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EUROPEAN GUIDANCE MATERIAL ON AERODROME OPERATIONS UNDER LIMITED VISIBILITY CONDITIONS

Third Edition

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Preamble

History

1. The principles of the Low Visibility Procedures and the basis for All-Weather Operations in Europe have been defined in the ICAO Manual of All-Weather Operations (Doc No. 9365, 2nd Edition, 1991) and previously in ECAC.CEAC Doc No. 17.

2. When the requirement to implement the ICAO Global Strategy for introduction and application of non-visual aids to approach and landing was set up, the European Air Navigation Planning Group (EANPG) established the All Weather Operations Group (AWOG) which was tasked to deal with the related matters and manage the transition in the EUR region.

3. At the first meeting of AWOG (AWOG/1) in March 1996 information was presented concerning the status of Low Visibility Procedures (LVP) in the EUR Region and variations in the application of these procedures at various aerodromes. As a result, the AWOG established a Project Team on Low Visibility Procedures (PT/LVP) with the task of reviewing these procedures and identifying areas where further harmonization would be appropriate (Decision 1/6).

4. At AWOG/2 the PT/LVP noted that the existing guidance material in ECAC Doc No. 17 was out of date in some respects. The Project Team recommended that guidance material on Low Visibility Procedures should be further developed, based on ECAC Doc No. 17 Issue 3, dated September 1988. It was also decided to create a new document to hold this updated material and that this new document should also be suitable to contain any additional guidance material that may be required for operations during Low Visibility Conditions utilizing new technology approach and landing aids.

5. Furthermore, the introduction in the JAR-OPS documents (Joint Aviation Requirements - Operations, Subpart E), of the term LVP as a set of procedures implemented at certain aerodromes in support of CAT II/III approach and landing and of take-off with RVR below 400 metres, has reinforced the urgent need to define common and standardized practices within the ICAO European Region.

6. The ECAC.CEAC Doc No. 17 covered three principal areas. These were the aeroplane and its flight crew, the aerodrome facilities and the Air Traffic Services Low Visibility Procedures. The PT/LVP felt that the requirements for the aeroplane and its crew were adequately covered in current regulations as implemented by States within the Region, developed by agencies such as the Joint Aviation Authorities (JAA) and the Federal Aviation Administration (FAA), and that these bodies provided sufficient guidance on these matters.

7. In order to ensure that up-to-date guidance on all aspects of operations during Low Visibility Conditions previously covered by ECAC.CEAC Doc No. 17 is available and timely maintained, the EANPG tasked the AWOG to develop a regional guidance material on the aerodrome facilities and ATS Low Visibility Procedures. While this EUR document was elaborated, the JAA worked, starting from ICAO Annex 6, Part I, to define Joint Aviation Requirements for operators regarding operations during Low Visibility Conditions, which has lead to definitions and some associated values which are not totally in agreement with those contained in this EUR Guidance Material on Low Visibility Procedures. Although the two documents could stand alone, because addressed to different users, it is felt that it would be preferable if common parameters could be agreed upon.

8. The adoption by ICAO of new SARPS related to non-visual aids to precision approach and landing means that this document includes procedures for MLS. The Guidance Material only addresses MLS procedures for ILS look-alike approaches, as these are the only type of operation currently being planned in the European Region. It is anticipated that the Guidance

Material will later be updated to include LVP for GNSS, advanced approach operations and any developments in wake turbulence separation as required.

9. Global ICAO provisions require that a safety assessment be carried out in respect of significant changes in the provision of ATS procedures applicable to an airspace or an aerodrome, and for the introduction of new equipment, systems or facilities.

10. In order to accommodate the desire of States for early implementation of MLS, provisions have been developed in this Guidance Material to permit States to undertake the safety assessment and to develop the specific procedures they require to perform these operations. In a safety assessment of MLS systems and procedures, account should be taken of all relevant material contained in previous studies by States and international organizations (*e.g.* Netherlands, United Kingdom, United States and European Community). Safety assessments undertaken by individual States as well as experience from initial MLS operations will be used to further refine the procedures as appropriate. In order to maintain this Guidance Material as a living document, States are requested to share the outcome of any safety assessments as well as operational experience from the implementation of MLS systems and procedures, for the benefit of other States wishing to implement MLS.

11. Low Visibility Procedures refer to specific procedures applied at an aerodrome to support precision approach CAT II/III operations as well as departure operations in RVR conditions less than a value of 550m (PANS-ATM Chapter 7, 7.12.2.1) specifically referred to as *Low Visibility Departure Operations* within this Guidance Material. In addition, the PANS-ATM (14th edition, applicable 1 November 2001) have introduced the requirement for procedures for low visibility operations whenever conditions are such that all or part of the manoeuvring area cannot be visually monitored from the control tower. (PANS-ATM Chapter 7, 7.12.1).

Objective

12. The purpose of this Guidance Material is to assist EUR States in the implementation of Low Visibility Procedures in a harmonized way. With due account taken to provisions enacted by the appropriate authorities, the Guidance Material can also be used by aerodrome operators in the Region and those responsible for providing other facilities and equipment to determine the steps to be undertaken in assessing the suitability of an aerodrome for operations during Low Visibility Conditions, to prepare for their introduction, and to maintain these operations safely. Similarly, it can also be used by ANS providers and Apron Management Services to ensure compliance with the pertinent LVP as required by the appropriate authorities for such operations.

13. The title of this Guidance Material refers to “Limited Visibility Conditions” as it not only provides details of Low Visibility Procedures but also includes other items such as the preparation phase which are undertaken outside Low Visibility Conditions. It describes the safety assessment to be undertaken prior to the initial implementation of LVP. It contains an overview of the requirements for LVP (visual and non-visual aids) and highlights the most important elements. It also provides, in a single document, details of the LVP to be implemented.

14. With due account taken to provisions enacted by the appropriate authorities, this document can also be used as a guidance to aircraft operators in assessing the suitability of an aerodrome for operations during Low Visibility Conditions, and ensuring that appropriate requirements are fulfilled and both the aircraft and its crew are compliant with them. The pilot will determine the minima for a particular operation in accordance with the aircraft operations manual which should be based upon the relevant requirements of the appropriate authorities.

15. Nothing in this Guidance Material should be construed as contradicting or conflicting with ICAO Standards and Recommended Practices and Procedures contained in the Annexes and PANS.

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References

ICAO Annex 3	Meteorological Service for International Air Navigation
ICAO Annex 6	Operation of Aircraft Part 1 — International Commercial Air Transport — Aeroplanes
ICAO Annex 10	Aeronautical Telecommunications Volume I (Radio Navigation Aids)
ICAO Annex 11	Air Traffic Services
ICAO Annex 14	Aerodromes Volume I (Aerodrome Design and Operations)
ICAO Annex 15	Aeronautical Information Services
ICAO Doc 4444	Procedures for Air Navigation Services Air Traffic Management (PANS-ATM)
ICAO Doc 8168	Procedures for Air Navigation Services Aircraft Operations (PANS-OPS)
ICAO Doc 9157	Aerodrome Design Manual Part 2 — Taxiways, Aprons and Holding Bays Part 5 — Electrical systems
ICAO Doc 9328	Manual of Runway Visual Range Observing and Reporting Practices
ICAO Doc 9365	Manual of All-Weather Operations
ICAO Doc 9476	Manual of Surface Movement Guidance and Control System
ICAO Doc 9830	Advanced Surface Movement Guidance and Control Systems (A-SMGCS) Manual
ICAO Doc 9859	Safety Management Manual (SMM)
ECAC.CEAC Doc No. 17 (Issue 3), 9/88	Common European Procedures for the Authorisation of Category II and III Operations
JAR-OPS 1	Joint Aviation Requirements — Operations, Commercial Air Transportation (Aeroplanes)
ESARR 3	Use of Safety Management Systems by ATM Service Providers
ESARR 4	Risk Assessment and Mitigation in ATM
EAPPRI	European Action Plan for the Prevention of Runway Incursions

Definitions

Note: Definitions of terms which are not self-explanatory in that they do not have accepted dictionary meanings are presented below. A definition does not have an independent status but is an essential part of the paragraph of the Guidance Material in which the term is used, since a change in the meaning of the term would affect the provision.

Note: Most of the definitions and terms used throughout this Guidance Material are taken from the relevant ICAO Annexes, PANS and Manuals (reference to ICAO Docs is indicated in brackets for each term). However, several terms have been defined specifically for this EUR Document and this is indicated by an "".*

When the following terms are used in this Guidance Material, they have the following meaning:

Aerodrome. (Annex-6) A defined area on land or water (including any buildings, installations, and equipment) intended to be used either wholly or in part for the arrival, departure and surface movement of aircraft.

Aerodrome Operating Minima. (Annex-6) 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.

Aeronautical Information Publication (AIP). (Annex-15) A publication issued by or with the authority of a State and containing aeronautical information of a lasting character essential to air navigation.

Aircraft stand. (Annex-14) A designated area on an apron intended to be used for parking an aircraft.

Air traffic service. (Annex-11) A generic term meaning variously, flight information service, alerting service, air traffic advisory service, air traffic control service (area control service, approach control service or aerodrome control service).

Air traffic services unit. (Annex-11) A generic term meaning variously, air traffic control unit, flight information centre or air traffic services reporting office.

All-Weather Operations. (Doc 9365 - foreword) Any taxi, take-off or landing operations in conditions where visual reference is limited by weather conditions.

Approach and landing operations using instrument approach procedures. (Annex-6) 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 decision height not lower than 60 m (200 ft) and 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 decision height lower than 60 m (200 ft), but not lower than 30 m (100 ft), and a runway visual range not less than 350 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 200 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 200 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).

Apron. (Annex-14) A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fuelling, parking or maintenance.

Apron Management Service. (Annex-14) A service provided to regulate the activities and the movement of aircraft and vehicles on an apron.

Automatic Terminal Information Service (ATIS). (Annex-11) The automatic provision of current, routine information to arriving and departing aircraft throughout 24 hours or a specified portion thereof:

Data link-automatic terminal information service (D-ATIS). The provision of ATIS via data link.

Voice-automatic terminal information service (Voice-ATIS). The provision of ATIS by means of continuous and repetitive voice broadcasts.

Categories of aeroplanes. (Doc 9365) 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

Note: Current Category E aircraft are not normally civil transport aircraft and their dimensions are not necessarily related to Vat at maximum landing mass. For this reason, they should be treated separately on an individual basis.

Ceiling. (Annex-2) The height above the ground or water of the base of the lowest layer of cloud below 6 000 m (20 000 ft) covering more than half the sky.

Decision altitude (DA) or decision height (DH). (Annex-6) 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 (MSL) 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".

Guided take-off. (*) A take-off in which the take-off run is not solely controlled with the aid of external visual references, but also with the aid of instrument references (*e.g.*: ILS localizer guidance).

Height. (Annex-2) The vertical distance of a level, a point or an object considered as a point, measured from a specified datum.

ILS critical area. (Annex 10) 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. (Annex 10) 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.

Intermediate holding position. (Annex-14) A designated position intended for traffic control at which taxiing aircraft and vehicles shall stop and hold until further cleared to proceed, when so instructed by the aerodrome control tower.

Low Visibility Conditions. (*) Meteorological conditions such that all or part of the manoeuvring area cannot be visually monitored from the aerodrome control tower.

Low Visibility Departure. (*) A departure operation in RVR conditions less than a value of 550 m.

Low Visibility Operations. (*) Precision approach CAT II/III operations and/or departure operations in RVR conditions less than a value of 550 m.

Low Visibility Procedures (LVP). (*) Specific procedures applied at an aerodrome for the purpose of ensuring safe operations during CAT II and III approaches and/or departure operations in RVR conditions less than a value of 550 m.

Low Visibility Take-Off (LVTO). (*) A term used by the Joint Aviation Authorities in relation to flight operations referring to a take-off on a runway where the RVR is less than 400 m.

Manoeuvring area. (Annex-14) That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.

MLS critical area. (Annex 10) An area of defined dimensions about the azimuth and elevation antennas where vehicles, including aircraft, are excluded during all MLS operations. The critical area is protected because the presence of vehicles and/or aircraft inside its boundaries will cause unacceptable disturbance to the guidance signals.

MLS sensitive area. (Annex 10) 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 MLS signals during MLS operations.

Movement area. (Annex-14) That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, consisting of the manoeuvring area and the apron(s).

NOTAM. (Annex-15) A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations.

Obstacle. (Annex-14) All fixed (whether temporary or permanent) and mobile objects, or parts thereof, that are located on an area intended for the surface movement of aircraft or that extend above a defined surface intended to protect aircraft in flight.

Obstacle Free Zone (OFZ). (Annex-14) 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.

Runway. (Annex-14) A defined rectangle area on a land aerodrome prepared for the landing and take-off of aircraft

Runway-holding position. (Annex-14) A designated position intended to protect a runway, an obstacle limitation surface, or an ILS/MLS critical/sensitive area at which taxiing aircraft and vehicles shall stop and hold, unless otherwise authorized by the aerodrome control tower.

Runway Visual Range (RVR). (Annex-3) The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.

State of the Aerodrome. (Doc 9365) The State in whose territory the aerodrome is located.

State of the Operator. (Annex-6) The State in which the operator's principal place of business is located or, if there is no such place of business, the operator's permanent residence.

Touchdown zone (TDZ). (Annex-14) The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.

Visibility. (Annex-3) 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.

Visibility Conditions: (Doc9830 Appendix A)

Visibility condition 1. Visibility sufficient for the pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, and for personnel of control units to exercise control over all traffic on the basis of visual surveillance.

Visibility condition 2. Visibility sufficient for the pilot to taxi and to avoid collision with other traffic on taxiways and at intersections by visual reference, but insufficient for personnel of control units to exercise control over all traffic on the basis of visual surveillance.

Visibility condition 3. Visibility sufficient for the pilot to taxi but insufficient for the pilot to avoid collision with other traffic on taxiways and at intersections by visual reference, and insufficient for personnel of control units to exercise control over all traffic on the basis of visual surveillance. For taxiing, this is normally taken as visibilities equivalent to an RVR of less than 400 m but more than 75 m.

Visibility condition 4. Visibility insufficient for the pilot to taxi by visual guidance only. This is normally taken as a RVR of 75 m or less.

Note: - The above visibility conditions apply for both day and night operations.

Note: (Doc7030 amendment awaiting publication) - For the purpose of describing the provision of an aerodrome control service in the context of varying visibilities, four (4) visibility conditions are defined. Criteria for determining the transition between visibility conditions are a function of local aerodrome and traffic characteristics.

Acronyms/Abbreviations

The acronyms/abbreviations used in this document have the following meanings:

AD	Aerodrome
AIC	Aeronautical information circular
AIP	Aeronautical information publication
A-SMGCS	Advanced surface movement guidance and control system
ATC	Air traffic control *(in general)*
ATFM	Air traffic flow management
ATIS	Automatic terminal information service
ATS	Air traffic services
AWOG	All Weather Operations Group of the EANPG
CAT	Category
CFMU	Central Flow Management Unit of Eurocontrol
cm	Centimetre
DA/H	Decision altitude/height
D-ATIS	Data link automatic terminal information service
DME	Distance measuring equipment
EANPG	European Air Navigation Planning Group
EASA	European Aviation Safety Agency
ECAC	European Civil Aviation Conference
EUR	European Region of ICAO
FAA	Federal Aviation Administration of the United States
FMP	Flow management position
FPL	Filed flight plan
ft	feet
IAS	Indicated airspeed
ICAO	International Civil Aviation Organization
ILS	Instrument landing system
JAA	Joint Aviation Authorities
LSA	Localizer sensitive area
LVP	Low visibility procedures
LVTO	Low visibility take-off
m	Metres
MDA/H	Minimum descent altitude/height
MET	Meteorological or meteorology
MLS	Microwave landing system
MOR	Meteorological optical range
NM	Nautical miles
OFZ	Obstacle free zone
PT/LVP	AWOG Project Team on Low Visibility Procedures
RPL	Repetitive flight plan
RTF	Radiotelephone
RVR	Runway visual range
SARPS	Standards and Recommended Practices
SMGCS	Surface movement guidance and control systems
SMR	Surface movement radar
TDZ	Touchdown zone
Voice-ATIS	Voice-automatic terminal information service

Chapter 1

Introduction

1.1 *Scope of this document*

1.1.1 When it is planned to conduct Low Visibility Operations at an aerodrome , there is a need to develop special procedures to ensure that these operations can be undertaken safely. The additional measures that are required to support these operations are contained in special procedures known as Low Visibility Procedures (LVP). The purpose of this document is to describe the circumstances in which LVP are required and to detail the steps that should be taken to implement and operate these procedures.

1.1.2 This Guidance Material provides, in a single document, details of the LVP to be implemented and is intended to assist those responsible for the equipment at the aerodrome and those responsible for developing the specific ATC procedures. It provides an overview of the requirements for LVP (visual and non-visual aids) and highlights the most important elements.

1.1.3 The purpose of this document is to give guidance to aerodrome operators in assessing the suitability of an aerodrome to undertake Low Visibility Operations. The document should also be used as the basis for preparing the LVP that are used for these operations.

1.1.4 Prior to the approval of an aerodrome for Low Visibility Operations, the appropriate ATS authority shall establish suitable provisions (PANS-ATM 7.12.2.1).The types of operations that require LVP are:

a) departure operations in RVR conditions less than a value of 550 m;

b) CAT II and III approach and landing operations.

1.1.5 LVP must be implemented wherever Low Visibility Operations are to take place. Once the LVP have been implemented by the appropriate authorities, these shall be published in the appropriate local instructions and also in the AIP in the AD section (Annex 15, Appendix 1, Part III). The LVP must be in operation whenever CAT II/III approach and landing operations and departure operations in RVR conditions less than a value of 550 m are in progress.

1.2 *Authorization of Low Visibility Operations*

1.2.1 At an aerodrome where LVP are established, Low Visibility Operations are subject to authorizations covering the aircraft and the flight crew.

1.2.2 The suitability of an aerodrome for Low Visibility Operations should be assessed by the State of the Aerodrome. As of 27 November 2003, aerodromes used for international operations shall be certified by the State of the Aerodrome (Annex 14, Vol. I, 1.4); it is also recommended that all aerodromes open to public use be certified. As part of the certification process, States should ensure that, prior to granting the aerodrome certificate, the applicant has submitted for approval/acceptance an aerodrome manual providing all pertinent information including, among other items, operating procedures. . The general conditions under which the low visibility procedures are applied must be published in the AIP (Annex 15, Appendix 1, Part III).

1.2.3 The authorization of an aircraft operator to carry out specific Low Visibility Operations is given by the State of the Operator. The criteria to be complied with will be established by the appropriate authorities.

1.3 *Applicable regulations*

1.3.1 *Introduction*

1.3.1.1 When considering the equipment requirements and the operations that take place on the aerodrome, it is important to appreciate the relationship between the existing provisions developed by the various agencies involved in the process.

1.3.2 *Aerodrome Operator and ATS authority*

1.3.2.1 ICAO requires that the appropriate ATS authority shall establish provisions at the aerodrome to support precision approach CAT II/III operations as well as departure operations in RVR conditions less than a value of 550 m (PANS-ATM Chapter 7, 7.12.2.1). Such provisions relate mainly to aerodrome traffic and include, for example, procedures for control of traffic on the manoeuvring area as well as applicable spacing between successive approaching aircraft. LVP are also required for runways which are used for departure operations in RVR conditions less than a value of 550 m, even if the runway is not equipped for CAT II/III approach and landing.

1.3.2.2 Additionally, ICAO has established provisions in Annexes and other associated documents applicable to aerodrome operations under Low Visibility Conditions. Chapter 5 of this Guidance Material highlights relevant Standards and Recommended Practices from Annex 14, Vol. 1. These requirements need to be considered by aerodrome authorities when determining the suitability of the aerodrome for LVP.

1.3.2.3 Finally, navigation facilities should be established in accordance with Annex 10 and appropriately designated. Details of the aerodrome facilities and the designation of navigation aids shall be published in the AIP. (Ref Annex 9? Annex 15? xxxx)

1.3.3 *Aircraft Operator and Flight Crew*

1.3.3.1 It is not intended that the specifications in Annex 14 limit or regulate the operation of an aircraft (Annex 14, Vol. 1, Chapter 1, Introductory Note). Aircraft operating agencies are regulated by the State of the operator. States should establish specific operating procedures for aircraft operators, which may include the term Low Visibility Take-Off (LVTO) with RVR below 400 m (as defined in JAR/OPS 1.435). States may also require that pilots ensure that LVP have been established and are in operation before undertaking a CAT II/III approach and landing or certain departure operations.

1.3.3.2 ICAO defines criteria to support Low Visibility Departures for departure operations in RVR conditions less then a value of 550 m. Certain aircraft operators may apply these requirements to a LVTO when the RVR is below 400 m.

1.3.3.3 Aircraft operators establish operating procedures and minima taking into account the applicable regulations (established by the relevant authority such as FAA, EASA etc) and depending upon the aerodrome facilities, aircraft equipment and performance, and crew qualifications. These are published in the aircraft operations manual. It is the responsibility of the pilot in command to determine the appropriate type of operation and minima applicable to a specific operation in accordance with standard operating procedures.

1.3.4 *Guided take-off*

1.3.4.1 Some aircraft are equipped with a take-off guidance system that provides directional guidance information to the pilot during the take-off. This operation is referred to as a guided take-off. Whenever an aircraft is conducting a guided take-off, the guidance signal (normally the ILS or MLS localizer) must be protected. In some States it is mandatory for the pilot to conduct a guided take-off below 125 m RVR (150 m for Cat D aircraft), but a pilot may request to conduct a guided

take-off at any time. ATC must then inform the pilot if the guidance signal is or is not protected. The conditions under which guided take-offs are available should be published in the AIP.

Chapter 2

Safety Assessment

2.1 *Introduction*

2.1.1 When a runway is to be upgraded to make it suitable for Low Visibility Operations, the most important point to be appreciated, during the initial planning phase, is that the lower the visibility, the less able the pilot will be to recognize and take action to avoid hazardous situations. Therefore, in order to maintain the overall level of safety, an appropriate level of facilities and additional procedures may be required to make up the ground environment. The design and application of the LVP must be done in such a way as to ensure that the safety level is maintained during these operations.

2.1.2 The required safety management programs are an integral part of the certification of aerodromes (Annex 14, Vol. I, 1.4) and ATS safety management (Annex 11, 2.26); PANS ATM, Chapter 2). As part of this process, a safety assessment must be carried out for any significant changes in the provision of ATS procedures and for the introduction of new equipment, systems or facilities. This implies that a safety assessment must be undertaken to ensure that adequate level of safety will be achieved during Low Visibility Operations.

2.1.3 The safety assessment process addresses the complete life-cycle of the ATM system under consideration, from initial planning and definition to post-implementation. The process should address the three different types of system elements (human, procedure and equipment elements), the interactions between these elements and the interactions between the system and its environment. In many States a risk-based approach for evaluating system safety is being utilized. Such an approach identifies the potential safety risks and directs resources to mitigate them.

2.1.4 The safety assessment process adopts a total system approach for addressing safety issues to ensure that all aspects that could impair safety are considered. The hazard identification, risk assessment and mitigation processes shall include a determination of the scope, boundaries and interfaces of the systems affected by the change; a determination of the safety objectives and requirements, the derivation, as appropriate, of a risk mitigation strategy and the verification that the safety objectives and requirements have been met using established risk and severity classification schemes.

2.1.5 Experience by a number of States shows that an effective way to ensure that all the elements in the ground environment are properly integrated into the total system is through establishing a body (working group) composed of representatives of all stakeholders that are concerned with the improvement. Such a group should normally include the aerodrome operating authority, air traffic services, MET services, major aircraft operators and those responsible for navigation services and the approach aids. Where national aviation safety authorities have established a Runway Safety Team as recommended by the European Action Plan for the Prevention of Runway Incursions (EAPPRI), the composition of any working group should be closely co-ordinated, or include such members, to ensure consistency and harmonization between the groups. The task of the working group is to conduct the safety assessment and establish a preparatory process which should include a timetable for the completion of the necessary preliminary studies, for the installation of visual and non-visual aids and for the development of the procedures required to ensure the safety of the operation (*e.g.*: any specific ATS procedures). This implementation process must ensure that all identified mitigation measures are in place before the commencement of these operations.

2.1.6 In some cases, an alternative procedure has been used, namely, to nominate a co-ordinator who, in liaison with the stakeholders concerned, has been responsible for the accomplishment of the whole task.

2.1.7 A list of actions to be undertaken in an LVP safety assessment has been provided in **Appendix C** to this Guidance Material.

2.2 ***Safety Assessment Methodology***

2.2.1 Generally, but not exclusively, the following actions to identify potential areas of problems, hazards, and to derive risks, should be taken:

a) consideration of the probability of a runway incursion taking into account the increased difficulty for vehicles and aircraft to navigate in Visibility Conditions 3 and 4;

b) examination of any past records of runway incursion and taxiway junction incidents. If no records are available it may be necessary to establish a picture of past incursions and incidents by gathering information from controllers and inspecting authorities, etc;

c) initiation of a local runway safety awareness campaign for controllers, pilots, vehicle drivers and other personnel who operate on or near the runway;

d) study of the suitability of the procedures and facilities for safe ground operations under Low Visibility Conditions;

e) examination of aerodrome lay-out with particular attention to taxi-routes between aprons and runways, ground traffic routes, ground traffic control points, movement area entrances and existing aids;

f) examination of the existing ATC instructions, operation orders and company rules that are relevant to the general movement scenario;

g) examination of aeronautical meteorological records and movement statistics for aircraft and other vehicles;

h) examination of existing airport security measures. The use of general security measures may have significant effect upon the overall incursion probability.

After the initial study, the actual situation regarding paragraphs a) through h) should be verified by an on-site inspection of the aerodrome conducted by a team of relevant experts and representatives of the responsible authorities.

2.2.2 The safety assessment should first analyze the situation when aircraft are in the take-off or landing phase, where the consequence of a runway incursion or disturbance of the guidance signal is serious. The aim of the assessment is to estimate the risk of an inadvertent incursion by an aircraft, vehicle or person:

a) onto the runway and associated OFZ (refer to Annex 14, Vol. I, Chapter 4 for dimensions), which might result in a collision with an aircraft landing, or taking-off, or;

b) into the critical and sensitive areas (refer to Annex 10, Vol. 1, Attachments C and G for dimensions) which would result in a disturbance of the guidance signal (*e.g.* ILS or MLS) large enough to result in an accident/incident occurring to a landing aircraft or to an aircraft undertaking a guided take-off.

2.2.3 The next task of such a group is to assess the suitability of the existing procedures and facilities for safe ground operation under low visibility conditions, to encompass:

- Examination of the runway and taxiway layout to find out whether it is possible for aircraft taxiing or holding for take-off to be kept clear of the inner approach surface, the inner transitional surface and the balked landing surface as defined in Annex 14, Vol. I, Chapter 4 (Obstacle Free Zone) and also clear of the critical and sensitive areas of the guidance signal (*e.g.* ILS critical and sensitive areas) as defined in Annex 10, Vol. 1., Attachments C and G.

- Examination of the road access points around the aerodrome perimeter to find out whether an inadvertent incursion may occur in Visibility Conditions 3 and 4;

- review of the instructions to personnel who are authorized to drive vehicles on taxiways, aprons and associated access roads.

In case that during the above examinations/studies the normal procedures and security arrangements are judged inadequate for operations during low visibility conditions, special procedures for the control of the ground movement of aircraft and vehicles would be required as well as special security arrangements.

2.2.4 The safety assessment should be considered by the working group as part of a complete system approach; it should be completed in an early stage of the implementation process. The general picture derived from the study will identify the mitigation measures that should be implemented before the Low Visibility Operations commence in order to ensure that these operations can be conducted safely. As an example, experience has shown that a major runway incursion risk comes from vehicles authorized on the manoeuvring area. Consequently, such authorization by ATC should be kept to the bare minimum and under strictly controlled conditions and specific procedures. (Annex 11 3.8 and PANS-ATM 7.6.3.2 and 7.12.6)

2.2.5 It can be expected that, due to the more demanding nature of operations during Low Visibility Conditions, additional procedures may be required to maintain the safety of the operation. These procedures may restrict the operation of the aerodrome during such periods. At low traffic density aerodromes this may not cause significant operational problems.

2.2.6 The safety related restrictions can, in principle, be reduced or removed by the application of higher technology means such as improved lighting systems and navigation systems or the installation of a surveillance system. The safety assessment should consider the operational requirements of the aerodrome and assess whether the identified hazards can be mitigated through the implementation of enhanced systems and quantify the extent to which this can be achieved.

2.2.7 A basic decision should be made on selecting the components of Surface Movement Guidance and Control Systems (SMGCS) or an Advanced Surface Movement Guidance and Control System (A-SMGCS). Such a system could be based primarily upon procedural methods of control and visual means to maintain spacing between aircraft and/or vehicles or assistance could be provided by the addition of an adequate surveillance display system (i.e. Surface Movement Radar (SMR), or A-SMGCS). There may be a requirement for additional measures in order to operate at the desired capacity level at the required level of safety.

Safety management

2.2.8 States shall implement systematic and appropriate ATS safety management programmes to ensure that safety is maintained in the provision of ATS within airspaces and at aerodromes (Annex 11, Chapter 2, 2.27.1). Furthermore, it is recommended that certified aerodromes have in operation a safety management system; as of 24 November 2005, a safety management system will be mandatory for certified aerodromes (Annex 14, Vol. I, 1.4). After the operations under Low Visibility Conditions are authorized, a system must be established in order to ensure that the

relevant provisions are amended or updated as a consequence of new developments or time variable factors affecting the safety assessment.

2.2.9 To prevent recurrence, States must have in place a system for reporting and investigation of occurrences, including occurrences during operations in Low Visibility Conditions, where aircraft, vehicles or pedestrians are involved. Arrangements should be made to compile and analyze the relevant information. It is particularly important to monitor the performance of the approach and landing aids. Regulations in many States require operators to report any unexpected events during the approach and landing. These reports should be collected and reviewed to provide ongoing feedback on the performance of the approach and landing aids. Action should be taken to address the issues raised in a timely manner in order to ensure that the safety of the operation is maintained.

2.2.10 As part of any safety management programme or system, a verification process should be established within the aerodrome organizations and other units responsible for the provision of services to ensure that facilities, equipment and operating conditions are in accordance with current safety regulations and local instructions. The size and organization of such systems should be adjusted to local conditions in order to ensure an adequate monitoring of aerodrome operations. This system should include routines for initiating corrective actions when deviations from prescribed provisions are detected and for the follow-up of such actions.

2.2.11 The ultimate requirement of the above safety assessment should provide the means to institute the necessary equipment and procedures to allow the required movement capacity at the aerodrome to be maintained whilst ensuring that the operations during Low Visibility Conditions are conducted safely.

Chapter 3

Aerodrome Facilities

3.1 *Introduction*

3.1.1 When Low Visibility Operations are planned for an aerodrome, all the facilities of the aerodrome must be considered and assessed for their suitability for such operations. The guidance given in this document must be considered in conjunction with appropriate ICAO Annexes and documents related to the aerodrome and its facilities. Special procedures, and, in some instances, additional equipment, may be required to ensure that these operations can be conducted safely.

3.1.2 This section of the guidance is intended to provide baseline requirements for the development of detailed procedures. The actual facilities and procedures required at any aerodrome depend on the type of operations to be conducted at that aerodrome. The specific types of operations that require LVP are:

a) departure operations in RVR conditions less than a value of 550 m;

b) CAT II and CAT III approach and landing operations..

3.1.3 The extent and complexity of the procedures depend on the operations being conducted, but the objective of the LVP is to protect the physical area around the runway and also to protect any guidance signals that may be used during these operations.

3.2 *Physical characteristics of aerodromes*

3.2.1 The physical characteristics of the runways and taxiways, as well as the requirements for obstacle clearance, the protection of the defined areas surrounding a runway, and the characteristics of pre-threshold terrain need to be carefully considered in order to ensure safe operations in Low Visibility Conditions.

3.3 *Aerodrome services*

3.3.1 *Suitability of the aerodrome LVP and facilities*

3.3.1.1 The conduct of Low Visibility Operations depends on the existence of suitable runway protection measures, surface movement guidance and control, emergency procedures, apron management, MET service and equipment. Although it is recognized that the implementation of these requirements is basically the responsibility of the appropriate State and aerodrome authority, the aircraft operator should ensure as far as possible that suitable measures have been taken.

3.3.1.2 At aerodromes or runways without CAT II/III approaches there may be a requirement to perform departure operations in RVR conditions less than a value of 550 m. The facilities required are less stringent than those for CAT II/III operations. LVP procedures need to be established. The simplest LVP procedure in that case would be to restrict the traffic to one aircraft movement at a time. These operations are subject to the same safety assessment and approval process as other Low Visibility Operations.

3.3.2 *Meteorological services*

3.3.2.1 In order to meet the requirements for all-weather operations, arrangements regarding RVR observations and reporting should be: as follows: (Annex 3, Chapter 4, 4.6.3):

3.3.2.1.1 Runway visual range shall be assessed on all runways intended for CAT II and III instrument approach and landing operations. In addition, Runway visual range should also be

assessed during periods of reduced visibility on all runways intended for use during periods of reduced visibility, including:

a) precision approach runways intended for CAT I instrument approach and landing operations; and

b) runways used for take-off and having high-intensity edge lights and/or centre line lights.

3.3.2.1.2 Runway visual range assessments shall be representative of:

a) the touchdown zone of the runway intended for non-precision or CAT I instrument approach and landing operations;

b) the touchdown zone and the mid-point of the runway intended for CAT II instrument approach and landing operations; and

c) the touchdown zone, the mid-point and stop-end of the runway intended for CAT III instrument approach and landing operations.

3.3.2.1.3 The units providing air traffic service and aeronautical information service for an aerodrome shall be kept informed without delay of changes in the serviceability status of the automated equipment used for assessing runway visual range.

3.3.2.2 With regard to the operational minima related to the decision height (DH), they are normally correlated to the cloud base/vertical visibility measurements through ceilometers. It is recommended that cloud observations for local routine and special reports should be representative of the approach area (Annex 3, Chapter 4, 4.6.5.2). In the case of aerodromes with precision approach runways, sensors for cloud amount and height of cloud base should be sited to give the best practicable indications of the height of cloud base (or vertical visibility) and cloud amount at the middle marker site of the instrument landing system or, at aerodromes where a middle marker beacon is not used, at a distance of 900 to 1200 m (3000 to 4000 ft) from the landing threshold at the approach end of the runway. *Note: — Specifications concerning the middle marker site of an instrument landing system are given in Annex 10, Volume 1, Chapter 3 and Attachment C, Table C-5.* (Annex 3, Appendix 3, 4.5.1). Cloud observations made for reports in the METAR/SPECI code forms should be representative of the aerodrome and its vicinity (Annex 3, Chapter 4, 4.6.5.3).

3.3.2.3 It is recommended that a secondary power supply should be provided for all meteorological equipment. (Annex 14, Vol 1, Chapter 8, 8.1.10.d)

3.3.3 *Dissemination of information*

3.3.3.1 Special attention shall be given to the rapid dissemination of information to pilots by ATIS or RTF as appropriate whenever the operating performance of any part of the ground facilities falls below the level at which it has been promulgated (Annex 11, Chapter 4, 4.2.1.d, further details of the information to be passed can be found in section 9.11 of this Guidance Material). This is particularly important if the MET conditions are such that CAT II or III operations are likely.

3.3.3.2 The wording of NOTAM or AIP entries should not give the impression that such operations are dependant on the availability of any particular part of the ground system, but should give a full description of each part of the system which is available. This should include a description of any special procedures which will be applied as part of the LVP, together with the trigger point at which they will be implemented by the air traffic service. *Note:— Details of the provisions which should be specified regarding low visibility operations are listed in PANS-ATM, Chapter 7, 7.12.5.*

3.3.3.3 Where there are a number of aerodromes in a State at which Low Visibility Operations may be carried out, a general entry should be included in the AD section of the AIP in addition to the detailed information relating to specific aerodromes. The description of the LVP should be comprehensive enough to avoid the need for additional enquiries from individual operators. Two samples of "AIP entries on LVP" are presented in **Appendix A** to this Guidance Material.

3.3.3.4 It is also recommended that in the AIP an entry should be made which describes the procedure for aircraft operators to obtain authorization for CAT II or CAT III operations, if an authorization is required.

3.3.3.5 When any part of the system supporting Low Visibility Operations is unserviceable or downgraded, a NOTAM shall be issued, provided the failure time complies with the NOTAM issuance requirements, giving a full description of what is unserviceable or downgraded (Annex 15, Chapter 5). The NOTAM shall also include any additional measures or restrictions that have been taken in the LVP as a result of the downgrading.

3.3.3.6 ATIS broadcasts are provided at aerodromes where there is a requirement to reduce the load on RTF communication channels and therefore reduce the workload on both controllers and pilots. This is particularly beneficial in LVP where additional information about the status of LVP and the aerodrome facilities should be provided. Pilots can receive the information required before they are in RTF contact with approach control units or before start-up. The information provided by ATIS broadcasts in LVP can assist pilots in planning for the approach and, should the need arise, any diversions in a timely manner.

3.3.3.7 The status of LVP shall be passed to pilots by means of the ATIS broadcast (Annex 11, Chapter 4, 4.3), where available, except for short notice changes which shall be passed by RTF (Annex 11, Chapter 4, 4.2).

3.3.3.8 Information may be passed automatically to ATIS and ATC display systems from other independent systems (*e.g.* RVR). It is essential that the correct information arrives in a timely manner. Automated systems (*e.g.* Voice-ATIS and D-ATIS) should include error checking to ensure that the information provided is accurate and reliable, and that erroneous information is not transmitted to users (pilots and ATC). In case of failure, a warning should be displayed to ATC who should inform pilots by RTF. The failure of an ATIS system may place considerable burdens on the controllers required to transmit this information to each aircraft and consequently reduce airport traffic capacity. Consideration should be given to providing backup or duplicate systems to ensure that a failure will not result in a loss of the ATIS broadcast.

3.3.3.9 The inclusion of the RVR in the ATIS broadcast may create operational problems. Manual systems require the message to be re-recorded every time a significant change occurs. In this case, frequently changing RVR values may make it impractical to issue a new ATIS broadcast for every change. Automated systems are able to update the RVR values very frequently and this interval should be harmonized.

3.3.3.10 In order to resolve these problems and harmonize the transmission of RVR on the ATIS, standard reporting intervals should be used. The RVR should be averaged over a one minute interval according to the criteria for the local routine and special reports (Annex 3, Appendix 3, 4.3.4). This average figure should be broadcast on the ATIS (Annex 11 Chapter 4, 4.3.6.1.g). Unless the Standards of Annex 11, Chapter 4, 4.3.6.1 b) require immediate updates, these should be done every 30 minutes where the ATIS is recorded manually. Local special reports should be transmitted as soon as specified conditions occur. However, by local agreement, they do not need to be issued in respect of: any element for which there is in the local ATS unit a display corresponding to the one in the MET station, and where arrangements are in force for the use of this display to update information included in local routine and special reports; and for RVR, when all changes of one or more steps on the reporting scale in use are being reported to the local air traffic services unit by an observer on the aerodrome (Annex 3, Appendix 3, 3.2.2). When automatic ATIS systems are in use,

in order to avoid frequent updates, the ATIS should only be updated when the one minute average values reach or pass through the criteria for the issuance of special reports in the SPECI code form. In the case of a deterioration, the RVR values should be updated immediately and in the case of an improvement, the RVR values should only be updated if this improvement lasts for 10 minutes. The normal interval of updating should be published in the AIP.

Chapter 4

Non-Visual Aids

Note:— The full text of SARPS related to non-visual aids at aerodromes appears in Annex 10, Vol 1.

4.1 *Introduction*

4.1.1 Low Visibility Operations require a means of guidance for the aircraft on the approach to the runway and for some take-off operations. The demanding requirements of Low Visibility Operations means that it is particularly important to ensure that the guidance signals are of the highest quality. Where ground based antennas are used to provide these signals, then this quality is assured by establishing critical and sensitive areas.

4.1.2 The authority responsible for the provision of non-visual aids should, in consultation with all relevant parties, determine the appropriate non-visual aids for the type of operations that are planned. The LVP should specify the minimum ILS/MLS equipment requirements for CAT II/III operations (PANS-ATM 7.12.5.b).

4.2 *ILS*

4.2.1 The signal-in-space may be degraded by reflected ILS signals and actions should be taken to minimize their effects. These include the use of wide aperture antenna systems for course signals and clearance signal techniques to protect against the effects of reflection from structures on the airport and from aircraft on the ground. Guidance material for the protection of the ILS critical and sensitive areas is provided in Annex 10 Vol I, Attachment C. The size and shape of critical and sensitive areas depend on the characteristics of the particular ILS system and the configuration of the particular environment. For all precision approach operations, the ILS critical areas should be protected at all times (Annex 10 Vol I, Attachment C 2.1.10.1). In addition, it is recommended that no personnel are permitted in the critical area during these operations. For CAT II and III operations the sensitive areas should be protected when aircraft are close to the runways during take-off and landing operations, as defined in Chapter 9 (Annex 14, Chapter 3, 3.12.6, 3.12.9 and Table 3-2).

4.2.2 Another possible cause of degradation of the signal-in-space, though less likely, is the presence of extraneous interfering signals. Periodic monitoring of the signal-in-space should be made in order to detect any interference. Reports from pilots about signal disturbances should be investigated and special flight checks should be made when there is reason to believe that serious interference is occurring.

4.2.3 It is important to ensure that pilots do not attempt to use an ILS localizer or glidepath signal that is being radiated for test or tuning purposes. There is a particular risk when no valid guidance information is being transmitted (a "null DDM (Difference in Depth of Modulation)" signal) or a false guidance is being transmitted for tuning purpose. Whenever an ILS is unavailable for use, the ident should be suppressed (Annex 10, 3,1,3,9,4). The appropriate notification must be carried out including sending a NOTAM (Annex 15??) and informing relevant ATC personnel so the information is reported to the pilot before commencing the approach. When a glide-path signal is transmitted for test or tuning purposes, it is recommended that the associated localizer system should be switched off. When localizer signal is radiated for test or tuning purposes, it is recommended that the associated glide-path system should be switched off.

4.3 *MLS*

4.3.1 The MLS critical and sensitive areas are defined in Annex 10 Vol I, Attachment G. MLS equipment is designed with reduced susceptibility and sensitivity to multipath effects which enables the use of much smaller protection areas. It is essential that these areas are protected from infringement by aircraft, vehicles and personnel on the ground during LVP. In practice the MLS critical and sensitive areas are sufficiently small as to place no restrictions on aircraft take-off and

landing operations on the runway and therefore do not represent a controlling criteria for runway utilisation.

4.3.2 The concept of "MLS Landing Clearance Trigger Line" (Chapter 8 refers) may be used to assist the development of ATC procedures, in observing fully all other various separation requirements.

4.4 ***Co-existing ILS/MLS operations***

4.4.1 Where MLS is installed on runways that are also equipped with ILS, specific procedures must be applied to ensure that the guidance signals in use by aircraft taking off and landing are protected. Details of the ILS/MLS procedures are given in Chapters 8 & 9 of this Guidance Material.

Chapter 5

Visual Aids

Note:— The full text of SARPS related to visual aids at aerodromes appears in Annex 14, Vol. I, Chapter 5.

5.1 *Introduction*

5.1.1 LVP should ensure that the visual aids required for aircraft operations under Low Visibility Conditions are available. The requirements for visual aids will depend on the visibility conditions, the type of operations to be undertaken, the traffic density and the complexity of the aerodrome layout.

5.1.2 As the MET conditions deteriorate, appropriate visual aids as described in Annex 14, Volume I may be required to allow pilots and vehicle drivers to identify their position and required routings on the movement area and to assist them in avoiding collisions. Consideration should be given to the provision of location signs and guidance signs, markings and traffic lights on service roads.

5.1.3 The visual aids and associated equipment that might be considered for LVP are identified in the following paragraphs. Basic provisions are contained in Annex 14, Volume I and references presented here identify those items considered to be particularly important together with any specific guidance for their implementation for LVP.

5.1.4 The requirements have been grouped under three headings to assist in the selection of appropriate visual aids according to the type of operations planned.

5.1.5 The *General requirements* section covers the visual aids that should be in place for ground operations in Low Visibility Conditions. These *general requirements* should be selected according to the types of operation and traffic density at the aerodrome.

5.1.6 In addition to the *general requirements*, the provisions of the *Low Visibility Departure Operations* or *ILS/MLS operations* sections should also be in place as appropriate according to the type of operation(s) being conducted.

5.2 *Notification of status of visual aids*

5.2.1 The notification of the status of visual aids is essential for the safe operation of LVP. Any change to critical facilities and associated limitations shall be disseminated to users without delay (Annex 15, Chapter 5, 5.1.1.1).

5.3 *Authorisation of operations*

5.3.1 The Standards and Recommended Practices in Annex 14 must be taken into account by the Aerodrome Operator when upgrading and maintaining the facilities for Low Visibility Operations. States should establish specific operating procedures for aircraft operators which are published in the aircraft operations manual. The decision to undertake a specific type of operation, and the minima to be applied, is the responsibility of the pilot based on standard operating procedures (See Chapter 1, para 1.3 Applicable regulations).

5.4 *General requirements*

5.4.1 *Markings*

5.4.1.1 When surface markings are the sole runway or taxiway centre line reference to the users during LVP, the aerodrome authorities should ensure that they are kept free of contamination and are sufficiently conspicuous to the users throughout the taxi routes. Furthermore, it must be ensured that other essential markings in connection with LVP are treated accordingly.

5.4.1.2 Runway-holding position markings (Annex 14, Vol. I, 5.2.10)

5.4.1.2.1 A runway-holding position marking is required along each runway-holding position. The need to give greater protection against incursion on the runway, the relevant approach aid critical/sensitive areas and into the obstacle free zone (OFZ) during LVP makes it essential for clearly defined holding positions to be installed at entry points to the runway

5.4.1.2.2 For runways to be used for guided take-off and CAT II/III approach and landing, the minimum distances from the runway centre line to a holding bay, runway-holding position or roadholding position in Annex 14, Table 3-2 ensure the necessary protection of the critical/sensitive area(s) (Annex 10, Volume I, Attachments C and G).

5.4.1.3 Intermediate holding position markings (Annex 14, Vol. I, 5.2.11)

5.4.1.3.1 During LVP, intermediate holding position markings at taxiway intersections and intermediate holding position markings of holding positions along a taxiway other than at taxiway intersections may assist in ensuring adequate spacing between taxiing aircraft.

5.4.1.4 Apron and aircraft stand markings (Annex 14, Vol. I, 5.2.13/14)

5.4.1.4.1 The clear definition of the apron and the aircraft stands assists pilots and vehicle drivers in identifying the areas in which they are permitted to operate. Aircraft stand markings and apron safety lines should be provided to achieve this.

5.4.1.4.2 Continuous guidance (including aircraft stand lead in line and manoeuvring guidance lights) should be provided from the runway to the stand.

5.4.2 *Lights*

5.4.2.1 Taxiway lights (Annex 14, Vol. I, 5.3.16/17)

5.4.2.1.1 Experience has shown that low intensity lighting is of little use in daylight. Centre line lighting with an intensity of 80 candelas have been found to be effective at night with RVR down to 350 m, but higher intensity lights are recommended by day in visibilities of this order on complicated taxi routes. The location and spacing of taxiway lighting requires particular attention and closer spacing should be provided for operations in lower RVR conditions and on tighter radius turns.

5.4.2.1.2 Taxiway edge lights combined with taxiway centre line marking (Annex 14, Vol. I, 5.2.8) are adequate for operations in visibility conditions corresponding to RVR down to 350 m. For operations with RVR less than 350 m, centre line lighting is essential to provide continuous guidance between the runway centre line and aircraft stands, except where the traffic density is light and taxiway edge lights and centre line marking provide adequate guidance (Annex 14, Vol. I, 5.3.16.1).

5.4.2.1.3 It is recommended that taxiway centre line lights should be provided on a taxiway intended for use at night in runway visual range conditions of 350 m or greater, and particularly on complex taxiway intersections and exit taxiways, except that these lights need not be provided where the traffic density is light and taxiway edge lights and centre line marking provide adequate guidance (Annex 14, Vol. I, 5.3.16.2).

Note: – Where there may be a need to delineate the edges of a taxiway, e.g. *on a rapid exit taxiway, narrow taxiway or in snow conditions, this may be done with taxiway edge lights or markers.*

5.4.2.1.4 The design of the taxiway centre line lighting intended to be used for operations in visibility conditions corresponding to RVR of less than 350 m, shall be based on Annex 14, Vol. I, Appendix 2, Figures 2-12, 2-13 and 2-14. *Note:— Guidance on the design of taxiways, including the cockpit centre line tracking technique, is given in the* Aerodrome Design Manual*, Part 2.*

5.4.2.2 Intermediate holding position lights (Annex 14, Vol. I, 5.3.20)

5.4.2.2.1 Where intermediate holding positions are defined, intermediate holding position lights are required for operations in visibility conditions corresponding to RVR below 350 m (Annex 14, Vol. I, 5.3.20.1) and they are recommended for all operations in LVP.

5.4.2.3 Stop bars and runway guard lights (Annex 14, Vol. I, 5.3.19 and 5.3.22)

5.4.2.3.1 Annex 14, Vol. I, 5.3.19.1 and 5.3.19.2 require that a stop bar shall be provided at every runway-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions less than a value of 550 m, except where:

a) appropriate aids and procedures are available to assist in preventing inadvertent incursions of aircraft and vehicles onto the runway; or

b) operational procedures exist to limit, in runway visual range conditions less than a value of 550 m, the number of:

1) aircraft on the manoeuvring area to one at a time; and

2) vehicles on the manoeuvring area to the essential minimum.

5.4.2.3.2 (Annex 14, Vol. I, 5.3.19.13) The lighting circuit shall be designed so that:

a) stop bars located across entrance taxiways are selectively switchable;

b) stop bars located across taxiways intended to be used only as exit taxiways are switchable selectively or in groups;

c) when a stop bar is illuminated, any taxiway centre line lights installed beyond the stop bar shall be extinguished for a distance of at least 90 m; and

d) stop bars shall be interlocked with taxiway centre line lights so that when the centre line lights beyond the stop bar are illuminated the stop bar is extinguished and vice versa.

Note 1: – A stop bar is switched on to indicate that traffic stop and switched off to indicate that traffic proceed.

Note 2: – Care is required in the design of the electrical system to ensure that all of the lights of a stop bar will not fail at the same time. Guidance on this issue is given in the Aerodrome Design Manual*, Part 5.*

5.4.2.3.3 Aircraft must not cross red stop bars, unless contingency measures are in force.

Note 1: – Contingency measures should be established to cover cases where the stop bars or controls are unserviceable and published in the AIP.

5.4.2.3.4 There are two standard configurations of runway guard lights, as illustrated in Annex 14, Vol. I, Figure 5-23. Annex 14, Vol. I, 5.3.22.1 requires that runway guard lights, Configuration

A, shall be provided at each taxiway/runway intersection associated with a runway intended for use in:

a) runway visual range conditions less than a value of 550 m where a stop bar is not installed; and

b) runway visual range conditions of values between 550 m and 1 200 m where the traffic density is heavy.

5.4.2.3.5 Runway-holding position markings, signs and stop bars may not by themselves be adequate during LVP and runway guard lights are recommended as reinforcement.

5.4.2.4 Road-holding position lights (Annex 14, Vol. I, 5.3.26)

5.4.2.4.1 A road-holding position light shall be provided at each road-holding position serving a runway when it is intended that the runway will be used in runway visual range conditions less than a value of 350 m. (Annex 14, Vol. I, 5.3.26.1). A road-holding position light should be provided at each road holding position serving a runway to be used for LVP.

5.4.2.5 Aircraft stand manoeuvring guidance lights (Annex 14, Vol. I, 5.3.25)

5.4.2.5.1 Guidance on the apron should be effective to manoeuvring aircraft during all visibility conditions in which the aerodrome is used. During LVP, aircraft stand manoeuvring guidance lights should be provided, unless adequate guidance is provided by other means. Where provided, aircraft stand manoeuvring guidance lights, other than those indicating a stop position, shall be fixed yellow lights, visible throughout the segments within which they are intended to provide guidance (Annex 14, Vol. I, 5.3.25.3).

5.4.2.6 Unserviceable areas (Annex 14, Vol. I, 7.4)

5.4.2.6.1 In addition to the requirements for closed markings specified in Annex 14, Vol. I, 7.1, unserviceability markers shall be displayed wherever any portion of a taxiway, apron or holding bay is unfit for the movement of aircraft but it is still possible for aircraft to bypass the area safely. On a movement area used at night, unserviceability lights shall be used (Annex 14, Vol. I, 7.4.1). It is recommended that such lights are used during all operations in LVP.

5.4.2.7 Closed runways, taxiways or parts thereof (Annex 14, Vol. I, 7.1.6)

5.4.2.7.1 Lighting on a closed runway or a closed or unauthorized taxiway or portion thereof shall not be operated, except for maintenance purposes (Annex 14, Vol. I, 7.1.6). It is recommended that during LVP such lighting should not be operated under any circumstances.

5.4.2.7.2 During LVP, mobile closure devices may be used, positioned in such a way as to meet the appropriate obstacle/obstruction clearance, frangibility and ILS/MLS localizer sensitive area clearance requirements.

5.4.3 *Signs*

5.4.3.1 During LVP, the designation of taxiways, exits and entries needs to be done in a manner which simplifies the orientation on the aerodrome (Annex 14, Vol. I, 5.4). The lack of visual reference for pilots and vehicle drivers means that mandatory instructions signs, information signs and locations signs shall be provided as appropriate to ensure that they are aware of their position and of the direction to follow. Information signs shall, wherever practicable, be located on the left-hand side of the taxiway in accordance with Annex 14, Vol. I, 5.4.3.14 and Table 5-4. It is recommended that information signs are installed on both sides of the taxiway.

5.4.3.2 A mandatory instruction sign shall be provided to identify a location beyond which an aircraft taxiing or vehicle shall not proceed unless authorized by the aerodrome control tower. (Annex 14, Vol. I, 5.4.2.1). Taxiway and taxiway/apron intersections and intermediate holding positions should be identified with markings or signs which are legible to the pilot in the cockpit in all visibility conditions during which the aerodrome will be used. A location sign shall be provided in conjunction with a runway designation sign except at a runway/runway intersection (Annex 14, Vol. I, 5.4.3.10). Each necessary intermediate holding position on the same taxiway should be provided with a location sign consisting of the taxiway designation and a number.

5.4.3.3 The location laterally from the taxiway pavement edge and the dimensions of the signs should be determined by the appropriate authority, taking into account the minimum visibility during which the aerodrome is used and the most restrictive aircraft type expected to operate at the aerodrome. The inscriptions on a sign shall be in accordance with the provisions of Annex 14, Vol. I, Appendix 4. Signs located near a runway or taxiway shall be sufficiently low to preserve clearance for propellers and the engine pods of jet aircraft (Annex 14, Chapter 5, 5.4.1.3). Requirements related to location distances for taxiing guidance signs including runway exit signs are provided in Annex 14, Vol. I, Table 5-4. Account should also be taken of the need to provide visual clues to pilots under very low visibilities as well as signs being able to resist the exposure of the blast of the aircraft engines.

5.4.3.4 Signs shall be illuminated in accordance with the provisions of Annex 14, Vol. I, Appendix 4 when intended for use in runway visual range conditions less than a value of 800 m (Annex 14, Vol. I, 5.4.1.7). The signs essential to the conduct of LVP should be illuminated internally.

5.4.3.5 The taxiway guidance system shall be published in the appropriate sections of the AIP (Annex 15, Appendix 1, ****AD 2.9).

5.5 *Low Visibility Departure Operations*

5.5.1 *Markings*

5.5.1.1 Runway centre line marking (Annex 14, Vol. I, 5.2.3)

5.5.1.1.1 A runway centre line marking shall be provided (Annex 14, Vol. I, 5.2.3.1).

5.5.2 *Lights*

5.5.2.1 Runway edge lights and runway end lights (Annex 14, Vol. I, 5.3.9 and 5.3.11)

5.5.2.1.1 Runway edge lights shall be provided for a runway intended for use at night (Annex 14, Vol. I, 5.3.9.1). In a number of States within the EUR Region, it is a further requirement that runway edge lights be provided for all take-offs under RVR below 250 m (300 m RVR for Category D aeroplanes). It is recommended that runway edge lights be provided on a runway intended for take-off under RVR below 800 m during daytime. Runway edge lights shall be spaced at intervals of not more than 60 m. Additionally, the spacing of runway edge lights shall be published in the AIP (Annex 15, Appendix 1, **** AD 2.14).

5.5.2.1.2 Runway end lights shall be provided on runways equipped with edge lights (Annex 14, Vol. I, 5.3.11.1).

5.5.2.2 Runway centre line lights (Annex 14, Vol. I, 5.3.12)

5.5.2.2.1 Runway centre line lights shall be provided on a runway intended to be used for take-off with an operating minimum below an RVR of the order of 400 m (Annex 14, Vol. I., 5.3.12.3). Aircraft operators in some States require runway centre line lights for take-off below 250 m RVR

(300 m RVR for Category D aeroplanes). The lights shall be located from the threshold to the end at longitudinal spacing of approximately 15 m. Where the serviceability level of the runway centre line lights specified as maintenance objectives in Annex 14, Vol. I, 10.4.7 or 10.4.11, as appropriate, can be demonstrated and the runway is intended for use in RVR conditions of 350 m or greater, the longitudinal spacing may be approximately 30 m (Annex 14, Vol. I, 5.3.12.5). Existing centre line lighting where lights are spaced at 7.5 m need not be replaced. Additionally, the spacing of runway centre line lights shall be published in the AIP (Annex 15, Appendix 1, **** AD 2.14).

5.5.2.3 Secondary power supply (Annex 14, Vol. I, 8.1)

5.5.2.3.1 For a runway intended to be used for take-off in RVR conditions less than 800 m, secondary power supplies meeting the required maximum switch over time (Annex 14, Vol. I, Table 8-1) shall be provided for the following lighting aids: runway edge, runway end, runway centre line, all stop bars, essential taxiway and obstacle (Annex 14, Vol., 8.1.7).

5.6 ***ILS/MLS operations***

5.6.1 *Markings*

5.6.1.1 Runway centre line marking (Annex 14, Vol. I, 5.2.3)

5.6.1.1.1 A runway centre line marking shall be provided (Annex 14, Vol. I, 5.2.3.1).

5.6.1.2 Threshold marking (Annex 14, Vol. I, 5.2.4)

5.6.1.2.1 A threshold marking shall be provided at the threshold of a paved instrument runway, and of a paved non-instrument runway where the code number is 3 or 4 and the runway is intended for use by international commercial air transport.

5.6.1.3 Aiming point markings (Annex 14, Vol. I, 5.2.5)

5.6.1.3.1 An aiming point marking shall be provided at each approach end of a paved instrument runway where the code number is 2, 3 or 4 (Annex 14, Vol. I, 5.2.5.2). An aiming point marking should be provided at each approach end of a paved instrument runway where the code number is 1, when additional conspicuity of the aiming point is desirable. These provisions regarding aiming point marking shall not require the replacement of existing markings before 1 January 2005 (Annex 14, Vol. I, 5.2.5.1).

5.6.1.4 Touchdown zone markings (Annex 14 Vol. I, 5.2.6).

5.6.1.4.1 A touchdown zone marking shall be provided in the touchdown zone of a paved precision approach runway where the code number is 2, 3 or 4 (Annex 14, Vol. I, 5.2.6.1). Additionally, it is suggested that pattern B (with distance coding) be implemented to provide improved awareness of position on the runway.

5.6.2 *Lights*

5.6.2.1 Approach lighting systems (Annex 14, Vol. I, 5.3.4)

5.6.2.1.1 The Standards for precision approach CAT II and III lighting systems are implemented for Low Visibility Operations according to the category of operations being undertaken.

5.6.2.2 Runway lead-in lighting systems and runway threshold identification lights, "Strobe lighting" (Annex 14, Vol. I, 5.3.7 and 5.3.8)

5.6.2.2.1 Strobe lighting (sequenced or not), if installed, should not be used when CAT II and III operations are in progress.

5.6.2.3 Runway lighting systems (Annex 14, Vol. I, 5.3.9 to 5.3.13)

5.6.2.3.1 Runway edge lights shall be provided spaced at intervals of not more than 60 m (Annex 14, Vol. I, 5.3.9.1 and 5.3.9.6). Additionally, the spacing of runway edge lights shall be published in the AIP (Annex 15, Appendix 1, **** AD 2.14).

5.6.2.3.2 Runway threshold lights shall consist of lights uniformly spaced between the rows of runway edge lights at intervals of not more than 3 m (Annex 14, Vol. I, 5.3.10.1 and 5.3.10.4).

5.6.2.3.3 Runway end lights shall consist of at least six lights which shall be placed on a line at right angles to the runway axis as near to the end of the runway as possible and, in any case, not more than 3 m outside the end (Annex 14, Vol. I, 5.3.11.1 and 5.3.11.2). For a precision approach runways CAT III, the spacing between runway end lights, except between the two innermost lights if a gap is used, should not exceed 6 m.

5.6.2.3.4 Runway centre line lights shall be located from the threshold to the end at longitudinal spacing of approximately 15 m. Where the serviceability level of the runway centre line lights specified as maintenance objectives in Annex 14, Vol. I, 10.4.7 or 10.4.11, as appropriate, can be demonstrated and the runway is intended for use in runway visual range conditions of 350 m or greater, the longitudinal spacing may be approximately 30 m (Annex 14, Vol. I, 5.3.12.5). Existing centre line lighting where lights are spaced at 7.5 m need not be replaced. Additionally, the spacing of runway centre line lights shall be published in the AIP (Annex 15, Appendix 1, **** AD 2.14).

5.6.2.3.5 Runway touchdown zone lights shall be provided on CAT II and III runways (Annex 14, Vol. I, 5.3.13.1).

5.6.2.4 Runway exit guidance

5.6.2.4.1 Identifying the nominated turn-off from the runway may necessitate switchable or additional lighting. The provision of taxiway centre line lights is a requirement for use in RVR conditions of less than 350 m (Annex 14, Vol. I, 5.3.16.1) and they are recommended for all LVP.

5.6.2.4.2 Alternate taxiway centre line lights shall show green and yellow from their beginning near the runway centre line to the perimeter of the ILS critical/sensitive area or the lower edge of the inner transitional surface, whichever is the farthest from the runway (Annex 14, Vol. I, 5.3.16.7).

5.6.2.4.3 Taxiway centre line markings and lights on rapid exit taxiways

5.6.2.4.3.1 So as to make best use of the capacity of a runway and to assist pilots in the assessment of their relative position along the runway, the conspicuity of the approach to a rapid exit taxiway should be enhanced. This permits the reduction of runway occupancy time by individual aircraft without jeopardizing safety. During LVP, the remaining distances to rapid exit taxiways should be identified by appropriate marking and lighting.

5.6.2.4.3.2 At an intersection of a taxiway with a runway where the taxiway serves as an exit from the runway, the taxiway centre line marking should be curved into the runway centre line marking as shown in Annex 14, Vol. I, Figures 5-6 and 5-25. The taxiway centre line marking should be extended parallel to the runway centre line marking for a distance of at least 60 m beyond the point of tangency where the code number is 3 or 4, and for a distance of at least 30 m where the code number is 1 or 2. Taxiway centre line lights on a rapid exit taxiway should commence at a point at least 60 m before the beginning of the taxiway centre line curve and continue beyond the end of the curve to a point on the centre line of the taxiway where an aeroplane can be expected to reach normal

taxiing speed. The lights on that portion parallel to the runway centre line should always be at least 60 cm from any row of runway centre line lights, as shown in Annex 14, Vol. I, Figure 5-25.

5.6.2.4.3.3 It is recommended that rapid exit taxiway indicator lights (RETILs) should be provided on a runway intended for use in runway visual range conditions less than a value of 350 m and/or where the traffic density is heavy. (Annex 14, Vol 1, 5.3.14.1).

5.6.2.5 Secondary power supply (Annex 14, Vol. I, 8.1)

5.6.2.5.1 The secondary power supply is particularly important to maintain the safety of operations during LVP. For a precision approach runway, a secondary power supply capable of meeting the requirements of Annex 14, Vol. I, Table 8-1 for the appropriate category of precision approach runway shall be provided. (Annex 14, Vol 1, 8.1.6).

5.6.3 *Signs*

5.6.3.1 Runway exit signs and vacated signs

5.6.3.1.1 On an aerodrome intended for operations during LVP, runway exit signs shall be provided (Annex 14, Vol. I, 5.4.3.3). A runway vacated sign shall be provided where the exit taxiway is not provided with taxiway centre line lights and there is a need to indicate to a pilot leaving a runway the perimeter of the ILS/MLS critical/sensitive area or the lower edge of the inner transitional surface whichever is farther from the runway centre line (Annex 14, Vol. I, 5.4.3.4). On an aerodrome intended for operations during LVP, runway vacated signs as mentioned above are recommended in all cases. When establishing LVP, it may be required to limit the number of runway exits, taking into account the traffic density and the availability of adequate means to control the ground operations.

Chapter 6

Operational Considerations

6.1 *Introduction*

6.1.1 Whenever an aerodrome operator wishes to establish operations under Low Visibility Conditions, a large number of operational aspects must be considered in the preparation of the aerodrome and the development of the operational procedures to be used. The type of operations that may be considered in Low Visibility Conditions are departure operations in RVR conditions less than a value of 550 m and CAT II and CAT III approach and landing operations. The primary focus for developing these procedures must be a safety driven exercise to ensure the protection of the runway and of the guidance signals of the non-visual aids and so ensure that these operations can be undertaken safely.

6.1.2 Aircraft may be required to manoeuvre on the aerodrome in very low visibility conditions before take-off and after landing. Ground operations of aircraft during limited visibility conditions become more demanding as visibility decreases. The first objective must be to make the runway area sterile and safe.

6.1.3 The specific equipment and procedures which need to be provided for the safe conduct of these ground operations depend on the aerodrome operating minima chosen and the extent to which aircraft and vehicles may come in conflict. Conflicting traffic may be eliminated by restrictions on the number and type of movements and selection of the right facilities for the particular aerodrome lay-out and traffic density planned. The means adopted will vary with the size and complexity of the manoeuvring area and with the movement rate required.

6.1.4 The first limitation occurs when all or part of the manoeuvring area cannot be visually monitored from the control tower. Procedures and facilities must be implemented to prevent incursions into the manoeuvring area, in particular onto the runway.

6.1.5 The required safety level to avoid collisions between aircraft taxiing to and from the runway in very low visibility conditions may not be achieved without suitable aids and effective assistance by ATC.

6.1.6 In very low visibility conditions, additional means are therefore necessary to ensure that aircraft can move safely, orderly and expeditiously. This may be done by extra visual aids, procedures and/or technical means.

6.2 *Meteorological conditions*

6.2.1 As the MET conditions deteriorate towards the levels specified for operations during Low Visibility Conditions, some additional equipment and LVP will be required to support these operations and to ensure that they can be conducted safely.

6.2.2 The initiation of LVP is determined by ceiling and visibility. The visibility criteria may be based on RVR or visibility reported by MET, depending on the equipment available at the aerodrome and the type of operations being conducted. The aerodrome LVP should include the specific MET criteria for the implementation of LVP and these shall be published in the relevant AIP (Annex 15, Appendix 1).

6.2.3 When the reported MET conditions fall below predefined limits, a preparation phase or an operations phase of LVP shall be in place (See Chapter 9), depending on the actual MET conditions and the type of operations being conducted (PANS-ATM, Chapter 7, 7.12.2).

6.2.4 For a single aircraft operation taking place on an aerodrome, where no MET information is available, the decision to taxi and take-off can be based upon the visibility assessed by the pilot of the aircraft. In this case, the assessment and decision to undertake this operation is the responsibility of the pilot.

6.3 *The use of RVR for ground operations*

6.3.1 The provision of RVR information is primarily to meet the requirements of aircraft landing and take-off operations and not aircraft ground operations in low visibility. The term RVR cannot strictly be applied to ground operations, but the basis for these procedures can be described in terms of visibility conditions that correspond to certain RVR values.

6.3.2 When implementing ground procedures in Low Visibility Conditions, consideration should be given to the visibility over the aprons and taxiways. The introduction of certain procedures (*e.g.* the use of certain elements of an A-SMGCS or additional visual aids) or the use of other elements of the ground procedures (*e.g.* the application of low visibility taxi-routes) may be dependant on the visibility conditions. Since it is not practical or cost effective to measure the visibility on taxiways or specific areas of the manoeuvring area, in practice, the RVR information from one or more observation positions close to the runways could be considered representative for the taxiing routes. The RVR values to be used are subject to local circumstances. Other visibility reports, *e.g.,* visual observations by the MET observers, or pilot reports from taxiing aircraft, if available, should also be taken into consideration. These factors should then be the basis of the decision to introduce specific local procedures or facilities.

6.3.3 At aerodromes where taxi-routes are extensive, the RVR observation positions may not be representative of the particular aircraft ground operations due to large distances and local meteorological factors. In this case these other factors should be taken into account in the determination of local procedures for ground operations.

Note: In this case, the local aerodrome authorities may consider installing additional visibility meters (e.g., forward-scatter meters, which are much cheaper than the transmissometers normally used in the RVR systems) at critical areas in support of their decision making related to the ground operations.

6.4 *Apron management service*

6.4.1 At some aerodromes an Apron Management Service is established to manage the movement of aircraft, vehicles and persons over the apron areas. The safe and effective movement of aircraft and vehicles requires both management and traffic regulation. The demand for traffic regulation will considerably increase in very low visibility where pilots and drivers of vehicles are hampered in identifying position and routing and in their ability to avoid collisions. Therefore, special procedures should be developed by the unit operating the Apron Management Service to manage the movement of aircraft and vehicles on the apron for the lowest visibility conditions under which the aerodrome will maintain operations.

6.4.2 The interface between the Apron Management Service and ATC is particularly important during LVP. A formal agreement between ATC and the Apron Management Service should define the LVP to be used and clearly state the tasks and responsibilities of each party in LVP, in particular including provisions for the movement of vehicles on the apron.

6.5 *Ground vehicles*

6.5.1 The requirement for ATS to be continuously informed of the movements of vehicles and other activities on the manoeuvring area assumes greater importance when LVP are in operation. A vehicle shall be operated on a manoeuvring area only as authorized by the aerodrome control tower and on an apron only as authorized by the appropriate designated authority (Annex 14, Vol. I, 9.7.1).

The driver of a vehicle on the movement area shall be appropriately trained for the tasks to be performed and shall comply with the instructions issued by the aerodrome control tower, when on the manoeuvring area and the appropriate designated authority, when on the apron (Annex 14, Vol. I, 9.7.4). All vehicles employed on the manoeuvring area shall be capable of maintaining two-way radio communication with the aerodrome control tower, except when the vehicle is only occasionally used on the manoeuvring area and is either accompanied by a vehicle with the required communications capability, or employed in accordance with a pre-arranged plan established with the aerodrome control tower (PANS-ATM, Chapter 7, 7.6.3.2.3.1). The driver of a radio-equipped vehicle shall establish satisfactory two-way radio communication with the aerodrome control tower before entering the manoeuvring area and with the appropriate designated authority before entering the apron. The driver shall maintain a continuous listening watch on the assigned frequency when on the movement area (Annex 14, Vol. I, 9.7.5).

6.5.2 In addition, these vehicles should be equipped with a current aerodrome chart permanently available in the driver's cab clearly showing all taxiways, runways, holding positions and vehicle routes marked with their appropriate designation. The chart should be accompanied by written instructions clearly detailing the action that the driver should take in the event that the vehicle should break down or that the driver should become unsure of his position on the aerodrome (Annex 14, Vol. I, 17.4).

6.5.3 The aerodrome control tower shall, prior to a period of application of LVP, establish a record of vehicles and persons currently on the manoeuvring area and maintain this record during the period of application of these procedures to assist in assuring the safety of operations on that area. (PANS-ATM, Chapter 7, 7.12.6).

6.6 *Rescue and fire fighting*

6.6.1 The first need, during emergencies requiring assistance, is to establish the location of the aircraft as accurately as possible and to enable Rescue and Fire Fighting vehicles to proceed to this location. In Low Visibility Conditions this could be the main problem. To obtain a response time as close as possible to the response time achieved in optimum visibility conditions, it is essential to have procedures and facilities for continuous communication between ATC and leading Rescue and Fire Fighting vehicles. All navigation aids available, including the Surface Movement Radar when installed, should be used to assist the Rescue and Fire Fighting vehicles to the location of the emergency.

6.6.2 For optimum deployment of the Rescue and Fire Fighting vehicles during Low Visibility Conditions, strategically located fire stations and/or stand-by positions should be used on the movement area. The actual locations used may be dependant on the visibility conditions in order to ensure that acceptable response times can be maintained. Service roads and emergency access roads should be provided with adequate signs and markings which enable drivers to establish their position and route in the lowest visibility conditions in which the aerodrome maintains operations.

6.7 *Training*

6.7.1 All personnel involved in LVP should be trained and exercises held regularly under conditions which include actual or simulated low visibility. A driver training programme should be in place and authorized drivers should be thoroughly briefed and familiar with the aerodrome layout including closed taxiway junctions and runway access points, the meaning of all markings, signs and aerodrome lighting and, where appropriate, standard RTF phraseology. Drivers that are restricted to certain areas of operation should be familiar with the limits of those areas. Authorized drivers should be checked periodically for competence and knowledge of local procedures (Annex 14, Vol. I, Attachment A, 18.4).

6.7.2 Such training should be conducted in close co-ordination with ATC so that personnel on the movement area become familiar with the limited ability in orientation, the level of assistance which can be given by ATC and other special characteristics of LVP.

6.8 *Autoland operations when LVP are not in operation*

6.8.1 ILS installations may be subject to signal interference by aircraft and other objects. In order to protect the ILS signal during operations in Low Visibility Conditions the sensitive area is protected during LVP. This ensures that the accuracy of the ILS signal is maintained.

6.8.2 There are a number of occasions when pilots wish to perform autoland operations when LVP are not in operation. These may be for pilot qualification and recency, for operational demonstration and in-service proving flights and for system verification following maintenance. In particular, some aircraft operators recommend that their pilots perform autoland operations routinely in order to reduce pilot work load during marginal MET conditions and after long haul flights.

6.8.3 When LVP are not in operation, it is possible that aircraft and vehicles may cause disturbance to the ILS signal. This may result in sudden and unexpected flight control movements at a very low altitude or during the landing and rollout when the autopilot attempts to follow the beam bends. As a result pilots are advised to exercise caution during these operations according to the instructions provided in their Operations Manual.

6.8.4 Pilots should inform ATC if they wish to conduct an autoland with protection of the LSA. In this case, ATC must inform the pilot if protection of the ILS/MLS sensitive area will or will not be provided. In some States, the hours where practice autolands are permitted are published in the AIP.

6.9 *Air Traffic Flow Management*

6.9.1 Operations, particularly at aerodromes where traffic density is high, may be seriously affected by MET related phenomena such as LVP. In such circumstances, appropriate forecasting and close co-ordination by ATC with MET offices and ATFM is essential to enable any capacity reductions to be implemented in time to be effective. Equally, significant changes and/or termination of these reductions to ensure that the actual ATC traffic load is at the optimum level, require similar close co-ordination not only to maintain safety but also to minimize any impact on the aircraft operators in terms of delay.

6.9.2 During the process of planning local procedures to be implemented whenever LVP are initiated/terminated, ATC together with their Flow Management Position (FMP) and other concerned aerodrome operational agencies, should be required to take into account the impact LVP have on the capacity of the aerodrome and should determine these capacities for each type of category which may be declared. Consideration should be given to determining figures for the total capacity, together with the arrival/departure capacities within the total figure.

6.9.3 The provision of MET forecasts to ATC is fundamental to the successful planning of LVP. A co-ordination process should be established to familiarise MET with the requirements for LVP and to provide ATC with forecasts which include the probability of visibility and/or ceiling conditions which may require LVP to be undertaken. These forecasts should be regularly reviewed in order to provide updates of the relevant conditions and advance warning of the expected termination of LVP.

6.9.4 Taking into account forecasts from MET, ATC shall co-ordinate with ATFM to manage the traffic (PANS-ATM Chapter 3, 3.2.5.2) in order to achieve optimum capacity for the aerodrome in the prevailing and expected conditions. The responsible ATS unit, in co-operation with the FMP and the unit providing ATFM services, should determine if ATFM measures are required. The timing of the implementation of any ATFM measures is also considered critical in ensuring a

smooth transition from full capacity to the reduced capacity due to LVP, and equally in the return to normal operations/capacity. Given the very nature of Low Visibility Conditions, experience has shown that it is often necessary to apply ATFM measures early and with a capacity which should be quite restrictive but which can be increased as conditions stabilize/improve. However capacity/acceptance rate should be increased only when there is a reasonable assurance that the MET condition will improve. Such decisions should be taken in close co-ordination with the relevant MET, ATS and FMP units.

6.9.5 In the event of low visibility at the destination airport, the Eurocontrol CFMU applies a regulation based upon the reduced capacity of the destination airport and following the principles listed below:

- Suspend flights with unknown RVR capability .
- Delay flights with insufficient RVR capability until the end of the low visibility period
- Slot flights with sufficient RVR capability within the low visibility period.

Note: The above guidance has been provided by the Eurocontrol CFMU on the application of flow measures within their area of responsibility.

6.9.6 The attention of all parties is drawn to the need for aircraft operators to strictly comply with any ATFM measures in force, including the provision of accurate aerodrome operating minima for individual flights, when requested, with absolute honesty. It should not be forgotten that in Low Visibility Conditions, the need to ensure safety is paramount.

6.9.7 Where ILS and MLS operations are in operation at an aerodrome, the units providing ATFM services may apply enhanced ATFM measures. Details of the aircraft ILS/MLS equipage can be obtained from item 10 of the ICAO Flight Plan Form (FPL). Full details of the MLS requirements are given in Chapter 8.

6.10 *Application of LVP over large operational areas*

6.10.1 The application of LVP is considered in respect of the operation of an aerodrome, including all runways. At certain aerodromes with large geographic areas, MET conditions may vary considerably between different parts of the manoeuvring area. At these aerodromes, there may be a need to consider the possibility that different types of operation could take place on each runway, e.g. CAT I on one runway and CAT III on another runway. This would normally be driven by the need to avoid unnecessary capacity restrictions on a runway where the MET conditions were better than the CAT I minima.

6.10.2 Where requirements exist for different categories of operation on various parts of the aerodrome, considerable care must be taken when establishing the LVP. The safety assessment (see Chapter 2) must consider the whole aerodrome and will depend on local factors such as the physical layout of the aerodrome, the facilities available and environmental issues. The ground movement capacity and the associated SMGCS and A-SMGCS facilities must also be considered to permit any increased movement rate to be handled safely.

6.10.3 The specific requirements for each runway must include the runway protection measures and the protection of the guidance signals of the non-visual aids. Pilots must be aware if LVP are in operation for that runway. The prime objective is to ensure that there is no confusion between the pilot and ATC regarding the category of operation being undertaken and the level of protection in place.

Chapter 7

Surface Movement Procedures

7.1 *Introduction*

7.1.1 The first consideration in respect of surface movement procedures, will be whenever MET conditions are such that all or part of the manoeuvring area cannot be visually monitored from the control tower (Low Visibility Conditions), when specific procedures for the control of aerodrome surface traffic should be applied (PANS-ATM, Chapter 7, 7.12.1). At some aerodromes, it may be acceptable to introduce these procedures without any additional equipment, as the associated reduction in capacity is operationally acceptable. In many cases, the requirement to maintain capacity in Visibility Condition 2 may require some means of surveillance.

7.1.2 It is also considered that, as visibility reduces further, the introduction of a surveillance system and procedures will be required at aerodromes where Low Visibility Operations are conducted. The extent of this provision depends on the operations being conducted and should be appropriate to the level of operations undertaken. This may vary from signs indicating a taxi-route or runway holding position to the most complex advanced technical systems.

7.1.3 The use of Surface Movement Guidance and Control Systems (SMGCS) and an Advanced Surface Movement Guidance and Control System (A-SMGCS) could be an enhancement to the existing surface movement provisions at the aerodrome. These systems are not a requirement to undertake operations during Low Visibility Conditions but may be provided either as a means to maintain the required capacity during Low Visibility Conditions or to ensure the safety of these operations.

7.1.4 The decision to install and operate an adequate surveillance display system (i.e. SMR or A-SMGCS) depends on the operational conditions and requirements of the particular aerodrome (i.e. visibility conditions, traffic density and aerodrome layout). This surveillance display should be used to augment visual observation of traffic and to provide surveillance of traffic on those parts of the manoeuvring area which cannot be observed visually as detailed in PANS-ATM, Chapter 8, 8.10.2.2.

7.1.5 The ability of an adequate surveillance display system (i.e. SMR or A-SMGCS) to support the additional requirements for LVP will then need to be considered. This will be a factor in determining the traffic level that can be safely maintained during these operations. The use of SMR is described in Annex 11 (3.10) and the use of surveillance systems is described in PANS-ATM (Ch 8) and Doc 9830).

7.1.6 At aerodromes with heavy traffic density, surveillance of the manoeuvring area should be required. An adequate surveillance display system (i.e. SMR or A-SMGCS) may considerably increase the ability of ATC to monitor the position of traffic on the aerodrome, to provide traffic information to pilots and vehicle drivers, and it can assist in maintaining the required traffic movement rate in LVP. This includes the assistance of rescue and fire fighting vehicles to an emergency site in order to avoid runway/taxiway incursion and to meet an acceptable response time.

7.1.7 For aerodromes having a medium or light traffic density and/or a system of well segregated ground movement routes, surface movements could be handled without ground surveillance monitoring. Surface movement radar for the manoeuvring area should be provided at an aerodrome intended for use in runway visual range conditions less than a value of 350 m (Annex 14, Vol. I, 9.8.7).

7.1.8 At aerodromes where aircraft operators may need to perform departure operations in RVR conditions less than a value of 550 m only, it may be accepted that LVP simply ensure that only

one aircraft at a time is allowed on the manoeuvring area and that vehicle traffic on the manoeuvring area is controlled and restricted to the essential minimum. The collision avoidance of aircraft could then be based on a procedural method when it has been assessed that an adequate level of safety will be obtained.

7.1.8 The degree of sophistication of the surface movement systems and thus the associated operational limitations should in principle be synchronous with the aerodrome lay-out, expected movement rates and the aerodrome operating minima. At aerodromes where a surveillance display system (i.e. SMR or A-SMGCS) is provided, it should be in operational use during LVP. When an essential component of the surface movement equipment is temporarily unserviceable or does not meet the minimum performance or technical requirements, then the operational use of the aerodrome should be restricted and, as a consequence, the traffic movement rate may be limited. The air traffic flow management unit should be advised of any restriction to traffic flow and a new flow rate declared together with, where possible, the anticipated period of time that the restriction will be in force.

7.1.9 Pilots can be expected to see and avoid other ground traffic in Visibility Condition 2. .During ground operations in Visibility Conditions 3 (normally taken as visibilities equivalent to an RVR of less than 400 m), the visibility is considered insufficient for the pilot to avoid collisions with other aircraft, vehicles and obstacles, solely based on visual reference. This creates the need for additional procedures and/or equipment if the required traffic movement rate is to be continued and an acceptable safety level maintained.

7.1.10 The ground navigation of aircraft (location and taxiing, excluding separation) is at present based on the use of visual aids by the pilot. Great emphasis should therefore be put on the means (and specifications) necessary to enable the pilot to locate the position (location signs, stopbars) and to follow a defined taxi-route (selective taxiing centre line lights, guidance signs) in LVP. Aerodrome charts should be of sufficient detail and clarity to enable pilots to navigate in these conditions.

7.1.11 In that respect, special attention should also be given to specifying an unacceptable level of deficiencies of the required visual aids, the monitoring criteria including the presentation to the ATC unit, and the action to be taken when the movement rate is being affected.

7.1.12 Regardless of visibility conditions, the movement of pedestrians or vehicles on the manoeuvring area shall be subject to authorization by the aerodrome control tower. Persons, including drivers of all vehicles, shall be required to obtain authorization from the aerodrome control tower before entry to the manoeuvring area. Notwithstanding such an authorization, entry to a runway or runway strip or change in the operation authorized shall be subject to a further specific authorization by the aerodrome control tower (PANS-ATM, Chapter 7, 7.6.3.2.1). During visibility conditions corresponding to RVR of less than 550 m, the movement of persons and vehicles on the manoeuvring area should be further restricted to the essential minimum (paragraphs 6.4 to 6.7).

7.2 *Operational requirements*

7.2.1 In every case the provision of the equipment on the ground must be supported by detailed procedures covering the use of the equipment and clearly defined responsibilities for those involved in the procedures such as pilots, controllers, vehicle drivers, apron management personnel and other departments on the aerodrome.

7.2.2 Fall back procedures should be established by the appropriate ATC units in case of a failure of essential components of the SMGCS or A-SMGCS.

7.2.3 LVP shall be initiated by or through the aerodrome control tower. The aerodrome control tower shall inform the approach control unit concerned when LVP will be applied and also

when such procedures are no longer in operation. The procedures should include a description of the responsibilities of the various sections which have a part to play, for example:

a) the sections responsible for the functioning of the visual and non visual aids should be informed by ATC when LVP are in operation;

b) they in turn should immediately advise ATC if the performance of those aids deteriorates below the level promulgated;

c) ATC should advise the sections responsible for the implementation of any safeguarding requirements that LVP are to be implemented;

d) they in their turn should advise ATC when such safeguarding actions are complete; and

e) ATC should inform all relevant agencies (*e.g.* Fire and Rescue, Police, Apron control etc) when LVP brought into operation and when they are cancelled.

Chapter 8

MLS and ILS/MLS Operations

8.1 *Introduction*

8.1.1 This Chapter provides background information to operations that may be required following the introduction of new technology precision approach and landing aids. Details of LVP for ILS and MLS are provided in Chapter 9.

8.1.2 There is a need to consider the operational issues that may arise due to the introduction of new precision approach and landing aids. In this transition particular attention should be given to the use of mixed technology, currently ILS and MLS, on the same runway. It is likely that the same issues will also apply to GNSS.

8.1.3 This Guidance Material is mainly concerned with the steps that should be taken to introduce LVP. Outside LVP, there is normally no major difference between MLS and ILS procedures where ILS look-alike approaches are being conducted. However, the particular items that are required for MLS operations under all visibility conditions, not just in LVP, are covered in the Guidance Material. The introduction of MLS will normally take place on runways which are already equipped with ILS. The resulting co-existing operations with more than one precision approach aid in use requires procedures to be in place for all types of operations. Co-existing ILS/MLS operations will require particular care to ensure that all the relevant guidance signals are protected.

8.1.4 At certain high density aerodromes, the installation of MLS may be associated with the requirement to increase runway capacity in LVP. In this case special procedures may be introduced to permit reduced approach spacing for MLS equipped aircraft while still protecting the ILS signal in co-existing ILS/MLS operations. This will permit the spacing between a leading aircraft on approach and a following aircraft conducting an MLS approach to be reduced below that of a following aircraft conducting an ILS approach.

8.1.5 The MLS equipment on board the aircraft should be notified in the flight plan and appropriate ATC procedures, including provision for the display of such information to relevant control positions, should be in place to handle the mixed equipage. When LVP are in operation, additional procedures should ensure that the approach aid actually being used is identified and the correct spacing between aircraft is used. In LVP, operations on the runway are mainly constrained by the need to protect the ILS critical and sensitive areas. MLS has much smaller protection areas around the runway. This will remove some restrictions on the operation and may offer the opportunity to increase runway capacity in LVP.

8.1.6 When an increase in runway capacity is planned, there may also be the need to review the ground movement capacity and the associated SMGCS and A-SMGCS requirements. There may be a requirement for improved monitoring of traffic on and around the runway to ensure that the increased movement rate is handled safely. Steps should be taken to ensure that the resulting increase in ground movements can be handled safely.

8.2 *MLS operations*

8.2.1 *Introduction*

8.2.1.1 For MLS only operations, the existing ICAO provisions in Annex 14 establish the location of the holding positions and associated visual aids. The MLS critical and sensitive areas are normally sufficiently small as to place no restrictions on aircraft take-off and landing operations on the runway. This will result in the MLS CAT II/III holding position being established at the same place as the holding position used for CAT I operations. The coded centre line should still be provided on runway exits and should extend to the MLS CAT II/III holding position.

8.2.2 *Flight plan*

8.2.2.1 The Repetitive Flight Plan (RPL) may not be the most appropriate means for disseminating information on MLS equipment and it is recommended that a specific Flight Plan (FPL) should be filed for each flight with the letter K in Field 10. An equipment failure before departure or a change to a non-equipped aircraft requires a change message to be sent. This information should be passed to all relevant air traffic services units and all relevant controllers should be informed when an aircraft is MLS equipped.

8.2.3 *ATIS*

8.2.3.1 The AIP for each State should indicate when the pilot is to confirm the approach aid to be used. This will normally be on first contact with approach (or ACC). On the ATIS, the LVP in operation message should be extended to include the requirement to request an MLS approach on first contact with approach control (or ACC). The approach aids normally available for each runway shall be published in the AIP (Annex 15, Appendix 1, **** AD 2.14 Approach and runway lighting, and **** AD 2.19 Radio navigation and landing aids). Any un-serviceability or non-availability of the approach aids shall be included in the ATIS (Annex 11, Chapter 4).

8.2.4 *Approach procedures*

8.2.4.1 In LVP it should be specifically stated on RTF which approach aid will be used, even where the letter “K” is indicated in Item 10 of the flight plan. Local procedures and, where appropriate, letters of agreement should ensure that the information is passed to the relevant approach and aerodrome controllers.

8.2.4.2 Operationally, MLS is implemented as an ILS look-alike and the terms "localizer" and "glidepath" are retained.

8.2.5 *Final approach spacing*

8.2.5.1 Outside LVP, the final approach spacing for MLS will be determined according to existing procedures (e.g. runway occupancy time, radar separation minima and wake turbulence spacing criteria). In LVP, the spacing should be determined according to the requirements to give landing clearance. Spacing should be established to meet the requirement that the preceding landing aircraft is clear of the MLS Landing Clearance Trigger Line (paragraph 8.2.6.2) before the landing aircraft descends below a height of 200 ft above the threshold. The spacing must never be less than the appropriate wake turbulence separation.

8.2.6 *Landing clearance*

8.2.6.1 The introduction of new technology approach and landing aids with small signal protection areas means that there is a need to define alternative methods of determining when landing clearance should be issued in LVP. The MLS localizer critical and sensitive areas are sufficiently small that they normally place no restrictions on aircraft take-off and landing operations on the runway. The issuing of landing clearance is therefore based on the assurance that the runway and surrounding areas are clear of obstructions. This is achieved for persons, vehicles and aircraft on the ground by observing the MLS CAT II/III holding positions.

Note: When ILS is used during LVP, protection of the ILS localiser sensitive area (LSA) is achieved by ensuring that previous landing aircraft have vacated the LSA before issuing landing clearance to a following aircraft. The MLS critical and sensitive areas are sufficiently small as to place no restrictions on aircraft take-off and landing operations on the runway and therefore do not represent a controlling criteria for runway utilisation. This creates the need for a new method of determining when landing clearance can be issued to an arriving aircraft conducting an MLS approach in LVP.

The significant factors in determining the separation between landing aircraft remain those stipulated in ICAO Doc 4444 (PANS-ATM) and the requirements for the OFZ (Annex 14,Vol. 1, Chapter 4). The concept of the "MLS Landing Clearance Trigger Line" may be used, as a first step, to assist those States planning to introduce MLS in the development of ATC procedures to meet the separation requirements. Although not entirely mature, this concept is currently being used as part of the safety assessment of MLS procedures at London Heathrow and is has been noted in the development work undertaken by Eurocontrol. The results will be used to refine the concept and this document will be updated as appropriate.

8.2.6.2 The concept of the MLS Landing Clearance Trigger Line has been established as a tool to assist controllers in determining when to issue landing clearance to an MLS aircraft, supplementing the requirements stipulated in PANS-ATM. The purpose of the MLS Landing Clearance Trigger Line is to indicate to the controller that the required objectives for the landing aircraft will be met during the landing of this aircraft. These objectives will include, as a minimum, the requirement to keep part of the runway strip clear of mobile objects (Annex 14, Vol. I, 3.4.7) and the requirements for the OFZ (Annex 14, Vol. I, Chapter 4). Other factors, such as the number and configuration of runway exits, may also be considered. The concept of operation is that, when the previous landing aircraft in its entirety has crossed the MLS Landing Clearance Trigger Line, landing clearance can be issued to the following MLS aircraft. The position of the MLS Landing Clearance Trigger Line is established such that any other requirements (e.g. in relation to vacating the runway strip when the aircraft crosses the threshold) are also achieved.

8.2.6.3 This line should be established on each side of the runway, running parallel to and for the full length of the runway a fixed distance from the runway centreline. The distance of the MLS Landing Clearance Trigger Line from the runway centreline should be established according to local requirements and based on a safety analysis of all the relevant factors. There may be specific situations, e.g. where a taxiway crosses in front of the elevation antenna where the MLS critical/sensitive areas are relevant, and this should be considered as a special case.

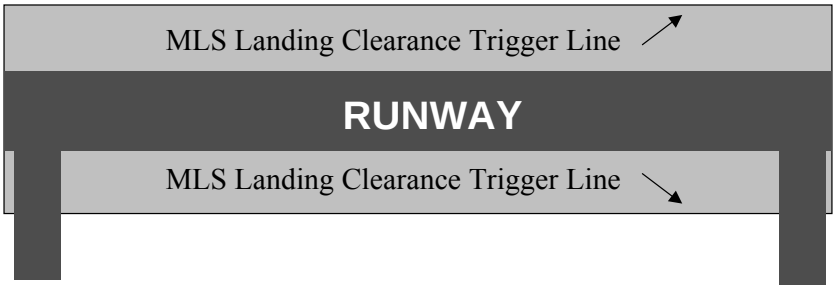

Figure 1: MLS Landing Clearance Trigger Line

8.2.6.4 The MLS Landing Clearance Trigger Line is not marked on the airfield. The line is used purely by ATC as the trigger for issuing landing clearance (e.g. by marking the line on a surveillance display system (i.e. SMR or A-SMGCS). The landing clearance may be issued to an aircraft conducting an MLS approach when the runway is clear and the previous landing aircraft is entirely clear of the MLS Landing Clearance Trigger Line.

8.2.6.5 The concept of the MLS Landing Clearance Trigger Line has been developed for MLS operations, but it is anticipated that it will also be relevant for other new technology approach and landing aids such as GNSS.

8.2.6.6 The prime objective of the procedures is to ensure the safety of the operation. A safety assessment should be undertaken and include all the relevant factors. The possibility that an aircraft will fail to clear the MLS Landing Clearance Trigger Line when this is anticipated, resulting in the need for a following aircraft to conduct a go-around, must be kept to an absolute minimum.

8.2.6.7 The procedures should respect the need for pilots to be kept informed of the traffic situation. In a number of States within the EUR Region, a final safety net is included in the pilots approach procedures in LVP. In these States, for aircraft executing an MLS approach, an absolute descent height restriction of 200 ft before receiving a landing clearance has been set. If the pilot has not received a landing clearance at this point he must go-around. The State of the Aerodrome should ensure that the authorization of LVP with reduced spacing for MLS aircraft includes an equivalent requirement within the pilots procedures.

8.2.6.8 The objective in LVP is that landing clearance for an aircraft conducting an MLS should normally be given before it reaches 1 NM from touchdown. It may be delayed up to the point the aircraft reaches a height of 200 ft above the threshold (approximately 0.62 NM from touchdown, depending on glide slope angle) at the latest. It is the controller's responsibility to give a landing clearance or a go-around instruction, although the controller will be aware that the aircraft will go-around at 200 ft if a clearance is not received. An arriving aircraft should not be allowed to continue beyond 1 NM unless a landing clearance is imminent and there is a high level of assurance that it can be given.

8.2.6.9 For an arrival/arrival runway the preceding landing aircraft must be clear of the runway and the MLS Landing Clearance Trigger Line before landing clearance is given. For an arrival/departure runway, the departing aircraft must be airborne before the landing clearance is given. The landing aircraft will not normally be permitted to cross the runway threshold until the preceding departing aircraft has crossed the end of the runway-in-use (PANS-ATM 7.10.1). The final approach spacing should also take into account the requirements to establish appropriate separation and wake turbulence separation between a departing aircraft and an aircraft conducting a missed approach.

8.2.6.10 The MLS localizer signal may be used for take-off guidance. The MLS azimuth sensitive area is sufficiently small that it can normally be disregarded in the operational procedures.

8.2.6.11 A landing aircraft should be given an unimpeded route to leave the runway and should continue taxiing until reaching the end of the coded taxiway centre line lights. For an MLS only runway, the coded taxiway centre line will extend to the position equivalent to the MLS CAT II/III holding position.

8.2.6.12 In order to apply these procedures with the associated increase in capacity, suitable means should be available to allow the controller to monitor the positions of all the aircraft involved and to determine when the runway and the MLS Landing Clearance Trigger Line are vacated. It is only with the use of a suitable surveillance display system (i.e. SMR or A-SMGCS) that this procedure could be implemented. In the event that the surveillance display is not available, or is out of service, procedures based on the MLS Landing Clearance Trigger Line will not be possible. Alternative procedures should be provided to allow controllers to determine when the runway is vacated (e.g. by instructing pilots to report vacated when clear of the coded taxiway centreline) (Annex 14, Vol. I, 5.3.16.7) (PANS ATM 7.10.3.4).

8.2.6.13 No additional procedures are required for practice MLS approaches or autoland operations.

8.3 ***ILS/MLS operations***

8.3.1 *Introduction*

8.3.1.1 Procedures for co-existing ILS/MLS operations require careful consideration. Any increase in complexity should be taken into account in respect of ATC, ATFM and pilots. These additional procedures, as a minimum, should be in place for co-existing ILS/MLS operations.

8.3.1.2 In conditions where LVP are in operation, persons and vehicles operating on the manoeuvring area of an aerodrome shall be restricted to the essential minimum, and particular regard shall be given to the requirements to protect the ILS/MLS sensitive area(s) when CAT II or CAT III precision instrument operations are in progress; when mixed ILS and MLS CAT II or CAT III precision instrument operations are taking place to the same runway continuously, the more restrictive ILS or MLS critical and sensitive areas shall be protected (Annex 11, Chapter 3, 3.8.2.a and 3.8.2.c).

8.3.2 *ATFM*

8.3.2.1 Where ILS/MLS operations take place, the units providing ATFM services may apply enhanced ATFM measures. Such revised capacity measures should be cognizant of relevant airport procedures, local prevailing traffic mix and other relevant factors.

8.3.3 *Approach procedures*

8.3.3.1 In LVP the type of approach should be included in the approach clearance using the phraseology (PANS-ATM, Chapter 12, 12.3.3.2.d):

CLEARED (type of approach) APPROACH [RUNWAY (*number*)]

8.3.3.2 The pilot must advise ATC before changing the instrument approach aid being used. The change should be acknowledged and steps taken to establish the required spacing. In LVP, when the aircraft is established on the ILS/MLS localizer, it is unlikely that the pilot will be able to change the type of approach and any ground or airborne system failure will result in the instrument approach being discontinued.

8.3.4 *Final approach spacing*

8.3.4.1 In LVP, where co-existing ILS and MLS operations are conducted on a runway, it is essential that the ILS critical and sensitive areas are protected. However, specific procedures may be introduced to permit the spacing for aircraft performing an MLS to be less than for those performing an ILS.

8.3.4.2 Procedures to establish that pilots will be conducting an MLS approach must be in place (paragraph 8.2.4.1).

8.3.4.3 The first consideration is the requirement to provide the appropriate spacing for aircraft conducting an ILS approach. Spacing should be established to meet the requirements for issuing landing clearance to an ILS aircraft and for the protection of the ILS LSA for this aircraft (paragraph 9.4.3).

8.3.4.4 However, when it has been confirmed that aircraft are conducting MLS approaches only, there is no requirement to protect the ILS LSA during the approach and landing of these aircraft. The spacing in front of an aircraft conducting an MLS approach should be based on the requirements to give landing clearance during MLS operations. Spacing should be established to meet the requirements that the preceding landing aircraft is entirely clear of the MLS Landing Clearance Trigger Line before the landing aircraft descends below a height of 200 ft above the threshold.

8.3.4.5 The spacing must never be less than the appropriate wake turbulence separation.

8.3.4.6 In order to confirm the approach aid being used, on the first call to the tower, the pilot should report established on the ILS or MLS.

8.3.4.7 A landing aircraft should continue taxiing until reaching the end of the coded taxiway centre line lights. On an ILS/MLS runway this will be the edge of the ILS LSA.

Chapter 9

Air Traffic Control Low Visibility Procedures

9.1 *Introduction*

9.1.1 The following guidance material should be used for the preparation of specific instructions to controllers and to those responsible for the operations on the aerodrome. This guidance is intended to provide baseline requirements for the development of detailed procedures. The actual LVP required at any aerodrome depends on the type of operations to be conducted at that aerodrome. Prior to the approval of an aerodrome for Low Visibility Operations, the appropriate ATS authority shall establish suitable provisions (PANS-ATM 7.12.2.1). The types of operations that will require LVP are:

a) Departure operations in RVR conditions less than a value of 550 m;

b) CAT II and CAT III Approach and Landing Operations.

9.1.2 Aircraft operators in some States require LVP to be in operation for CAT II/III approach and landing operations and for take-offs when the RVR is below 400 m. However, the provisions of PANS-ATM 7.12.2 require that for control of aerodrome traffic the appropriate ATS authority shall establish provisions applicable to the start and continuation of precision approach CAT II/III operations as well as departure operations in RVR conditions less than a value of 550 m. Such provisions regarding low visibility operations should specify:

a) the RVR value(s) at which the low visibility operations procedures shall be implemented;

b) the minimum ILS/MLS equipment requirements for CAT II/III operations;

c) other facilities and aids required for CAT II/III operations, including aeronautical ground lights, which shall be monitored for normal operation;

d) the criteria for and the circumstances under which downgrading of the ILS/MLS equipment from CAT II/III operations capability shall be made;

e) the requirement to report any relevant equipment failure and degradation, without delay, to the pilots concerned, the approach control unit, and any other appropriate organization;

f) special procedures for the control of traffic on the manoeuvring area, including;

1) the runway-holding positions to be used;

2) the minimum distance between an arriving and a departing aircraft to ensure protection of the ILS/MLS sensitive and critical areas;

3) procedures to verify that aircraft and vehicles have vacated the runway;

4) procedures applicable to the separation of aircraft and vehicles;

g) applicable spacing between successive approaching aircraft;

h) action(s) to be taken in the event low visibility operations need to be discontinued, *e.g.* due to equipment failures; and

i) any other relevant procedures or requirements.

9.1.3 The responsibilities of ATC during these operations do not differ from those in other operations. However since the safety of the operation is much more dependant on the integrity of the ground system than it is in CAT I or non precision operations, additional safeguards are required. Furthermore, the greater complexity in the combinations of airborne systems and ground systems which are acceptable for Low Visibility Operations makes it essential that ATC be in a position to transmit accurate and up to date information to pilots on the status of the various elements of the ground system.

9.1.4 The fact that ATC informs the pilots of the status of the aerodrome facilities and the MET conditions does not mean that they have responsibility for deciding whether or not Low Visibility Operations may be carried out. States establish specific operating procedures for aircraft operators which are published in the aircraft operations manual. The decision to undertake a specific type of operation, and the minima to be applied, is the responsibility of the pilot based upon standard operating procedures (See Chapter 1, para 1.3 Applicable regulations). ATC must keep the pilot informed as to the category of operations which the guidance equipment can support. (***e.g.*** ILS CAT I, II, or III), the status of the relevant MET equipment and visual aids, and of the operation and cancellation of LVP. Based on this information the pilot should be satisfied that appropriate LVP are in operation before commencing a Low Visibility Departure or a CAT II or III approach. …

9.2 ***Safeguarding measures***

9.2.1 There is a need for procedures to provide specific safeguarding measures and surveillance against incursion by vehicles. At some aerodromes the safeguarding arrangements for normal operations may be adequate for CAT II or III operations, (***i.e.*** where there is a continuous security fence around the aerodrome and the only vehicle access to the manoeuvring area is via the apron) but where there are uncontrolled access points, then special procedures will be required to ensure that such access points are secured, ***e.g.*** by closing and locking the gates, unless special surveillance equipment is available which can detect any incursion. The monitoring of the manoeuvring area with such equipment would normally be done by ATC, but the actual carrying out of special safeguarding measures could be the responsibility of other appropriate authorities on the aerodrome provided that the Air Traffic Service is kept fully informed. These measures should also provide for the safety and regulation of all traffic on an aerodrome which has access to the movement area.

9.2.2 The principal factors in determining the extent and complexity of the LVP will be to ensure the protection of the guidance signals used and also to protect the physical area around the runway to ensure the safety of aircraft taking off and landing. This will normally involve the protection of the relevant areas around the runway and the critical and sensitive areas around the antenna of the guidance equipment. The number, size and location of these areas depends on the type of the navigation aid in use (ILS,MLS or GBAS).

9.3 ***Factors to be considered for LVP***

9.3.1 The following are basic principles which should be used in establishing ATC procedures:

a) the requirements during the approach and landing to keep the runway and relevant surrounding areas clear of all obstacles/obstructions;

b) the requirements to strictly control access to the ILS/MLS critical and sensitive areas.

9.3.2 The requirements have been grouped under headings based on the type of operations planned. The *General requirements* sections should be in place for LVP and should be selected according to the types of operation and traffic density at the aerodrome. In addition, the provisions of

the *Low Visibility Departure Operations* or *ILS/MLS operations* sections should also be in place as appropriate according to the type of operation(s) being conducted.

9.4 ***Aircraft spacing required***

9.4.1 *General requirements*

9.4.1.1 A landing aircraft should not stop taxiing until well past the end of the coded taxiway centre line lights. Runway exit points should be kept clear of any aircraft or vehicles to allow landed aircraft to move out of the ILS localizer sensitive area and/or the MLS Landing Clearance Trigger Line with no delay. Instructions to controllers should state that if a landed aircraft is not entirely clear of the ILS localizer sensitive area and/or the MLS Landing Clearance Trigger Line (as appropriate) then the runway is not usable for CAT II or III operations even though the obstructing aircraft may well be clear of the runway itself.

9.4.1.2 If an aerodrome surveillance display system (i.e. SMR or A-SMGCS) is available, the procedures should require that it should be used to monitor the clearance of the ILS localizer sensitive area and/or the MLS Landing Clearance Trigger Line. If it is not available, traffic should be directed to leave the runway where there is a positive indication to the pilot that the aircraft is clear of the ILS localizer sensitive area and pilots be required to report when the entire aircraft is clear of this area. Where a surveillance display is not available, or is out of service, procedures based on the MLS Landing Clearance Trigger Line will not be possible, that is to say that MLS procedures will be the same as ILS with pilots reporting clear of the coded centreline.

9.4.1.3 Wake turbulence separation must always be taken into account. In some cases, the requirements to ensure that the MLS Landing Clearance Trigger Line, critical and sensitive areas are clear will require aircraft spacings in excess of those required for wake turbulence separation. Where the guidance means does not have large critical and sensitive areas to protect (*e.g.* MLS), the wake turbulence separation may be the determining factor for aircraft spacing.

9.4.1.4 The spacing should be varied according to the actual MET and runway conditions at the time. As these conditions deteriorate, pilots will need to taxi more slowly when exiting or crossing the runway and when lining up for take-off. The spacing on final approach should be increased as the MET conditions deteriorate in order to achieve the required objectives. The availability of an adequate surveillance display system (i.e. SMR or A-SMGCS) and appropriate procedures will also be a factor in the choice of final approach spacing. This will enable the position of aircraft entering and leaving the runway to be monitored and an adequate level of situational awareness to be maintained. The actual spacing depends upon the configuration and conditions on the runway and the available exit points.

9.4.1.5 The procedures should accommodate the requirement for aircraft to be able to carry out a stabilized approach; accordingly, they should allow the approaching aircraft to intercept the ILS or MLS at a range of typically 10 NM from touchdown.

9.4.2 *Low Visibility Departure Operations*

9.4.2.1 Safety measures should ensure that the runway is protected against incursions while an aircraft is conducting a departure operation in RVR conditions less than a value of 550 m. This may be achieved through the use of suitable holding positions (*e.g.* where stopbars are installed). At aerodromes with light traffic this may, in the most restrictive case, be achieved by only allowing one aircraft movement at a time and no vehicle movements.

9.4.2.2 Where the ILS localizer guidance is used for guided take-offs, the ILS localizer critical and sensitive areas should be kept clear while an aircraft is conducting a guided take-off until it has overflown the ILS localizer antenna. A subsequent departing aircraft should not be cleared for take-off until the preceding departure has overflown the ILS localizer antenna. The ILS localizer

sensitive area behind the departing aircraft may be infringed, *e.g.* to line up or cross the runway. The MLS azimuth sensitive area is sufficiently small that it can normally be disregarded in the operational procedures.

9.4.3 *ILS operations*

9.4.3.1 To ensure that the integrity of the guidance signal radiated by the ILS is maintained during aircraft approaches, all vehicles and aircraft on the ground should remain outside the ILS critical and sensitive areas. The ILS critical areas must be clear of all vehicles, persons and aircraft at all times.

9.4.3.2 These objectives are normally achieved by providing appropriate spacing between successive landing and/or departing aircraft. This may frequently be in excess of the spacing normally used and this may affect the capacity of the aerodrome. To accord with the basic requirements, the spacing specified should provide sufficient separation between successive approaching aircraft, normally to allow the leading aircraft to land, to vacate the runway, and to clear the ILS localizer sensitive area before the following aircraft reaches a point 2 NM from touchdown. Some States have found that spacing of the order of 10 NM between successive aircraft may be necessary. At aerodromes where the traffic density is low or where the range of the approaching aircraft cannot be monitored by radar, the separation should be increased to enable the leading aircraft to clear the runway and ILS localizer sensitive area before the following aircraft reaches a point 4 NM from touchdown, *i.e.* about the position of the outer marker (or equivalent DME position).

9.4.3.3 When departing aircraft are using the same runway as arriving aircraft, it is essential that the aircraft taking off has passed over the ILS localizer antenna before the arriving aircraft reaches a point on the approach where the interference caused by the overflight will have a critical effect. The aim should be for the departing aircraft to pass over the ILS localizer antenna before the arriving aircraft reaches a point 2 NM from touchdown. The experience in some States is that to achieve this, the departing aircraft must commence its take-off run before the arriving aircraft reaches a point 6 NM from touchdown.

9.4.3.4 Landing clearance should normally be given to an approaching aircraft when the runway and the ILS localizer sensitive area are clear, normally before the time it reaches a point 2 NM from touchdown; exceptionally a clearance may be delayed until 1 NM from touchdown, provided that the pilot is warned to expect a late landing clearance and also provided that the position of the approaching aircraft can be monitored.

9.4.4 *MLS operations*

9.4.4.1 The small size of the MLS sensitive and critical areas mean that these can normally be ignored. Therefore the aircraft spacing is not based on the need to protect the guidance signals but on the need for the preceding aircraft to vacate the runway and the MLS Landing Clearance Trigger Line.

9.4.4.2 The objective is that the runway and the MLS Landing Clearance Trigger Line are vacated before the approaching aircraft descends below a height of 200 ft above the threshold. Spacing should be established such that landing clearance is given before the following aircraft reaches 1 NM from touchdown. It is possible for this to be delayed to less than 1 NM when a landing clearance is imminent and there is a reasonable expectation that it can be given (paragraphs 8.2.6.5 and 8.2.6.6).

9.4.4.3 For a mixed mode arrivals/departure runway, the objective is that departing aircraft must have passed the end of the runway in use before the landing aircraft crosses the beginning of the runway. The spacing should be established such that landing clearance is given before the following aircraft reaches 1 NM from touchdown. It is possible for this to be delayed to less than 1 NM when a

landing clearance is imminent and there is a reasonable expectation that it can be given (paragraphs 8.2.6.5 and 8.2.6.6).

9.4.5 *ILS/MLS operations*

9.4.5.1 Where co-existing ILS and MLS operations are conducted on a runway, it is essential that the ILS critical and sensitive areas are protected. The first consideration is the requirement to provide the appropriate spacing for aircraft conducting an ILS approach (paragraph 9.4.3). However, when it has been specifically stated on RTF that aircraft conducting MLS approaches only (paragraph 8.2.4.1), there is no requirement to protect the ILS LSA during the approach and landing of this aircraft. The spacing in front of an aircraft conducting an MLS approach should be based on the requirements for MLS operations (paragraph 9.4.4). In addition, wake turbulence separation must also be taken into account. The spacing must never be less than the appropriate wake turbulence separation.

9.5 *Ground movements*

9.5.1 There may be some additional requirements for ground operations according to the prevailing visibility conditions. These are also dependant on the physical characteristics of the manoeuvring area and the position of the control tower in this area. Before the MET conditions deteriorate to those required for LVP, the situation may prevail where it becomes difficult for control personnel to monitor the movement of traffic and exercise control on the basis of visual surveillance alone. Procedures and visual aids (signs, markings, lights) should be designed and published to allow the pilot to determine his position and follow the required route.

9.5.2 As the visibility deteriorates towards the levels required for LVP, there might be a need to limit the movement rate taking into account the physical layout of the aerodrome and the availability of a SMR or other technical means. Adequate safeguards against runway incursions should be provided, such as limiting the choice of taxi-routing, additional procedures and/or radar monitoring, stopbars at runway access points or other technical means.

9.5.3 To determine the ability of the pilot to taxi in limited visibility conditions, the following facilities should be taken into account for suitability:

- the taxiway lighting;

- the taxiway markings;

- the location and characteristics of the position and route information signs.

9.5.4 With regard to the control of ground movement of departing aircraft and the movement of vehicles, the instructions from ATC should make it clear which taxiway routes should be used during LVP and which holding positions at runway entries should be used when these differ from those in use during CAT I operations. Standard taxi routes shall be published in the AIP (Annex 15, Appendix 1, **** AD 2.20). All vehicles employed on the manoeuvring area shall be capable of maintaining two-way radio communication with the aerodrome control tower, except when the vehicle is only occasionally used on the manoeuvring area and is either accompanied by a vehicle with the required communications capability, or employed in accordance with a pre-arranged plan established with the aerodrome control tower (PANS-ATM, Chapter 7, 7.6.3.2.3.1). The driver of a radio-equipped vehicle shall establish satisfactory two-way radio communication with the aerodrome control tower before entering the manoeuvring area and with the appropriate designated authority before entering the apron. The driver shall maintain a continuous listening watch on the assigned frequency when on the movement area (Annex 14, Vol. I, 9.7.5). Drivers should be informed of any special requirements in the relevant LVP.

9.6 ***RVR Reports***

9.6.1 ATC shall ensure that the current RVR values for the runway in use are passed to pilots of arriving and departing aircraft (PANS-ATM, Chapter 6, 6.4.1 and 6.6.1). This shall always be given in the landing direction (*i.e.* TDZ, mid-point and stop-end) when multiple values are available (PANS-ATM, Chapter 11, 11.4.3.2.3 and Chapter 12, 12,3,1,7f).

9.6.2 When values for three or more positions are passed, the positions need not be identified provided that the values are given in the correct order, but when only two reports are given, the positions should be identified. If it is not possible to report the RVR for any reason, the MET visibility should be given instead.

9.6.3 LVP should include the requirements for setting the correct runway light intensity during RVR conditions to ensure that correct RVR values are obtained. (Annex 3, Appendix 3, 4.3.5)

9.7 ***Low Visibility Procedures***

9.7.1 The objectives of LVP are to protect the physical area around the runway to ensure the safety of aircraft taking off and landing. They may also provide the means to maintain the safety of movements on the ground. The main concern when developing LVP for ILS based operations is the need to protect the ILS critical and sensitive areas. Any obstruction in these areas, including aircraft and vehicles, may cause undesirable multipath effects which can degrade the signal received by the aircraft and can result in false indications to the pilot. This is true of both the ILS localizer and ILS glidepath systems and this requires measures to ensure these areas remain clear during take-off and landing operations.

9.8 ***Preparation phase***

9.8.1 *General requirements*

9.8.1.1 The transition phases for both the initiation and termination of LVP are in many ways the most important from an operational point of view and it is during these phases that some States have found that the most problems may occur. Any confusion or misunderstanding as to the status of LVP may have safety implications and the change in the status of the operations creates additional demands on pilots and controllers. Careful planning and clear procedures during these phases will reduce the risk of an incident occurring.

9.8.1.2 Prediction of conditions for initiation and termination of LVP is dependent on specific co-ordination with MET. The timescale for this co-ordination will vary according to the type of traffic expected, but for airfields handling significant amounts of long-haul traffic this process may have to commence much more than 12 hours in advance. MET forecasts and any subsequent updates are needed in order to plan the introduction of LVP and to determine the optimum traffic capacity for the aerodrome in the expected conditions.

9.8.1.3 The aerodrome control tower shall co-ordinate with FMP and other ATC units (Approach Control, Area Control) as required to determine, as far as possible, the maximum traffic acceptance rate. This allows the unit providing ATFM services ample time to allow for the regulation of traffic rates and the efficient introduction of LVP.

9.8.1.4 A pre-defined preparation phase for LVP should be implemented when conditions for LVP are imminent. All persons involved with LVP must be informed when this phase is initiated.

9.8.1.5 The preparation phase for LVP should be initiated by the appropriate authority at such a time as to ensure that the procedures and associated safeguarding measures are in place at the latest before the MET conditions fall below CAT I limits or the limits for departure operations in RVR conditions less than a value of 550 m. The trigger point must be clearly defined and included in

the LVP. It is normally related to specific MET criteria reached in a worsening MET situation. If the weather is deteriorating rapidly, the procedures may be initiated at a higher value of RVR, the precise value being a matter for judgement based on experience at the aerodrome and the extent of the preparations required.

9.8.2 *Low Visibility Departure Operations*

9.8.2.1 When the visibility decreases to the predetermined value, and is expected to fall further, the withdrawal of vehicles and persons on the manoeuvring area should be initiated. Where the ILS localizer guidance is used to conduct guided take-offs, the ILS localizer sensitive area should be cleared of all traffic except for the operating aircraft.

9.8.3 *ILS/MLS operations*

9.8.3.1 When the MET criteria decreases to the predetermined trigger value, and is expected to fall further, steps defined in the preparation phase should be taken prior to the introduction of LVP:

- the withdrawal of vehicles and persons involved in construction, maintenance and other non essential activities on the manoeuvring area should be initiated;

- the ILS sensitive area should be cleared of all traffic except for operating aircraft.

9.8.3.2 At a visibility corresponding to 600 m RVR the withdrawal of non essential vehicles and persons from the manoeuvring area should be completed.

9.9 ***Operations phase***

9.9.1 *General requirements*

9.9.1.1 LVP should be in operation at the latest when the MET conditions deteriorate below the lower limit of CAT I operations at the specific aerodrome (the lowest being ceiling below 200 ft and/or RVR less than 550 m). In the case of departures only, LVP should be in operation at the latest when the RVR deteriorates below 550 m. Specific additional measures should be in place as detailed below:

a) all relevant controllers should be aware of the status of LVP and all other relevant personnel should be informed of the status and any changes;

b) ATC should take action to ensure that the runway and relevant surrounding areas are not penetrated by aircraft and vehicles. CAT II and CAT III holding positions may be established and certain predefined taxi-routes may be introduced;

c) protection for aircraft taking off and landing should be achieved by providing the appropriate spacing between landing and/or departing aircraft;

d) stopbars, when provided, should be operated and monitored when LVP are in operation;

e) a surveillance display system (i.e. SMR or A-SMGCS), where available, should be in use.

f) all relevant agencies should be informed that LVP are brought into operation.

9.9.2 *Low Visibility Departure Operations*

a) Procedures should ensure that the runway is protected. At aerodromes with only light traffic this may be achieved by only allowing one aircraft movement at a time and no vehicle movements;

b) Where the ILS localizer guidance is used for guided take-offs, ATC should ensure that the ILS localizer sensitive area is clear before giving clearance for a guided take-off.

9.9.3 *ILS Operations*

a) ATC should take action to ensure that the ILS critical and sensitive areas are protected. This involves ensuring that they are protected from infringement by aircraft and vehicles on the ground. CAT II and CAT III holding positions may be established to meet this requirement and certain predefined taxi-routes should be introduced.

b) ATC will ensure that the ILS sensitive area is clear before issuing clearance for landing and that the ILS localizer sensitive area is clear before issuing take-off clearance for a Guided Take-off.

9.9.4 *MLS operations*

a) ATC should take action to ensure that the runway and the MLS Landing Clearance Trigger Line are protected. This may involve additional procedures to ensure they are protected from infringement by aircraft and vehicles on the ground. This includes the provision of visual aids to mark MLS CAT II and CAT III holding positions and runway exits.

b) ATC will ensure that the requirements for the runway and the MLS Landing Clearance Trigger Line to be clear (paragraphs 8.2.6.5/6) are complied with when issuing take-off and landing clearance.

9.9.5 *ILS/MLS operations*

a) The "Low Visibility Procedures [CAT II or CAT III] in operation" message on the ATIS should be extended to include the requirement to request an MLS approach on first contact with approach control (or ACC).

b) ATC should take action to ensure that the ILS critical and sensitive areas are protected at all times against intrusion by persons, vehicles and aircraft on the ground by observing the ILS CAT II/III holding position and Sensitve Area boundaries.

c) ATC will ensure that the ILS sensitive area is clear before issuing landing clearance for the landing of an aircraft conducting an ILS approach or take-off clearance for an ILS guided take-off. Where special procedures have been introduced to permit reduced approach spacings for MLS equipped aircraft then procedures to establish that pilots will be conducting an MLS approach should be in place. When it has been confirmed that aircraft are conducting MLS approaches only, there is no requirement to protect the ILS LSA during the approach and landing of these aircraft. This will permit the spacing in front of the MLS aircraft to be reduced. ATC will ensure that the requirements for the runway and the MLS Landing Clearance Trigger Line to be clear are complied with for these aircraft.

9.9.6 *Additional measures below a visibility corresponding to an RVR of 400 m*

9.9.6.1 General requirements

a) ATC may accept increased tasks for ground movements, for example to assist in guiding rescue and fire fighting services to the scene of an accident or incident. The additional procedures and/or equipment provided for ATC to maintain the required traffic movement rate and the required safety level during aircraft ground operations should be in force.

b) The operation of ground vehicles in the movement area shall be restricted to the essential minimum (Annex 11, Chapter 3, 3.8.2). Procedures should ensure coordination with all the parties involved as the visibility deteriorates.

c) Additional means for guidance on the apron, like yellow aircraft stand manoeuvring guidance lights should be in operation.

9.10 ***Termination phase***

9.10.1 The termination phase of LVP should be carefully managed in order to ensure a smooth transition back to normal operations. Specific co-ordination with MET should include MET forecasts and any subsequent updates with the objective of predicting the conditions for the termination of LVP.

9.10.2 Commercial interests of operators mean that they consider it desirable for LVP to be removed as soon as conditions allow in order to increase airport capacity and reduce delays. The LVP should include procedures developed for the termination of LVP to ensure an efficient return to normal operations. A common phenomenon of poor visibility is a temporary improvement in visibility, followed by a subsequent reduction in visibility. The removal of LVP before a sustained improvement is evident, can result in the need to re-instate the LVP again when the MET conditions deteriorate.

9.10.3 When the relevant MET conditions improve and it is expected that LVP are to be withdrawn then co-ordination with the unit providing ATFM services is essential. They should be provided with the expected improvement in flow rates and the time from which this improvement will be achieved.

9.10.4 Pilots must be advised of the cancellation of LVP. Where possible, it is of assistance to inform approaching aircraft in advance that LVP will be cancelled at a certain time. This will assist pilots to plan their approaches accordingly, in particular where autoland is involved. For an aircraft which has passed the outer marker, (or equivalent DME position), no changes to the status of LVP should be made.

9.10.5 When LVP are terminated, pilots should immediately be informed, individually if necessary. The ATIS should be updated by removing the "Low Visibility Procedures [CAT II or CAT III] in operation" message.

9.11 ***Equipment failure***

9.11.1 *Introduction*

9.11.1.1 Under normal circumstances, the appropriate facilities should be provided according to the operations being carried out at the aerodrome. The following paragraphs describe the effect on these operations of failures of the ground equipment. It should not be interpreted as meaning that multiple failures are acceptable or that any part of the ground equipment need not be provided. As a general rule, it is expected that every effort should be made to keep the period of non-availability of the failed equipment to an absolute minimum. It is the responsibility of the State of the Aerodrome to define in the aerodrome regulations the maximum acceptable length of time any failure may be permitted, taking into account the effect on safety and any mitigation means available.

9.11.1.2 Should the performance of any visual or non-visual aid deteriorate below the level promulgated, ATC shall inform pilots immediately (Annex 11, Chapter 4, 4.2.1 d)). This information shall also be passed to the approach control unit (Annex 11, Chapter 7, 7.2); in addition, it should be reported to any other appropriate organization (PANS-ATM, Chapter 7, 7.12.5.e) and these deficiencies should be published by NOTAM (Annex 15??).

9.11.1.3 It is important that the information passed by ATC to pilots is clear and unambiguous. In order to meet the needs of the pilots in determining the effect of the failure on the operation, ATC should report the failure in terms of the category of operations which the ILS/MLS can support (CAT I, II or III). As a general rule, a change in the category of operations which the ILS/MLS can support (CAT I, II or III), and changes in the status of the aerodrome lighting, ancillary equipment and the RVR assessment equipment, shall be reported to the pilot (Annex 11, Chapter 4, 4.2.1 d)).

9.11.2 *Effects of ILS/MLS deficiencies*

9.11.2.1 It is recognized that the ILS/MLS classification published in the AIP is of a long-term nature; nevertheless, on a day to day basis due to different causes (*e.g.* equipment defects, environmental effects), the ILS/MLS status may be impaired. With regard to equipment failure, two situations can exist: long-term or short-term deficiencies.

9.11.3 *Long-term deficiencies*

9.11.3.1 In the case of long-term ILS/MLS deficiencies, as for example environmental effects causing deterioration of the localizer or glide path course structure, the ILS/MLS classification can change and the reduced category of operations which the ILS/MLS can support shall be published, *e.g.* by NOTAM (Annex 15, Chapter 5, 5.1).

9.11.4 *Short-term deficiencies*

9.11.4.1 It is an absolute necessity to avoid any misunderstanding by the pilot in the case of a reduced category of operations which the ILS/MLS can support. Aerodrome control towers and units providing approach control service shall be provided without delay with information on the operational status of radio navigation aids essential for approach, landing and take-off at the aerodrome(s) with which they are concerned (Annex 10, Vol. I, 2.8). For that reason, it is necessary to present clear information to the controller on the maximum category of operation which the ILS/MLS can support. In order to provide this information to the controller, it is recommended that an automatic system is used in order to avoid a controller overload and to facilitate a clear and unambiguous report to the pilot. Therefore, this system should provide unmissable alert to the controller for any downgrading of the category of operations which the ILS/MLS can support. It is also essential to report failure of the lighting systems.

9.11.4.2 In order to assist in determining the category of operations that can be supported in the case of the failure of a component of the ILS/MLS system, or a failure of the visual aids, MET equipment and ancillary systems, two tables have been developed to indicate the effect of any failure on the category of operation, as presented in **Appendix B**.

9.11.4.3 The purpose of these tables is to provide ATC and aerodrome operators with information on the items which need to be reported to pilots in case of a failure or downgrading in accordance with paragraphs 9.11.1.3 and 9.11.1.4.

9.11.4.4 The consequences of equipment failures for flight operations are dependent upon the operational regulations for the individual operator. This is presented in the right hand column of the tables (**Appendix B** refers). It should be noted that combinations of failures are only acceptable where specifically authorized in flight operations rules.

Appendix A
SAMPLES
of
AIP entries on LVP

(paragraph 3.3.3 refers)

SAMPLE N°1

EZZZ AD 2.22 Flight and ground procedures

Low Visibility Procedures

1. **Runways and associated equipment**

1.1 Runways 08 and 26 are equipped with ILS and MLS and are approved for CAT III operations, including guided take-off. Runway 21 is equipped with ILS and is approved for CAT II operations. Runway 03 is equipped with ILS and is approved for CAT I operations.

2. **Criteria for the initiation and termination of LVP**

2.1 The preparation phase will be implemented when visibility falls below 1 200 m and/or ceiling is at or below 300 ft and CAT II/III operations are expected.

2.2 The operations phase will be commenced when the RVR falls to 600 m or the ceiling is below 200 ft.

2.3 LVP will be terminated when RVR is greater than 600 m and ceiling is greater than 200 ft and a continuing improvement in these conditions is anticipated.

3. Description of ground marking and lighting

3.1 Runway exits for Runways 08 and 26 are equipped with green/yellow coded taxiway centre line lights.

3.2 Aircraft landing on Runway 21 must only exit via the SOUTH taxiway where white flashing lights indicate the boundary of the ILS localizer sensitive area.

4. **Description of LVP**

a) Pilots will be informed by ATIS or RTF when LVP are in operation.

b) Pilots must request an MLS on first contact with EZZZ Approach.

c) Aircraft will be vectored to intercept the ILS/MLS at least 10 NM from touchdown.

d) The ILS localizer sensitive area will be protected when an ILS landing aircraft is within 2 NM from touchdown. ATC will provide suitable spacing between aircraft on final approach to achieve this objective. It is anticipated that for CAT II operations this spacing will be in the order of 6 NM and for CAT III operations this spacing will be in the order of 8 NM. Spacing in front of an aircraft conducting an MLS approach will be in the order of 5 NM.

e) Guided take-off may be conducted on Runways 08 and 26. Whenever LVP are in operation the ILS localiser sensitive area will be protected for all departing aircraft.

4.1 Departing aircraft are required to use the following CAT II and CAT III holding positions:

Runway 08 – D2 (CAT III)
Runway 26 – A3 or B3 (CAT III)
Runway 21 – E2 (CAT II)

4.2 Intersection take-offs are not permitted.

4.3 Taxiing is restricted to taxiways equipped with centre line lights as indicated on the aerodrome chart. On receiving taxi clearance aircraft must only proceed when a green centre line path is illuminated. In the event of failure of the taxiway lights or stopbars, aircraft are only to taxi on the direction of a "follow me" vehicle.

4.4 Aircraft taxiing for departure on Runway 26 must use Taxiway Bravo to avoid infringing the ILS sensitive area.

4.5 Restrictions on traffic flow

The following hourly traffic rates are anticipated in LVP:

RVR 600 m to 350 m = 15 arrivals / 12 departures.

RVR less than 350 m = 12 or less arrivals / 10 or less departures.

It is expected that these figures will increase according to the proportion of MLS equipped aircraft.

4.6 Multiple use of both Runway 21 and Runway 26 is not permitted in LVP. ATC will designate the runway in use according to the prevailing wind and RVR conditions.

SAMPLE N°2

EXXX AD 2.22 Flight and ground procedures

Low Visibility Procedures

1. **Runways and associated equipment**

1.1 Runway 24 is approved for departure operations in RVR conditions less than a value of 550 m.

2. **Criteria for the initiation and termination of LVP**

2.1 LVP operations will be provided when requested by an aircraft operator to conduct departure operations in RVR conditions less than a value of 550 m. This request should be made a minimum of 30 minutes in advance to permit the appropriate preparations by the aerodrome authority.

3. **Description of ground marking and lighting**

3.1 Entry and exit to Runway 24 is only permitted via Taxiway Alpha.

4. **Description of LVP**

a) Aircraft and vehicle movements will be restricted to one aircraft movement at a time while departure operations in RVR conditions less than a value of 550 m are conducted in order to ensure protection of the runway.

b) Aircraft movements on the apron must only be carried out with the direction of a marshaller.

4.1 Use the holding position for Runway 24 on Taxiway Alpha.

4.2 Taxiing is normally restricted to one aircraft movement at a time. Operation of vehicles on the manoeuvring area is not permitted when departure operations in RVR conditions less than a value of 550 m are in progress. The only taxiway available is Taxiway Alpha to the threshold of Runway 24. This taxiway is equipped with green taxiway centre line lights.

Appendix B

EQUIPMENT FAILURE TO BE REPORTED

LOW VISIBILITY DEPARTURE OPERATIONS AND ILS/MLS APPROACH AND LANDING OPERATIONS

(paragraph 9.11 refers)

EQUIPMENT FAILURE TO BE REPORTED - *LOW VISIBILITY DEPARTURE OPERATIONS*

SYSTEM CONSIDERED	FAILURE TO BE REPORTED ON RTF BY ATC[4]	*EXPECTED EFFECT ON FLIGHT OPERATIONS*
ILS (Where used for guided take-off)	ILS localizer downgraded to CAT II	*No take-off guidance. Guided Take-Off not permitted*
	ILS localizer downgraded to CAT I	*No take-off guidance Guided Take-Off not permitted*
	ILS out of service[1]	*No take-off guidance Guided Take-Off not permitted*
MLS (Where used for guided take-off)	MLS downgraded to CAT II	*No take-off guidance Guided Take-Off not permitted*
	MLS downgraded to CAT I	*No take-off guidance Guided Take-Off not permitted*
	MLS out of service[1]	*No take-off guidance Guided Take-Off not permitted*
RVR	Touchdown RVR system unserviceable	*Restriction depending on State of aerodrome regulations and operation rules*
	(*Other*) RVR systems unserviceable	*Restriction depending on flight operation rules*
LIGHTING SYSTEMS	Runway lighting unserviceable	*Restriction depending on flight operation rules*
	Standby power supply unserviceable[2]	*Restriction depending on State of aerodrome regulations and operation rules*
	Runway centre line lighting unserviceable [3]	*Restriction depending on flight operation rules*
	Runway edge lighting unserviceable [3]	*Restriction depending on flight operation rules*
	Taxiway lighting system unserviceable [3]	*Restriction depending on flight operation rules*
ANCILLARY	Stop bars unserviceable	*No effect if runway protection is ensured by other means*
	Ceilometer unserviceable	*No effect*
	Anemometer unserviceable	*No effect if other sources available otherwise restriction depending on flight operation rules*

(1) - This may be caused by the failure of a component of the complete ILS or MLS system (*e.g.* failure of the localizer/Azimuth or failure of the status monitoring equipment).

(2) - Generally, a single standby power supply is provided for all lighting systems.

(3) - When a portion of the lighting system is unserviceable, then this should be reported as a percentage when evenly distributed and the lighting pattern is not distorted (e.g. if 1 in 4 lights is unserviceable the "*25% of runway centreline unserviceable*") or otherwise the failure should be described in full

(4) - And to be reported on ATIS as appropriate (see para 3.3.3)

EQUIPMENT FAILURE TO BE REPORTED - *ILS/MLS APPROACH AND LANDING OPERATIONS*

SYSTEM CONSIDERED	FAILURE TO BE REPORTED ON RTF BY ATC[4]	*EXPECTED EFFECT ON FLIGHT OPERATIONS*
ILS	ILS downgraded to CAT II	*Flight operations limited to CAT II*
	ILS downgraded to CAT I	*Flight operations limited to CAT I*
	ILS out of service[1]	*Restricted to non precision approach (or other precision approach aid if available)*
	Outer Marker unserviceable	*No limitation if replaced by published equivalent position, otherwise restricted to non-precision approach*
	Glide path out of service	*Restricted to non-precision approach (e.g. localizer only)*
MLS	MLS downgraded to CAT II	*Flight operations limited to CAT II*
	MLS downgraded to CAT I	*Flight operations limited to CAT I*
	MLS out of service[1]	*Restricted to non-precision approach (or other precision approach aid if available)*
DME	DME (as alternative to marker beacons) unserviceable	*No limitation if replaced by published equivalent position, otherwise restricted to non-precision approach*
RVR	Touchdown RVR system unserviceable	*Restriction depending on State of Aerodrome regulations and operation rules*
	(*Other*) RVR systems unserviceable	*Restriction depending on flight operation rules*
LIGHTING SYSTEMS	Approach lighting unserviceable [3]	*Restriction depending on flight operation rules*
	Runway lighting unserviceable	*Restriction depending on flight operation rules*
	Standby power supply unserviceable[2]	*Restriction depending on State of Aerodrome regulations and operation rules*
	Runway centre line lighting unserviceable [3]	*Restriction depending on flight operation rules*
	Runway edge lighting unserviceable [3]	*Restriction depending on flight operation rules*
	Touch Down Zone lighting unserviceable [3]	*Restriction depending on flight operation rules*
	Taxiway lighting system unserviceable	*Restriction depending on flight operation rules*
ANCILLARY	Stop bars unserviceable	*No effect if runway protection is ensured by other means*
	Ceilometer unserviceable	*No effect*
	Anemometer unserviceable	*No effect if other sources available otherwise restriction depending on flight operation rules*

(1) - This may be caused by the failure of a component of the complete ILS or MLS system (*e.g.* failure of the localizer/Azimuth or failure of the status monitoring equipment).
(2) - Generally, a single standby power supply is provided for all lighting systems.
(3) - When a portion of the lighting system is unserviceable, then this should be reported as a percentage when evenly distributed and pattern is not distorted (e.g. if 1 in 4 lights is unserviceable the "*25% of runway centreline unserviceable*") or otherwise the failure should be described in full.
(4) - And to be reported on ATIS as appropriate (see para 3.3.3)

Appendix C
Actions to be considered within the LVP Safety Assessment Process

(paragraph 2.1.5 refers)

1. A safety assessment process must be carried out for any significant changes in the provision of ATS procedures and for the introduction of new equipment, systems or facilities. This includes the establishment of LVP and any subsequent changes to the equipment or procedures associated with LVP. Further guidance on the safety assessment process is provided in Chapter 2 of this Guidance Material.

2. The safety assessment should include representatives of all the sections that are concerned with the change such as the aerodrome operating authority, air traffic services, MET services, the major aircraft operators and the sections responsible for the visual and non-visual aids. Where national aviation safety authorities have established a Runway Safety Team as recommended by the European Action Plan for the Prevention of Runway Incursions (EAPPRI), the composition of any working group should be closely co-ordinated, or include such members, to ensure consistency and harmonization.

3. Generally, but not exclusively, the following actions should be taken to identify potential areas of problems and hazards, to derive risks, and to implement any mitigation measures:

i) Establish a working group consisting of experts from all relevant sections;

ii) Examine aeronautical meteorological records and movement statistics for aircraft and vehicles to provide information on the MET phenomena and movement rates that can be expected;

iii) Determine the type of operations to be conducted (departure operations with RVR less than 550 m and/or CAT II/III approach and landing operations);

iv) Consider the probability of a runway incursion, taking into account the increased difficulty for vehicles and aircraft to navigate in the conditions of reduced visibility. This could be the result of an inadvertent incursion by an aircraft, vehicle or person:-

a) onto the runway and associated OFZ which might result in a collision with an aircraft landing, or taking-off, or;

b) into the critical and sensitive areas which would result in a disturbance of the guidance signal (*e.g.* ILS or MLS).

v) Examine any past records of runway incursion and taxiway junction incidents to identify areas of risk (hot spots) and consider the introduction of suitable mitigation measures. If no records are available it may be necessary to establish a picture of past incursions and incidents by gathering information from controllers and inspecting authorities, etc.

vi) Examine the aerodrome lay-out with particular attention to taxi-routes between aprons and runways, ground traffic routes, ground traffic control points, movement area entrances and existing aids to assess any additional risks to the operation. This may result in the requirement for additional procedures or equipment (e.g. closing of roads/taxiways in LVP or additional visual aids);

vii) Institute a study of the suitability of the existing ATC instructions, operation orders and company rules for safe ground operations under Low Visibility Conditions, identifying areas for improvement or the need for new provisions;

viii) Examine existing airport security measures. The use of general security measures may have significant effect upon the overall incursion probability;

ix) Conduct an inspection on the aerodrome to verify the actual situation regarding paragraphs i) through viii) by the relevant experts and responsible authorities;

x) Determine the mitigation measured required to eliminate the risks identified in the safety assessment process (e.g. amended operating procedures, visual aids or new equipment such as an adequate surveillance display system (ie.. SMR or A-SMGCS)). Implement the mitigation measures as appropriate;

xi) Develop and publish the detailed ATC Low Visibility Procedures (LVP);

xii) Institute a training and education process for all parties (ATC, pilots, vehicle drivers, other relevant staff). In particular, consider the need to initiate a local runway safety awareness campaign for controllers, pilots, vehicle drivers and other personnel who operate on or near the runway;

xiii) Commence an ongoing monitoring and review process to ensure that the mitigation measures are effective, to investigate any incidents that may threaten the continued safety of the operations, and to ensure that the safety of these operations in maintained.

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