intended for use during Category II and III operations. They should therefore be instructed in how to obtain

maximum benefit from redundancy provided in the airborne equipment and to fully understand the limitations of the total system, including both ground and airborne elements. The ground instruction should cover at least:

a) the characteristics, capabilities and limitations of the navaids involved (e.g. ILS) including the effect on aeroplane systems performance of interference to the ILS signal caused by other landing, departing, or overflying aeroplanes, and the effect of the infringement of ILS critical and sensitive areas by aeroplanes or vehicles in the manoeuvring area;

b) the characteristics of the visual aids (e.g. approach lighting, touchdown zone lighting, centreline lighting), and the limitations on their use as visual cues in reduced visibility with various glide path angles and cockpit cut-off angles, and the heights at which various cues may be expected to become visible in actual operations;

c) the operation, capabilities and limitations of the airborne systems (e.g. the automatic flight controls systems, monitoring and warning devices, flight instruments, including altimetry systems and the means the pilot has to assess the position of the aeroplane during the approach, touchdown and roll-out);

d) approach, including missed approach procedures and techniques, including descriptions of the factors affecting height loss during missed approach in normal and abnormal aeroplane configurations;

e) the use and limitations of RVR, including the applicability of RVR readings from different positions on the runway, the different methods of measuring and assessing RVR, the conversion method of Visibility into an RVR (CMV), and the limitations associated with each method;

f) the basic understanding of obstacle limitation and the obstacle-free zone, including missed approach design criteria and obstacle clearance for Category II and III operations (PANS-Ops, Volume I);

g) the effects of low-level wind shear, turbulence and precipitation;

h) pilot tasks at decision height, and procedures and techniques for transition from instrument to visual flight in low visibility conditions, including the geometry of eye, wheel and antenna positions with reference to ILS reference datum height;

i) action to be taken if the visual reference becomes inadequate when the aeroplane is below decision height, and the technique to be adopted for transition from visual to instrument flight should a go-around become necessary at these low heights;

j) use of alert height and appropriate actions;

k) action to be taken in the event of failure of approach and landing equipment above and below decision height;

l) recognition of and action to be taken in event of failure of ground equipment;

m) significant factors in the determination of decision height;

n) effect of specific aeroplane malfunctions (e.g. engine failure) on auto-throttle, auto-pilot performance, etc.;

o) procedures and precautions to be followed while taxiing during limited visibility conditions; and

p) existence and the effects of visual illusions.

Training aids may include films of approaches in actual conditions and the use of an approved visual flight simulator. The training should ensure that all flight crew members understand their duties and responsibilities, those of the other flight crew members and the need for close crew co-ordination.

In actual operations some approaches may result in the aeroplane being off centreline or glide path at, before, or after decision height. Therefore, pilots should be given instruction on decision making in such circumstances. This must illustrate the limitations of visual cues in reduced visibility. Pilots must also be shown that they can be led into a premature transition to outside references for aeroplane control when available visual cues are not adequate for control of pitch attitude and/or vertical flight path. They should therefore be cautioned against premature disengagement of the auto-pilot, and should continue monitoring flight instrumentation even when adequate visual contact with the runway and its environment can be maintained until the safe completion of the approach and landing.

Flight training and proficiency programme

Each member of the flight crew should be trained to carry out the duties appropriate to the particular airborne system, and subsequently demonstrate the ability to carry out the duties as a member of the flight crew to an acceptable level of competency before being authorized to engage in the particular category of operations. Additionally, before a pilot is authorized to operate to Category II or III minima, the pilot should have gained experience in using the appropriate procedures in meteorological conditions above the relevant minima. Flight crews should be given practical training and tests in the use of applicable systems and associated procedures in conditions of the lowest minima to be specified.

Initial training can most effectively be carried out in an approved visual flight simulator. The specific type of training will depend upon the particular airborne system and on the operating procedures adopted. The initial training should at least include:

a) approaches with all engines operating, and with an engine inoperative; using the appropriate flight guidance and control systems installed in the aeroplane down to the appropriate minimum height without external visual reference followed by transition to visual reference and landings;

b) approaches with all engines operating, and with an engine inoperative; using the appropriate flight guidance and control systems installed in the aeroplane down to the appropriate minimum height followed by missed approaches, all without external visual reference;

c) approaches utilizing the automatic flight control and landing system, followed by reversion to manual control for flare and landing after disconnecting the automatic system at low level, if appropriate;

d) approaches utilizing the automatic flight control and landing system with automatic flare, automatic landing and, where appropriate, automatic roll out;

e) procedures and techniques for reversion to instrument flight and the execution of a missed approach from decision altitude (height), including obstacle clearance aspects; and

f) go-around from a height below decision height which may result in a touchdown on the runway in cases of a go-around initiated from a very low altitude, e.g. such as to simulate failures or a loss of visual reference just prior to touchdown.

The flight training programme should provide practice in handling system faults, particularly those which have an effect on the operating minima and/or subsequent conduct of the operation. However, the frequency of system malfunctions introduced should not be such so as to undermine the confidence of flight crews in the over-all integrity and reliability of the systems used in low minima operations.

Simulation techniques

Simulation techniques are a valuable training aid for limited visibility operations. Simulators should be used for general training in the aeroplane system and the operating procedures to be used. However, their real value in training is that different RVR values can be simulated so that pilots, who may rarely encounter limited visibility conditions in practice, can be given a realistic idea of what to expect in these conditions and can maintain their proficiency during recurrent training. To provide for missed approach training, it must be possible to simulate visibilities lower than the lowest authorized for the operator. An approved visual flight simulator can be used during initial and recurrent training, with various RVR values simulated, for:

a) approaches;

b) missed approaches;

c) landings;

d) relevant drills and procedures after experiencing malfunction of:

   1) the aeroplane system; and

   2) the ground system;

e) transition from instrument to visual flight; and

f) transition from visual to instrument flight at low level.

It is most important that the visibility simulated is a correct reflection of the RVR intended. A simple calibration check of the visual system can be made by relating the number of runway centreline lights or runway edge lights which are visible with the simulator aligned for take-off, to the selected RVR. It is preferred, however, that checks also be made of the visual references with the simulator in the flying mode because the static and dynamic visual scenes may differ in certain visual systems.

Recurrent proficiency checks

In conjunction with normal pilot proficiency checks at regular intervals, a pilot should demonstrate the knowledge and ability necessary to perform the tasks associated with the authorized category of operation. Due to the low probability of encountering limited visibility conditions during actual operations, the use of an approved flight simulator for recurrent training, proficiency checking, and renewal of ratings assumes increased importance.

Recency requirements

Some operators actively encourage or require operators and pilots to use procedures developed for Category II or III operations during normal service, regardless of the weather conditions and, whenever the necessary ground facilities are available and traffic conditions permit. This practice ensures flight crew familiarity with the procedures, builds confidence with the equipment, and ensures appropriate maintenance of the Category II and III related systems. However, it is important to ensure that pilots maintain proficiency in manual flying skills. Experience has shown that this is particularly important where crews are flying a route structure with long stage lengths. Consideration should be given to a recency requirement, i.e. that crews should achieve a minimum number of automatic approaches, or approaches and landing as applicable, each month (or other suitable period) to maintain their Category II or III qualifications. This recency requirement is in no way a substitute for recurrent training.

ANNEXURE-7

DEFINITIONS AND GLOSSARY

The definitions herein exist for the sole purpose of making the text in this document unequivocal and clear. They do not re[place or invalidate any operating rules in force. Should theer be differences between these definitions and the regulations, the regulations must prevail.

The terms used in this document have the following meanings:

Aerodrome operating minima. The limits of usability of an aerodrome for:

a) take-off, expressed in terms of runway visual range and/or visibility and, if necessary, cloud conditions;

b) landing in precision approach and landing operations, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H) as appropriate to the category of the operation;

c) landing in approach and landing operations with vertical guidance, expressed in terms of visibility and/or runway visual range and decision altitude/height (DA/H); and

d) landing in non-precision approach and landing operations, expressed in terms of visibility and/or runway visual range, minimum descent altitude/height (MDA/H) and, if necessary, cloud conditions.

Alert height. An alert height is a height above the runway threshold based on the characteristics of the aeroplane and its fail operational landing system, above which a Category III operation would be discontinued and a missed approach initiated if a failure occurred in one of the redundant parts of the landing system, or in the relevant ground equipment.

All weather operations. Any surface movement, take-off, departure, approach or landing operations in conditions where visual reference is limited by weather conditions.

Alternate aerodrome. An aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

Take-off alternate. An alternate aerodrome at which an aircraft can land should this become necessary shortly after take-off and it is not possible to use the aerodrome of departure.

En-route alternate*.* An aerodrome at which an aircraft would be able to land after experiencing an abnormal or emergency condition while en-route.

Destination alternate*.* An alternate aerodrome to which an aircraft may proceed should it become impossible or inadvisable to land at the aerodrome of intended landing.

Note.— The aerodrome from which a flight departs may also be an en-route or a destination alternate aerodrome for that flight.

Automatic flight control system (AFCS) with coupled approach mode. Airborne system which provides automatic control of the flight path of the aeroplane during approach. (SeeICAO Airworthiness Manual.)

Automatic landing system. The airborne system which provides automatic control of the aeroplane during the approach and landing. (See ICAO Airworthiness Manual, , Volume II, Part A, Chapter 4.6.)

Categories of aeroplanes. The following five categories of typical aeroplanes have been established based on 1.3 times the stall speed in the landing configuration at maximum certificated landing mass.

Category A — less than 169 km/h (91 kt) IAS

Category B — 169 km/h (91 kt) or more but less than 224 km/h (121 kt) IAS

Category C — 224 km/h (121 kt) or more but less than 261 km/h (141 kt) IAS

Category D — 261 km/h (141 kt) or more but less than 307 km/h (166 kt) IAS

Category E — 307 km/h (166 kt) or more but less than 391 km/h (211 kt) IAS

Ceiling. The height above the ground or water of the base of the lowest layer of cloud covering more than half the sky.

Circling approach*. An extension of an instrument approach procedure which provides for visual circling of the aerodrome prior to landing.

****Authorisation Reqd.***

Continuous Descent Final Approach (CDFA).*Also referred* to as **CANPA**: A technique, consistent with stabilized approach procedures, for flying the final approach segment of a non-precision instrument approach procedure as a continuous descent, without level-off, from an altitude/height at or above the final approach fix altitude/height to a point approximately 15 m (50 ft) above the landing runway threshold or the point where the flare manoeuvre should begin for the type of aircraft flown.

Commercial air transport operation(for this document). An aircraft operation involving the transport of passengers, cargo or mail for remuneration or hire.

Decision altitude (DA) or ***decision height (DH).*** A specified altitude or height in the precision approach or approach with vertical guidance at which a missed approach must be initiated if the required visual reference to continue the approach has not been established.

Note 1.— Decision altitude (DA) is referenced to mean sea level and decision height (DH) is referenced to the threshold elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the desired flight path. In Category III operations with a decision height the required visual reference is that specified for the particular procedure and operation.

Note 3.— For convenience where both expressions are used they may be written in the form "decision altitude/height" and abbreviated "DA/H".

Fail-operational automatic landing system. An automatic landing system is fail-operational if, in the event of a failure, the approach, flare and landing can be completed by the remaining part of the automatic system. (See ICAO Airworthiness Manual, , Volume II, Part A, Chapter 4.6.)

Fail-passive automatic landing system. An automatic landing system is fail-passive if, in the event of a failure, there is no significant deviation of aeroplane trim, flight path or attitude but the landing will not be completed automatically. (See ICAO Airworthiness l Manual, Volume II, Part A, Chapter 4.6.).

Final approach. That part of an instrument approach procedure which commences at the specified final approach fix or point, or where such a fix or point is not specified,

a) at the end of the last procedure turn, base turn or inbound turn of a racetrack procedure, if specified; or

b) at the point of interception of the last track specified in the approach procedure; and ends at a point in the vicinity of an aerodrome from which:

1) a landing can be made; or

2) a missed approach procedure is initiated.

Flight visibility. The visibility forward from the cockpit of an aircraft in flight.

ILS critical area. An area of defined dimensions about the localizer and glide path antennas where vehicles, including aircraft, are excluded during all ILS operations. The critical area is protected because the presence of vehicles and/or aircraft inside its boundaries will cause unacceptable disturbance to the ILS signal-in-space.

ILS sensitive area. An area extending beyond the critical area where the parking and/or movement of vehicles, including aircraft, is controlled to prevent the possibility of unacceptable interference to the ILS signal during ILS operations. The sensitive area is protected to provide protection against interference caused by large moving objects outside the critical area but still normally within the airfield boundary.

Instrument Approach and Landing Operations. Instrument approach and landing operations are classified as follows:

Non-precision approach and landing operations. An instrument approach and landing which utilizes lateral guidance but does not utilize vertical guidance.

Approach and landing operations with vertical guidance. An instrument approach and landing which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

Precision approach and landing operations. An instrument approach and landing using precision lateral and vertical guidance with minima as determined by the category of operation.

Note.— Lateral and vertical guidance refers to the guidance provided either by:

a) a ground-based navigation aid; or

b) computer generated navigation data.

Categories of precision approach and landing operations:

Category I (CAT I) operation. A precision instrument approach and landing with:

a) a decision height not lower than 60 m (200 ft); and

b) with either a visibility not less than 800 m or a runway visual range not less than 550 m.

Category II (CAT II) operation. A precision instrument approach and landing with:

a) a decision height lower than 60 m (200 ft), but not lower than 30 m (100 ft); and

b) a runway visual range not less than 300 m.

Category IIIA (CAT IIIA) operation. A precision instrument approach and landing with:

a) a decision height lower than 30 m (100 ft) or no decision height; and

b) a runway visual range not less than 175 m.

Category IIIB (CAT IIIB) operation. A precision instrument approach and landing with:

a) a decision height lower than 15 m (50 ft), or no decision height; and

b) a runway visual range less than 175 m but not less than 50 m.

Category IIIC (CAT IIIC) operation. A precision instrument approach and landing with no decision height and no runway visual range limitations.

Note.— Where decision height (DH) and runway visual range (RVR) fall into different categories of operation, the instrument approach and landing operation would be conducted in accordance with the requirements of the most demanding category (e.g. an operation with a DH in the range of CAT IIIA but with an RVR in the range of CAT IIIB would be considered a CAT IIIB operation or an operation with a DH in the range of CAT II but with an RVR in the range of CAT I would be considered a CAT II operation).

Instrument approach procedure. A series of predetermined manoeuvres by reference to flight instruments with specified protection from obstacles from the initial approach fix, or where applicable, from the beginning of a defined arrival route to a point from which a landing can be completed and thereafter, if a landing is not completed, to a position at which holding or en-route obstacle clearance criteria apply. Instrument approach procedures are classified as follows:

Non-precision approach (NPA) procedure. An instrument approach procedure which utilizes lateral guidance but does not utilize vertical guidance.

Approach procedure with vertical guidance (APV). An instrument approach procedure which utilizes lateral and vertical guidance but does not meet the requirements established for precision approach and landing operations.

Precision approach (PA) procedure. An instrument approach procedure using precision lateral and vertical guidance with minima as determined by the category of operation.

Note.— Lateral and vertical guidance refers to the guidance provided either by:

a) a ground-based navigation aid; or

b) computer-generated navigation data.

Instrument flight rules (IFR). Regulatory provisions for instrument flight.

Note.— IFR specifications are found in Chapter 4 of Annex 2. .Instrument flight rules may be followed in both IMC and VMC.

Instrument meteorological conditions (IMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling*, less than the minima specified for visual meteorological conditions.

Note.— The specified minima for visual meteorological conditions are contained in Chapter 4 of Annex 2.

Low visibility procedures (LVP). Specific procedures applied at an aerodrome for the purpose of ensuring safe operations during Categories II and III approaches and/or low visibility take-offs.

Low visibility take-off (LVTO). A term used in relation to flight operations referring to a take-off on a runway where the RVR is **less than 400 m.***

Minimum descent altitude (MDA) or ***minimum descent height (MDH).*** A specified altitude or height in a non-precision approach or circling approach below which descent must not be made without the required visual reference.

Note 1.— Minimum descent altitude (MDA) is referenced to mean sea level and minimum descent height (MDH) is referenced to the aerodrome elevation or to the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. A minimum descent height for a circling approach is referenced to the aerodrome elevation.

Note 2.— The required visual reference means that section of the visual aids or of the approach area which should have been in view for sufficient time for the pilot to have made an assessment of the aircraft position and rate of change of position, in relation to the

desired flight path. In the case of a circling approach the required visual reference is the runway environment.

Note 3.— For convenience when both expressions are used they may be written in the form "minimum descent altitude/ height" and abbreviated "MDA/H".

Missed approach point (MAPt). That point in an instrument approach procedure at or before which the prescribed missed approach procedure must be initiated in order to ensure that the minimum obstacle clearance is not infringed.

Missed approach procedure. The procedure to be followed if the approach cannot be continued.

Obstacle clearance altitude (OCA) or ***obstacle clearance height (OCH).*** The lowest altitude or the lowest height above the elevation of the relevant runway threshold or the aerodrome elevation as applicable, used in establishing compliance with appropriate obstacle clearance criteria.

Note 1.— Obstacle clearance altitude is referenced to mean sea level and obstacle clearance height is referenced to the threshold elevation or in the case of non-precision approaches to the aerodrome elevation or the threshold elevation if that is more than 2 m (7 ft) below the aerodrome elevation. An obstacle clearance height for a circling approach is referenced to the aerodrome elevation.

Note 2.— For convenience when both expressions are used they may be written in the form "obstacle clearance altitude/ height" and abbreviated "OCA/H".

Obstacle free zone (OFZ). The airspace above the inner approach surface, inner transitional surfaces, and balked landing surface and that portion of the strip bounded by these surfaces, which is not penetrated by any fixed obstacle other than a low-mass and frangibly mounted one required for air navigation purposes.

Performance-based navigation (PBN). Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

Note.— Performance requirements are expressed in navigation specifications (RNAV specification, RNP specification) in terms of accuracy, integrity, continuity, availability and

functionality needed for the proposed operation in the context of a particular airspace concept.

Procedure turn. A manoeuvre in which a turn is made away from a designated track followed by a turn in the opposite direction to permit the aircraft to intercept and proceed along the reciprocal of the designated track.

Note 1.— Procedure turns are designated "left" or "right" according to the direction of the initial turn.

Note 2.— Procedure turns may be designated as being made either in level flight or while descending, according to the circumstances of each individual instrument approach procedure.

Required Navigation Performance (RNP). A statement of the navigation performance necessary for operation within a defined airspace

Note.— Navigation performance and requirements are defined for a particular RNP type and/or application.

Runway holding position. A designated position intended to protect a runway, an obstacle limitation surface, or an ILS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorised by the aerodrome control tower.

Note.— In radiotelephony phraseologies, the expression "holding point" is used to designate the runway-holding position.

Runway visual range (RVR). The range over which the pilot of an aircraft on the centreline of a runway can see the runway surface markings or the lights delineating the runway or identifying its centreline.

Stabilised Approach. (SAp). An approach which is flown in a controlled and appropriate manner in terms of configuration, energy and control of the flight path from a pre-determined point or altitude/height down to a point 50 feet above the threshold or the point where the flare manoeuvre is initiated if higher.

Surveillance radar. Radar equipment used to determine the position of an aircraft in range and azimuth.

Touchdown zone (TDZ). The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.

Vertical Navigation (VNAV). A method of navigation which permits aircraft operation on a vertical flight profile using altimetry sources, external flight path references, or a combination of these.

Visibility. Visibility for aeronautical purposes is the greater of:

a) the greatest distance at which a black object of suitable dimensions, situated

near the ground, can be seen and recognized when observed against a bright background;

b) the greatest distance at which lights in the vicinity of 1 000 candelas can be seen and identified against an unlit background.

Note 1.— The two distances have different values in air of a given extinction coefficient, and the latter b) varies with the background illumination. The former a) is represented by the meteorological optical range (MOR).

Note 2.— The definition applies to the observations of visibility in local routine and special reports, to the observations of prevailing and minimum visibility reported in METAR and SPECI and to the observations of ground visibility.

Visual approach. An approach by an IFR flight when either part or all of an instrument approach procedure is not completed and the approach is executed by visual reference to terrain.

Visual flight rules (VFR). Regulatory provisions for visual flight.

Visual meteorological conditions (VMC). Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling*, equal to or better than specified minima.

The abbreviations used in this manual have the following meanings:

AFCS	Automatic flight control system
AFM	Airplane Flight Manual
AIC	Aeronautical information circular
AIP	Aeronautical information publication
AIREP	Air report
AIS	Aeronautical information service
ALS	Automatic landing system
APV	Approach procedure with vertical guidance
A-SMGCS	Advanced surface movement guidance and control system
ATC	Air traffic control

* As defined in Annex 2.

ATIS	Automatic terminal information service
ATS	Air traffic services
BALS	Basic Approach Light System
CANPA	Constant Angle Non-Precision Approach
CAT I	Category I
CAT II	Category II
CAT III	Category III
CDFA	Continuous Descent Final Approach
CFIT	Controlled Flight Into Terrain
CMV	Converted Meteorological Visibility
DA	Decision altitude
DA/H	Decision altitude/height
DH	Decision height
DME	Distance measuring equipment
FAF	Final approach fix
FALS	Full Approach Light System
FAP	Final approach point
FDS	Flight director system
GNSS	Global Navigation Satellite System
hhAT	Height above threshold
HI	High intensity
HIALS	High intensity approach light system
HUD	Head-up display
HUDLS	Head-up Display Landing System
IALS	Intermediate Approach Light System
IAP	Instrument approach procedure
IAS	Indicated airspeed
IFR	Instrument flight rules

ILS	Instrument landing system
IMC	Instrument meteorological conditions
LI	Low intensity
LOC	Localizer
LNAV	Lateral guidance provided by a computer generated navigation data
LSA	Localizer sensitive area
LVP	Low Visibility procedures
LVTO	Low visibility take-off
MAPt	Missed approach point
MDA	Minimum descent altitude
MDA(H)	Minimum descent altitude (height)
MDH	Minimum descent height
MEL	Minimum equipment list
MET	Meteorological
METAR	Aviation routine weather report
MM	Middle marker
MOC	Minimum obstacle clearance
MSL	Mean sea level
NALS	No Approach Light System
NDB	Non-directional beacon
NOTAM	Notices to airmen
NPA	Non-precision approach
OAS	Obstacle assessment surface
OCA	Obstacle clearance altitude
OCA/H	Obstacle clearance altitude/height
OCH	Obstacle clearance height
OFZ	Obstacle free zone
PA	Precision approach

PAR	Precision approach radar
RESA	Runway end safety area
RFFS	Rescue and fire fighting services
RNAV	Area Navigation
RNAV *with approved vertical guidance*	RNAV with LNAV/ VNAV or LPV.
RNAV *without approved vertical guidance*	RNAV with LNAV only
RNP	Required Navigation Performance
R/T	Radiotelephony
RVR	Runway visual range
RWY	Runway
SAp	Stabilised Approach
SID	Standard instrument departure
SIGMET	Significant weather report
SMGCS	Surface movement guidance and control system
SRE	Surveillance radar element
SRA	Surveillance Radar Approach
STAR	Standard instrument arrival
SVR	Slant visual range
TAWS	Terrain Avoidance Warning System
TDZ	Touchdown zone
THR	Threshold
VDF	Very high frequency direction finding station
VDP	Visual descent point
VFR	Visual flight rules
VIS	Visibility
VMC	Visual meteorological conditions
VNAV	Vertical guidance provided by a computer generated navigation data
VOR	Very high frequency omni-directional radio range

ANNEXURE 8

REFERENCES

Convention on International Civil Aviation (Chicago Convention) (Doc 7300)

Annexes to the Convention:

Annex 1 —*Personnel Licensing*

Annex 2 —*Rules of the Air*

Annex 3 —*Meteorological Service for International Air Navigation*

Annex 4 —*Aeronautical Charts*

Annex 5 —*Units of Measurement to be Used in Air and Ground Operations*

Annex 6 —*Operation of Aircraft*, Part I — *International Commercial Air Transport - Aeroplanes*

Annex 8 —*Airworthiness of Aircraft*

Annex 10—*Aeronautical Telecommunications*, Volume I Radio Navigation Aids,

Annex 11—*Air Traffic Services*

Annex 14—*Aerodromes*, Volume I — *Aerodrome Design and Operations*

Annex 15—*Aeronautical Information Services*

Procedures for Air Navigation Services:

Aircraft Operations (PANS-OPS) (Doc 8168)

Volume I - *Flight Procedures*

Volume II - *Construction of Visual and Instrument Flight Procedures*

Air Traffic Management (PANS-ATM) (Doc 4444)

Manuals:

Aerodrome Design Manual (Doc 9157)

Part 2 — *Taxiways, Aprons and Holding Bays*

Part 3 — *Pavements*

Part 4 — *Visual Aids*

Part 5 — *Electrical Systems*

Aeronautical Chart Manual (Doc 8697)

Aeronautical Information Services Manual(Doc 8126)

Advanced Surface Movement Guidance and Control Systems (SMGCS) Manual (Doc 9830)

Air Traffic Services Planning Manual (Doc 9426)

Airport Services Manual (Doc 9137)

Part 6 — *Control of Obstacles*

Part 9 — *Airport Maintenance Practices*

Airworthiness Manual (Doc 9760)

Manual of Aeronautical Meteorological Practice (Doc 8896)

Manual of Procedures for Operations Inspection, Certification and Continued Surveillance (Doc 8335)

Manual of Runway Visual Range Observing and Reporting Practices (Doc 9328)

Manual of Surface Movement Guidance and Control Systems (SMGCS) (Doc 9476)

Manual on Testing of Radio Navigation Aids (Doc 8071)

Volume I - *Testing of Ground-based Radio Navigation Systems*

Volume II - *Testing of Satellite-based Radio Navigation Systems*

Performance-Based Navigation Manual (Doc 9613)

Preparation of an Operations Manual (Doc 9376)

Safety Management Manual (Doc 9859)

Related Reading Material:

OPERATIONS:

Circular No. 3 of 1996 - Missed Approach by Pilots during Final Approach to Land.
Circular No. 2 of 2001 - Operational Training & Procedures: Pilots.
Circular No. 4 of 2010 - Approach And Landing Accident Reduction (ALAR) And Controlled Flight Into Terrain (CFIT) Prevention Training.
Circular No. 1 of 2003 - ALAR India Training Tool Kit.
Circular No. 1 of 2009 & 11 of 1995- Controlled Flight into Terrain.

Circular No. 5 of 2002 - Enhanced Ground Proximity Warning System (EGPWS) - Operation and Training.
Circular No. 3 of 2009 - Reduced Effectiveness Of TAWS/EGPWS Equipment.
Circular No. 1 of 2005 - Guidance to Operators for Conducting Constant Angle Non-Precision Approaches (CANPA).
Circular No. 9 of 2009 - Standard Operating Procedures.

Circular No. 6 of 2009 - Line Operational Simulations: Line-Oriented Flight Training, Special Purpose Operational Training.
Circular No. 8 of 2009 - Crew Resource Management Training.
Circular No. 2 of 2009 - Communication And Coordination Between Flight Crew members And Cabin Crews.
Circular No. 3 of 2010 - Pilot's Spatial Disorientation.
Circular No. 3 of 2010 - Vertical Speed Indicator.
Circular No. 1 of 2010 - Mode Awareness and Energy State Management Aspects of Flight Deck Automation.
Circular No. 4 of 2009 - Dispatcher/ Flight Operations Officer Resource Management Training.

AIR SAFETY :

Circular ASC 7 of 2005
Monsoon Circular 2007
Circular ASC 4 of 2002

References: -

1. Ramage, C., *Monsoon Meteorology*. International Geophysics Series, Vol. 15, 296 pp., Academic Press, San Diego, Calif. 1971.
2. Trenberth, .K.E., Stepaniak, D.P., Caron, J.M., 2000, The global monsoon as seen through the divergent atmospheric circulation, *Journal of Climate*, **13**, 3969-3993.
3. Glossary of Meteorology (June 2000). "Monsoon". American Meteorological Society.
4. International Committee of the Third Workshop on Monsoons. The Global Monsoon System: Research and Forecast.

ANNEXURE 9

Alternate Minima

A minimum criteria for departure, destination, and en-route alternates is required- when applicable. Typically, alternate minima are either a fixed minimum ceiling and visibility requirement, or a flexible ceiling and visibility requirement which is based on navigational and other facilities for one or more runways which can reasonably be expected to be available at arrival time based on forecast weather conditions and AIS. Table D-1 provides an example of alternate minima.

Table D-1. Example Alternate Minima table

Destination Alternate Aerodrome Operating Minima		
Approach Facility Configuration	**Ceiling DA(H)/MDA(H)**	**RVR**
For airports supporting one approach and landing operation.	Authorised DA(H)/MDA(H) plus an increment of 400 ft	Authorised visibility plus an increment of 1500 metres
For airports supporting at least two approach and landing operations, each providing a straight-in approach and landing operation to different, suitable runways.	Authorised DA(H)/MDA(H) plus an increment of 200 ft	Authorised visibility plus an increment of 800 metres
For airports with a published CAT II or CAT III approach and landing operation, and at least two approach and landing operations, each providing a straight-in approach and landing operation to different, suitable runways.	CAT II procedures, a ceiling of at least 300 ft, or for CAT III procedures, a ceiling of at least 200 ft.	CAT II, a visibility of at least RVR 1200 m, or for CAT III, a visibility of at least RVR 550m.

ANNEXURE 10

MINIMUM STANDARDS*

Technical guidance information only.

Table 6.3 contains an example of the lowest straight-in approach minima which can be used for any instrument approach and landing operation other than CAT II or CAT III.

Table 6-3. Example table of Lowest Approved Straight-in Approach Minima for Instrument Approach and Landing Operations Other Than CAT II or CAT III

DH or MDH (ft)			Class of Lighting Facility			
			FALS	IALS	BALS	NALS
			(metres)			
			See para 6.5.7.9. for RVR < 750 m			
200	**-**	*210*	*550*	*750*	*1000*	*1200*
211	**-**	*220*	*550*	*800*	*1000*	*1200*
221	**-**	*230*	*550*	*800*	*1000*	*1200*
231	**-**	*240*	*550*	*800*	*1000*	*1200*
241	**-**	*250*	*550*	*800*	*1000*	*1300*
251	**-**	*260*	*600*	*800*	*1100*	*1300*
261	**-**	*280*	*600*	*900*	*1100*	*1300*
281	**-**	*300*	*650*	*900*	*1200*	*1400*
301	**-**	*320*	*700*	*1000*	*1200*	*1400*
321	**-**	*340*	*800*	*1100*	*1300*	*1500*
341	**-**	*360*	*900*	*1200*	*1400*	*1600*
361	**-**	*380*	*1000*	*1300*	*1500*	*1700*
381	**-**	*400*	*1100*	*1400*	*1600*	*1800*
401	**-**	*420*	*1200*	*1500*	*1700*	*1900*
421	**-**	*440*	*1300*	*1600*	*1800*	*2000*
441	**-**	*460*	*1400*	*1700*	*1900*	*2100*
461	**-**	*480*	*1500*	*1800*	*2000*	*2200*

DH or MDH (ft)			Class of Lighting Facility			
			FALS	IALS	BALS	NALS
			(metres)			
			See para 6.5.7.9. for RVR < 750 m			
541	**-**	*560*	*1800*	*2100*	*2300*	*2500*
561	**-**	*580*	*1900*	*2200*	*2400*	*2600*
581	**-**	*600*	*2000*	*2300*	*2500*	*2700*
601	**-**	*620*	*2100*	*2400*	*2600*	*2800*
621	**-**	*640*	*2200*	*2500*	*2700*	*2900*
641	**-**	*660*	*2300*	*2600*	*2800*	*3000*
661	**-**	*680*	*2400*	*2700*	*2900*	*3100*
681	**-**	*700*	*2500*	*2800*	*3000*	*3200*
701	**-**	*720*	*2600*	*2900*	*3100*	*3300*
721	**-**	*740*	*2700*	*3000*	*3200*	*3400*
741	**-**	*760*	*2700*	*3000*	*3300*	*3500*
761	**-**	*800*	*2900*	*3200*	*3400*	*3600*
801	**-**	*850*	*3100*	*3400*	*3600*	*3800*
851	**-**	*900*	*3300*	*3600*	*3800*	*4000*
901	**-**	*950*	*3600*	*3900*	*4100*	*4300*
951	**-**	*1000*	*3800*	*4100*	*4300*	*4500*
1001	**-**	*1100*	*4100*	*4400*	*4600*	*4900*

481	-	*500*	*1500*	*1800*	*2100*	*2300*
501	-	*520*	*1600*	*1900*	*2100*	*2400*
521	-	*540*	*1700*	*2000*	*2200*	*2400*

1101	-	*1200*	*4600*	*4900*	*5000*	*5000*
1201 and above			*5000*	*5000*	*5000*	*5000*

In order to qualify for the lowest allowable values of RVR/CMV detailed in Table 6-3 and Table F-2 (applicable to each approach grouping), the instrument approach procedures should be flown using a vertical profile and shall meet at least the following facility requirements and associated conditions:

(i) Instrument approaches procedures with a designated vertical profile which does not require a rate of descent greater than 1000 feet per minute, up to and including 4.5° for Category A and B aeroplanes, or 3.77° for Category C and D aeroplanes, unless other approach angles are approved by the Authority, where the facilities are:

(A) ILS / PAR; or

(B) RNAV*with a approved vertical guidance*; and,

where the final approach track is offset by not more than 15 degrees for Category A and B aeroplanes or by not more than 5 degrees for Category C and D aeroplanes.

(ii) Instrument approach procedures flown using the CDFA technique with a nominal vertical profile which does not require a rate of descent greater than 1000 feet per minute, up to and including 4.5° for Category A and B aeroplanes, or 3.77° for Category C and D aeroplanes, unless other approach angles are approved by the Authority where the facilities are NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA or RNAV/LNAV, with a final-approach segment of at least 3NM, which also fulfil the following criteria:

(A) The final approach track is offset by not more than 15 degrees for Category A and B aeroplanes or by not more than 5 degrees for Category C and D aeroplanes; and

(B) The FAF or another appropriate fix where descent is initiated is available, or distance to THR is available by FMS/RNAV or DME; and

(C) If the MAPt is determined by timing, the distance from FAF to THR is < 8 NM.

6.5.7.9 An RVR as low as 550 m (1800 ft) as indicated in Table 6-3 may be used:

(i) for Category I operations to runways with FALS, Runway Touchdown Zone Lights (RTZL) and Runway Centreline Lights (RCLL); or

(ii) for Category I operations to runways without RTZL and RCLL when using an approved HUDLS, or equivalent approved system, or when conducting a coupled approach or flight-director-flown approach to the DH; or

Minima for approach and landing operations

The DA/H or MDA/H for a particular operation should be the OCH (for the non-precision approach procedure), or the minimum height authorized for the aeroplane and the crew, or the system minima of Table F-1 below, whichever is the highest. The minimum RVR/CMV to be associated with this DA/H or MDA/H can be determined from Table F-2 and Table 6-3 above.

Table F-1. System minima vs Instrument Approach Procedures

System minima	
Instrument Approach Procedure	Lowest DH / MDH
ILS/MLS/GLS CAT I	200 ft (NOTE 1)
RNAV *with approved vertical guidance*	200 ft
Localizer with or without DME	250 ft
SRA (terminating at ½ NM)	250 ft
SRA (terminating at 1 NM)	300 ft
SRA (terminating at 2 NM or more)	350 ft
RNAV*without approved vertical guidance*	300 ft
VOR	300 ft
VOR/DME	250 ft
NDB	350 ft
NDB/DME	300 ft
VDF	350 ft

Note 1.— 200 ft is the lowest authorized DH for Category I operation unless an equivalent level of safety can be achieved through use of additional procedural or operational requirements.

Note 2.— A lowest DH of 200 ft for RNAV with approved vertical guidance approaches shall only be used if full SBAS capability is available. Otherwise a DH of 250 ft is required.

Table F-2. Minimum and Maximum RVR for Instrument Approaches down to CAT I Minima

Facility/Conditions	*RVR/CMV (m)*	*Aeroplane Category*			
		A	*B*	*C*	*D*
LS/MLS/GLS, PAR, and RNAVwith approved vertical guidance	*Min*	*According to Table 6-3*			
	Max	*1500*	*1500*	*2400*	*2400*
NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, RNAVwithout approved vertical guidance with a procedure which fulfills the critera in paragraph 6.5.7.8	*Min*	*750*	*750*	*750*	*750*
	Max	*1500*	*1500*	*2400*	*2400*
For NDB, NDB/DME, VOR, VOR/DME, LOC, LOC/DME, VDF, SRA, RNAVwithout approved vertical guidance: - *Not fulfilling the criteria in paragraph 6.5.7.8, or* - *With a DH or MDH ≥ 1200 ft*	*Min*	*1000*	*1000*	*1200*	*1200*
	Max	*According to Table 6-3, if flown using the CDFA technique, otherwise an add-on of 200/400 m applies to the values in Table 6-3 but not to result in a value exceeding 5000 m.*			

Table 6-4. Example of Category II operation minima

CATEGORY II operation minima		
Decision height	Coupled to below DH (note 1)	
	RVR/Aeroplane Category A, B & C	RVR/Aeroplane Category D
100 ft – 120 ft	300 m	300 m (Note 2)/350 m
121 ft – 140 ft	400 m	400 m
141 ft – 199 ft	450 m	450 m

Note 1.— The reference to 'Coupled to below DH' in this table means continued use of the automatic flight control system down to a height which is not greater than 80% of the applicable DH. Thus airworthiness requirements may, through minimum engagement height for the automatic flight control system, affect the DH to be applied.

Note 2.— 300 m may be used for a CAT D aeroplane conducting an autoland.

6.6.5 Other than standard Category II operations

To create further incentives for improved on board systems equipage, some States have implemented other than standard CAT II operations with increased RVR minima at runways with reduced approach and/or runway lighting systems, as an alternative to the standard light systems described in Annex 14, Volume I. Decreased emphasis on approach and runway lighting systems in the visual segment is offset by the required use of autoland, increasing the emphasis on highly accurate and reliable airborne and ground equipment. FSD, DGCA may allow the use of other than standard CAT II minima under specific conditions.