CIVIL AVIATION AUTHORITY OF BANGLADESH
AIR NAVIGATION ORDERS

AIRWORTHINESS REQUIREMENTS

PART E - AIRCRAFT EQUIPMENT

CHAPTER E.1	**AIRCRAFT FIRST AID KITS AND EMERGENCY MEDICAL KITS**

SECTIONS

1. GENERAL
2. REQUIREMENT-FIRST AID KIT CONTAINERS
3. REQUIREMENT - EMERGENCY MEDICAL KITS
4. DESIGN STANDARDS - FIRST AID AND EMERGENCY MEDICAL KITS
5. CERTIFICATION

1. GENERAL

1.1 This Order prescribes the requirements for the carriage of first aid kits and emergency medical kits on Bangladesh aircraft, and for the standards and certification thereof.

2. REQUIREMENT - FIRST AID KITS

2.1 Unless otherwise approved by the Chairman, no Bangladesh registered aircraft shall be flown unless it is equipped for the treatment of injuries or medical emergencies likely to occur in flight or in minor accidents with at least:

(a) One first aid kit where the aircraft has not more than 50 passenger seats.

(b) Two first aid kits where the aircraft has at least 51 but not more than 150 passenger seats.

(c) Three first aid kits where the aircraft has at least 151 but not more than 250 passenger seats.

(d) Four first aid kits where the aircraft has more than 250 passenger seats.

2.2 Each-first aid kit shall be stowed inside the aircraft:

(a) In locations that are appropriately and conspicuously marked in Bengali and English and are readily accessible to the occupants of the aircraft.

(b) As close as practicable to an emergency exit for aircraft equipped with one first aid kit.

(c) In dispersed locations when the aircraft is equipped with more than one first aid kit.

2.3 Each first aid kit shall contain a first aid handbook written in English, an inventory of contents affixed to the inside of the lid and at least:

(a) 16 adhesive bandage compresses, 1 inch.

(b) 20 antiseptic cleansing wipes.

(c) 8 bandage compresses, 4 inch.

(d) 4 roller bandage, 4 inch

(e) 2 adhesive tape, 1 inch, standard roll.

(f) 5 triangular bandage compresses, 40 inch.

(g) 1 arm splint, non-inflatable,

(h) 1 leg splint, non-inflatable,

(i) 10 ammonia inhalants,

(j) 6 burn compound, 1/8 oz.

(k) Scissors and safety pins.

3. REQUIREMENT - EMERGENCY MEDICAL KITS

3.1 Each passenger carrying Bangladesh registered aircraft engaged in international commercial air transport service shall be equipped with at least one emergency medical kit.

3.2 Each emergency medical kit shall be stowed securely in a clearly marked location readily accessible to crew members, and in a manner to keep it free from dust, moisture and temperature extremes.

3.3 Each emergency medical kit shall contain basic instructions for the use of drugs in the kit, an inventory of contents and at least:

(a) 1 sphygmomanometer.

(b) 1 stethoscope.

(c) 3 airways, oropharyngeal (3 sizes).

(d) 4 syringe (sizes appropriate to drugs to administer).

(e) 6 needles (sizes appropriate to drugs to administer).

(f) 1 50% dextrose injection, 50cc.

(g) 2 epinephrine 1:1000 single dose ampule or equivalent.

(h) 2 diphenhydramine HCl injection single dose ampule or equivalent.

(i) 10 nitroglycerin tablets.

4. DESIGN STANDARDS • FIRST AID AND EMERGENCY MEDICAL KIT CONTAINERS

4.1 Each first aid and each emergency medical kit container shall:

(a) Be constructed to prevent dust and moisture contamination.

(b) Be constructed of non-flammable material.

(c) For first aid kit containers, nave the words FIRST AID in Bengali and English, and a red crescent, prominently and permanently displayed.

(d) For emergency medical kit containers, have the words EMERGENCY MEDICAL in Bengali and English, and a red crescent, prominently and permanently displayed.

(e) Be permanently marked with a serial number.

(f) Be provided with a positive seal such that the container can not be opened without breakage of the seal being obvious.

5. CERTIFICATION

5.1 The contents and serviceability of the contents for each first aid kit and each emergency medical kit shall initially, and subsequently at twelve month intervals, be verified and certified by a medical officer or by an authorised representative of an approved safety equipment shop.

5.2 The certification shall be affixed to the container exterior and shall contain the serial number, date of certification, expiry date and signature and authorization number of the person certifying.

Issued in pursuance to the Civil Aviation Rules 1984, Rule 4 and Rule 156.

CIVIL AVIATION AUTHORITY OF BANGLADESH
AIR NAVIGATION ORDERS

AIRWORTHINESS REQUIREMENTS

PART E - AIRCRAFT EQUIPMENT

CHAPTER E.2	FLIGHT DATA RECORDER

Section No.	Title
1.	GENERAL
2.	DEFINITIONS
3.	DESIGN STANDARDS
4.	REQUIREMENTS
5.	OPERATION AND CONTINUED SERVICEABILITY
6.	INSPECTION OF FLIGHT RECORDER SYSTEM
7.	CALIBRATION OF FLIGHT RECORDER SYSTEM
8.	EXEMPTION

1. GENERAL

1.1 This Order prescribes the requirements for the carriage of Flight Data Recorder on all aircraft registered in Bangladesh and also foreign registered aircraft to be operated in Commercial Operations under Air Operator Certificate (AOC) issued by the Chairman CAAB.

1.2 The Operators shall also refer to the ANO (Airworthiness) Chapter E.6 for information on the requirements of equipment, systems and instruments that are required to be installed on applicable aircraft.

2. DEFINITIONS

2.1 For the purpose of this Order, the definitions as mentioned under the Rule 2 and 183 of the Civil Aviation Rules, 1984 shall apply. Where a particular definition is not given under the rule, the under mentioned definitions shall apply:

(a) **"Flight Recorders"** means two recorders, a Flight Data Reorder (FDR) and a Cockpit Voice Recorder (CVR).

(b) **"Flight Data Recorder (FDR)"** means type of recorder installed in the aircraft for recording of specified flight parameters for the purpose of complementing accident/incident investigation, that meets the current recording requirements approved by the Chairman.

(c) **"Cockpit Voice Recorder (CVR)"** means type of recorder installed in the aircraft for recording of the aural environment on the flight deck during flight times for the purpose of complementing accident/incident investigation that meets the current recording requirements approved by the Chairman.

(d) **"Type I FDR"**, **"Type II FDR"**, **"Type IIA FDR"**," **Type IV FDR"** and **"Type V FDR"** means the type of FDRs prescribed in the ICAO Annex-6.

3. DESIGN STANDARD

3.1 The minimum design standard for a flight data recorder installed in an aircraft shall be in accordance with the requirements of the ANO (Airworthiness) Chapter A.1 of these orders.

3.2 All FDRs installed in aeroplanes shall be capable of retaining the information recorded during at least the last 25 (twenty five) hours of their operation, except for the Type IIA FDR which shall be capable of retaining the information recorded during at least the last 30 (thirty) minutes of its operation.

3.3 Type IV and type V flight data recorders installed in helicopters shall be capable of retaining the information recorded during at least the last 10 (ten) hours of their operation.

4. REQUIREMENTS

4.1 All aeroplanes of a maximum certificated take-off mass (MCTM) of over 27000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 1989, shall be equipped with a Type I flight data recorder.

4.2 All aeroplanes of a MCTM of over 5700kg, up to and including 27000kg, for which the individual certificate of airworthiness is first issued on or after 1 January, 1989 shall be equipped with a Type II flight data recorder.

4.3 All turbine-engined aeroplanes of a MCTM of over 5700kg, for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989 except those mentioned in the paragraph 4.4 of this ANO shall be equipped with a flight data recorder which shall record time, Altitude, airspeed, normal acceleration and heading.

4.4 All turbine-engined aeroplanes of MCTM of over 27000kg that are of types of which the prototype was certificated by the appropriate national authority after 30 September 1969 but for which the individual certificate of airworthiness was first issued on or after 1 January 1987 but before 1 January 1989, shall be equipped with a Type II flight data recorder.

4.5 All turbine-engined aeroplanes of a MCTM of over 5700kg for which the individual certificate of airworthiness was first issued before 1 January 1987, shall be equipped with a flight data recorder which shall record time, altitude, airspeed, normal acceleration and heading.

4.6 All aeroplanes of a MCTM of 5700kg or less for which the individual certificate of airworthiness is first issued after 1 January 2005, shall be equipped with a Type IA flight data recorder (FDR).

4.7 All aeroplanes for which the individual certificate of airworthiness is first issued after 1 January 2005, which utilize data link communications and are required to carry a CVR, shall record on a flight recorder, all data link communications to and from the aeroplane. The minimum recording" duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

4.8 From 1 January 2007, all aeroplanes which utilize data link communications and are required to carry a CVR shall record on a flight recorder, all data link communications to and from the aeroplane. The minimum recording duration shall be equal to the duration of the CVR, and shall be correlated to the recorded cockpit audio.

4.9 All helicopters of a maximum certificated take-off mass of over 7000kg for which the individual certificate of airworthiness is first issued on or after 1 January 1989 shall be equipped with a Type IV flight data recorder.

4.10 From 1 January 2005, all helicopters equipped to utilize digital communications and required to carry a cockpit voice recorder, shall record on the cockpit voice recorder or the flight data recorder the digital communication messages with ATS.

4.11 The use of engraving metal foil FDRs shall be discontinued by 1 January 1995.

4.12 The use of photographic film FDRs shall be discontinued from 1 January 2003.

4.13 All aeroplanes of a maximum certificated take-off mass of over 5700 kg for which the individual certificate of airworthiness is first issued after 1 January 2005 shall be equipped with a Type IA FDR.

4.14 All turbine-engined aeroplanes of a maximum certificated take-off mass of 5 700 kg or less for which the application for type certification is submitted to a Contracting State on or after 1 January 2016 shall be equipped with:

a. Type II FDR; or

b. A Class C AIR or AIRS capable of recording flight path and speed parameters displayed to the pilot(s);

c. an ADRS capable of recording the essential parameters defined in Table 1 of Appendix 1.

4.15 All aeroplanes which are required to record normal acceleration, lateral acceleration and longitudinal acceleration for which the application for type certification is submitted to a Contracting State on or after 1 January 2016 and which are required to be fitted with an FDR shall record those parameters at a maximum sampling and recording interval of 0.0625 seconds.

4.16 All aeroplanes which are required to record pilot input and/or control surface position of primary controls (pitch, roll, yaw) for which the application for type certification is submitted to a Contracting State on or after 1 January 2016 and which are required to be fitted with an FDR shall record those parameters at a maximum sampling and recording interval of 0.125 seconds.

4.17 The use of analogue FDRs using frequency modulation (FM) shall be discontinued.

4.18 The use of magnetic tape FDRs shall be discontinued by 1 January 2016.

4.19 Non-deployable flight recorder containers shall have securely attached an automatically activated underwater locating device operating at a frequency of 37.5 kHz. At the earliest practicable date, but not later than 1 January 2018, this device shall operate for a minimum of 90 days.

5. OPERATION AND CONTINUED SERVICEABILITY

5.1 FOR recorder installed in accordance with these requirements shall not be switched off during flight time.

5.2 To preserve FDR records, the flight recorders shall be de-activated upon completion of flight time following an accident or incident. The flight recorders shall not be re- activated before their disposition is determined by the Chairman.

5.3 An operator shall ensure, to the extent possible, in the event the aircraft becomes involved in an accident or incident, the preservation of all related flight recorder records, and if necessary the associated flight recorders, and their retention in safe custody pending their disposition by the Chairman.

5.4 Operational checks and evaluations of recordings from the FDR and CVR systems shall be conducted to ensure the continued serviceability of the recorders. Operator shall have to maintain documentation concerning parameter allocation, conversion equations, periodic calibration and other serviceability/maintenance information. The documentation needs to be sufficient to ensure that accident investigation authorities have the necessary information to read out the data in engineering units.

5.5 The pilot-in-command and the Operator shall ensure that:

(a) The FDR shall be operated continuously from brakes release on take off until it has completed the landing;

(b) All recorded data is kept until the aircraft has been operated for at least 25 (twenty five) hours after each operating cycle;

(c) A maximum of 1 (one) hour of recorded data may be erased for the purpose of testing the flight recorder of the flight recorder system; and

(d) All erasure must be recorded in the appropriate maintenance documentation.

6. INSPECTION OF FLIGHT RECORDER SYSTEM

6.1 Prior to the first flight of the day, the built-in test features for the flight recorders and flight data acquisition unit (FDAU), when installed, shall be monitored by manual and/or automatic checks.

6.2 FDR systems shall have recording system inspection intervals of one year. This period may be extended to two years provided these systems have demonstrated a high integrity of serviceability and self-monitoring.

7. CALIBRATION OF FLIGHT RECORDER SYSTEM

7.1 For those parameters which have sensor dedicated only to the FDR and are not checked by other means, recalibration shall be carried out at least every five (05) years or in accordance with the recommendations of the sensor manufacturer to determine any discrepancies in the engineering conversion routines for the mandatory parameters and to ensure that parameters are being recorded with the calibration tolerances; and

7.2 When the parameters of altitude and airspeed are provided by sensors that are dedicated to the FDR system, there shall be a recalibration performed as recommended by the sensor manufacturer or at least every two years.

8. EXEMPTION

8.1 Where a FDR becomes inoperative but the CVR is serviceable and functioning, an aircraft may be flown on such flights in accordance with the CAAB approved MEL.

8.2 An aircraft in which both the FDR and the CVR are inoperative shall not commence a flight unless authorized by Chairman.

8.3 Where a flight is authorized under paragraph 6.2 of this order, the operator of the aircraft shall make and retain a report of the circumstances relating to the authorization for a period of 6 (six) months from the date of the authorization.

This order is issued in pursuance of the Rules 4 and 107 of the Civil Aviation Rules, 1984. The ANO is a complete re-issue and supersedes the issue 3, dated 28 February, 2002.

AIR VICE MARSHAL M MAFIDUR RAHMAN
BBP, BSP, BUP, ndu, afwc, psc
Chairman
Civil Aviation Authority of Bangladesh

Table-1

No.	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
1	Heading (Magnetic or True)	R*	±180 degrees	1	±2 degrees	0.5 degree	* If not available, record rates
2	Pitch attitude	E*	±90 degrees	0.25	±2 degrees	0.5 degree	* If not available, record rates
3	Roll attitude	E*	±180 degrees	0.25	±2 degrees	0.5 degree	* If not available, record rates
4	Yaw rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no heading available
5	Pitch rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no pitch attitude available
6	Roll Rate	E*	±300 degrees/s	0.25	±1% + drift of 360°/hr	2 degree/s	* Essential if no roll attitude available
7	Positioning system: latitude/longitude	E	Latitude:±90 degrees Longitude:±180 degrees	2 (1 if available)	As installed (0.00015 degree recommended)	0.00005 degree	
8	Positioning system: estimated error	E*	Available range	2 (1 if available)	As installed	As installed	* If available
9	Positioning system altitude	E	–300 m (–1 000 ft) to maximum certificated altitude of aeroplane +1 500 m (5 000 ft)	2 (1 if available)	As installed (±15 m (±50 ft) recommended)	1.5 m (5 ft)	
10	Positioning system: time*	E	24 hours	1	±0.5 second	0.1 second	* UTC time preferred where available.
11	Positioning system: ground speed	E	0–1 000 kt	2 (1 if available)	As installed (±5 kt recommended)	1 kt	
12	Positioning system: channel	E	0–360 degrees	2 (1 if available)	As installed (± 2 degrees recommended)	0.5 degrees	
13	Normal acceleration	E	–3 g to + 6 g (*)	0.25 (0.125 if available)	As installed (± 0.09 g excluding a datum error of ±0.45 g recommended)	0.004 g	
14	Longitudinal acceleration	E	±1 g (*)	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	

No.	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
15	Lateral acceleration	E	±1 g (*)	0.25 (0.125 if available)	As installed (±0.015 g excluding a datum error of ±0.05 g recommended)	0.004 g	
16	External static pressure (or pressure altitude)	R	34.4 mb (3.44 in-Hg) to 310.2 mb (31.02 in-Hg) or available sensor range	1	As installed (±1 mb (0.1 in-Hg) or ±30 m (±100 ft) to ±210 m (±700 ft) recommended)	0.1 mb 0.01 in-Hg) or 1.5 m (5 ft)	
17	Outside air temperature (or total air temperature)	R	–50° to +90°C or available sensor range	2	As installed (±2°C recommended)	1°C	
18	Indicated air speed	R	As the installed pilot Display measuring system or available sensor range	1	As installed (±3 % recommended)	1 kt (0.5 kt recommended)	
19	Engine RPM	R	Full range including overspeed condition	Each engine each second	As installed	0.2% of full range	
20	Engine oil pressure	R	Full range	Each engine each second	As installed (5% of full range recommended)	2% of full range	
21	Engine oil temperature	R	Full range		As installed (5% of full range recommended)	2% of full range	
22	Fuel flow or pressure	R	Full range	Each engine each second	As installed	2% of full range	
23	Manifold pressure	R	Full range	Each engine each second	As installed	0.2% of full range	
24	Engine thrust/power/ torque parameters required to determine propulsive thrust/ power*	R	Full range	Each engine each second	As installed	0.1% of full range	* Sufficient parameters e.g. EPR/N1 or torque/Np as appropriate to the particular engine shall be recorded to determine power in both normal and reverse thrust. A margin for possible overspeed should be provided.
25	Engine gas generator speed (Ng)	R	0-150%	Each engine each second	As installed	0.2% of full range	

No.	Parameter name	Parameter category	Minimum recording range	Maximum recording interval in seconds	Minimum recording accuracy	Minimum recording resolution	Remarks
26	Free power turbine speed (Nf)	R	0-150%	Each engine each second	As installed	0.2% of full range	
27	Coolant temperature	R	Full range	1	As installed (±5°C recommended)	1 degree Celsius	
28	Main voltage	R	Full range	Each engine each second	As installed	1 Volt	
29	Cylinder head temperature	R	Full range	Each cylinder each second	As installed	2% of full range	
30	Flaps position	R	Full range or each discrete position	2	As installed	0.5 degree	
31	Primary flight control surface position	R	Full range	0.25	As installed	0.2 % of full range	
32	Fuel quantity	R	Full range	4	As installed	1% of full range	
33	Exhaust gas temperature	R	Full range	Each engine each second	As installed	2% of full range	
34	Emergency voltage	R	Full range	Each engine each second	As installed	1 Volt	
35	Trim surface position	R	Full range or each discrete position	1	As installed	0.3% of full range	
36	Landing gear position	R	Each discrete position*	Each gear every two seconds	As installed		* Where available, record up-and-locked and down-and-locked position
37	Novel/unique aircraft features	R	As required	As required	As required	As required	

Key:

E: Essential parameters
R: Recommended parameters

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PART E - AIRCRAFT EQUIPMENT

CHAPTER E.3	COCKPIT VOICE RECORDER

Section No.	Title
1.	GENERAL
2.	DEFINITIONS
3.	DESIGN STANDARDS
4.	REQUIREMENTS
5.	OPERATION AND CONTINUED SERVICEABILITY
6.	EXEMPTION

1. GENERAL

1.1 This Order prescribes the requirements for the carriage of Cockpit Voice Recorder on all aircraft registered in Bangladesh and also foreign registered aircraft to be operated in Commercial Operations under Air Operator Certificate (AOC) issued by the Chairman CAAB.

1.2 The Operators shall also refer to ANO (Airworthiness) Chapter E.6 for information on the requirements of equipment, systems and instruments that are required to be installed on applicable aircraft.

2. DEFINITIONS

2.1 For the purpose of this Order, the definitions as mentioned under the Rule 2 and 183 of the Civil Aviation Rules, 1984 shall apply. Where a particular definition under the rule, the under mentioned definitions shall apply:

(a) **"Flight Recorders"** means two recorders, a Flight Data Recorder (FDR) and a Cockpit Voice Recorder (CVR).

(b) **"Flight Data Recorder (FDR)"** means type of recorder installed in the aircraft for recording of specified flight parameters for the purpose of complementing accident/incident investigation that meets the current recording requirements approved by the Chairman.

(c) **"Cockpit Voice Recorder (CVR)"** means type of recorder installed in the aircraft for recording of the aural environment on the flight deck during flight times for the purpose of complementing accident/incident investigation, that meets the current recording requirements approved by the Chairman.

3. DESIGN STANDARD

3.1 The minimum design standard for a cockpit voice recorder installed in a Bangladesh aircraft shall be in accordance with the requirements of the ANO (Airworthiness) Chapter A.1 of these orders.

3.2 The use of magnetic tape and wire CVRs or CARS shall be discontinued.

3.3 All CVRs shall be capable of retaining the information recorded during at least the last two hours of their operation.

3.4 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the individual certificate of airworthiness is first issued on or after 1 January 2021 shall be equipped with a CVR which shall retain the information recorded during at least the last 25 hours of its operation.

3.5 All aeroplanes that are required to be equipped with CARS, and for which the individual certificate of airworthiness is first issued on or after 1 January 2025, shall be equipped with a CARS which shall retain the information recorded during at least the last two hours of their operation.

3.5 A CVR installed in helicopter shall be capable of retaining the information recorded during at least the last 30 (thirty) minutes of its operation.

Note: Image and Data link information may be recorded either on the CVR or the FDR.

4. REQUIREMENTS

4.1 All aeroplanes of a maximum certificated take-off mass (MCTM) of over 5700kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 shall be equipped with a CVR.

4.2 All turbine-engined aeroplanes of a MCTM of over 27000kg that are of types of which the prototype was certificated by the appropriate National Authority after 30 September 1969 and for which the individual certificate of airworthiness was first issued before 1 January 1987 shall be equipped with a CVR.

4.3. All helicopters of a MCTM of over 7000kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 shall be equipped with a CVR. For helicopters not equipped with a FOR, at least main rotor speed shall be recorded on one track of the CVR.

4.4 All helicopter of a MCTM of over 2700kg up to and including 7000kg for which the individual certificate of airworthiness is first issued on or after 1 January 1987 shall be equipped with a CVR. For helicopters not equipped with a FDR, at least main rotor speed shall be recorded on one track of the CVR.

4.5 All helicopter of a MCTM of over 7000kg for which the individual certificate of airworthiness was first issued before 1 January 1987, shall be equipped with a CVR. For helicopters not equipped with a FDR, at least main rotor speed shall be recorded on one track of the CVR.

4.6 All turbine-engined aeroplanes of a maximum certificated take-off mass of over 2250 kg, up to and including 5700 kg, for which the application for type certification is submitted to a Contracting State on or after 1 January 2016 and required to be operated by more than one pilot shall be equipped with either a CVR or a CARS.

4.7 An alternate power source shall automatically engage and provide ten minutes, plus or minus one minute, of operation whenever aeroplane power to the recorder ceases, either by normal shutdown or by any other loss of power. The alternate power source shall power the CVR and its associated cockpit area microphone components. The CVR shall be located as close as practicable to the alternate power source.

4.8 All aeroplanes of a maximum certificated take-off mass of over 27 000 kg for which the application for type certification is submitted to a Contracting State on or after 1 January 2018 shall be provided with an alternate power source, as defined in 4.7 that powers the forward CVR in the case of combination recorders.

4.9 All aeroplanes for which the individual certificate of airworthiness is first issued on or after 1 January 2016, which use any of the data link communications applications are required to carry a CVR, shall record the data link communications messages on a crash-protected flight recorder.

5. OPERATION AND CONTINUED SERVICEABILITY

5.1 CVR installed in accordance "with these requirements shall not be switched off during flight time.

5.2 To preserve CVR, the recorder shall be de-activated upon completion of flight time following an accident or incident. The recorder shall not be re-activated before their disposition as determined by the Chairman.

5.3 An operator shall ensure, to the extent possible, in the event the aircraft becomes involved in an accident or incident, the preservation of all related flight recorder records, and if necessary the associated flight recorders, and their retention in safe custody pending their disposition by the Chairman.

5.4 Operational checks and evaluations of recordings from the CVR systems shall be conducted to ensure the continued serviceability of the records. CVR/DLR System shall have recording inspection intervals of one year.

5.5 The pilot-in-command and the Operator shall ensure that:

(a) The CVR shall be operated continuously from the start of the checklist commenced before engine start until the completion of the final checklist at the termination of flight;

(b) Flight crew members shall use boom or throat microphones or equivalent while operating below the transition level/altitude, if the aircraft is equipped to record the uninterrupted audio signals received by a boom or throat microphones or equivalent; and

(c) If any erasure feature is used in the cockpit voice recorder, the last 30 (thirty) minutes of recorded information shall be protected from erasure and all erasures must be recorded in appropriate maintenance documentation.

6. EXEMPTION

6.1 Where a CVR becomes inoperative but the FDR is serviceable and functioning, an aircraft may be flown on such flights in accordance with the CAAB approved MEL.

6.2 An aircraft in which both the CVR and the FDR are inoperative shall not commence a flight unless authorized by Chairman.

6.3 Where a flight is authorized under paragraph 6.2 of this order, the operator of the aircraft shall make and retain a report of the circumstances relating to the authorization for a period of 6 (six) months from the date of the authorization.

This order is issued in pursuance of the Rules 4 and 107 of the Civil Aviation Rules, 1984. The ANO is a complete re-issue and supersedes the issue 3, dated 28 February, 2002.

AIR VICE MARSHAL M MAFIDUR RAHMAN
BBP, BSP, BUP, ndu, afwc, psc
Chairman
Civil Aviation Authority of Bangladesh

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PART B - AIRCRAFT EQUIPMENT

CHAPTER E.4	**USE OF AUTOMATIVE GASOLINE**

SECTIONS

1. GENERAL
2. MOQAS JMPORTNT CONSIDERATION
3. FAA SIC OR EQUIVALENT DOCUMENTS
4. OPERATIONAL CONSIDERATION
5. MAINTENA NCE CONSIDERATION
6. FIELD TEST METHODF FOR DETERMINING THE PRESENCE AMOUNT OF ALCOHOL IN FUEL
7. PLACARDS AND RECORDING
8. CLASSIFI CATION OF OPERATION
9. APPROVAL BY CAAB
10. LABORATORY TEST OF MOGAS.

1. GENERAL

1.1 This Order defines policy of the Civil Aviation Authority of Bangladesh (CAAB) on the use of Automotive Gasoline (MOGAS) in Bangladesh Registered Civil Aircraft The CAAB considers MOGAS an acceptable fuel for use in specific categories of aircraft as mentioned in section 8 of the ANO and subject to the imposed limitation, requirements and recommendation for the use of MOGAS in outlined here.

2. MOGAS IMPORTANT CONSIDERATION

2.1 The use of MOGAS is generally NOT supported by Engine Manufacturers. MOGAS is not engineered for use on aircraft, although it may be considered a suitable alternative to Aviation Gasoline (AVGAS). The CAAB assumes no liability or responsibility for infringements of any manufactures warranty due to use of MOGAS in aircraft engine.

3. FAA STC OR EQ UIVALENT DOCUMENTS

3.1 The CAAB accepts Supplementary Type Certificate (STC) issued by FAA for specific groups of Engine Airframe combination. The STC require the use of automotive Gasoline as per ASTM specification D-439 (superseded by ASTM D-4814).

4. OPERATIONAL CONSIDERATION

4.1 The MOGAS-shall comply with the specification ASTM-D439 (superseded by ASTM-D4814)

4.2 The duel shall be unleaded automotive gasoline with 87 minimum anti-knock index or leaded automotive gasoline with 88 minimum anti-knock index (RON+MON)/2.

4.3 The MOGAS must conform to the specification of volatility class "B" which corresponds to the Reid Vapors Pressure of 10 psi maximum.

4.4 If lead content in the MOGAS is below 0.50 gm per U.S. gallon, than to ensure adequate lead, operate the aircraft with AVGAS (100 LL) at every 75 hours for at least 04 (four) flying hours.

4.5 The fuel shall be obtained only from Aviation Fuel supplier depot at Airport.

4.6 The fuel shall be serviced into the aircraft tank at least through a 5 micron or finer aviation type fuel filter with a go-on/go water separator.

4.7 Use only freshly obtained supplies and avoid long storage in the aircraft fuel Tank.

4.8 The fuel barrel, (atleast 43 gallons) shall be marked clearly with the fuel specification, date of filling and batch number. Jerry Can shall not be used under any circumstances.

4.9 As carburetor icing is more likely when using MOGAS, particular attention should be paid to the use of carburetor hot air and no flight shall be made with inoperative Carburetor heating system.

4.10 Make sure during the pre-take-off checks, that a good RPM drop is obtained when hot air is selected.

4.11 After a prolong period of "heat soak" at low fuel flow (e.g. hot day ground idling) establish the ability to maintain full power before commencing a take-off, This is to minimize chances of vapors lock.

4.12 The aircraft shall be flown below pressure altitude of 6000 ft

4.13 The temperature of the fuel in the tank prior to the commencement of each flight shall be less than 35°C and shall be recorded in the aircraft maintenance log.

4.14 Intermittent selection of hot air in flight should be made whether or not the symptoms of loss of power are experienced.

4.15 If the aircraft has been standing for 24 hours or longer, check fuel for water.

4.16 Intermixing of AVGAS and MOGAS is allowed.

4.17 The MOGAS used by the operator is to be certified by the supplier/producer that no additives, alcohol or blending agents (MTBE) are mixed with MOGAS.

5. MAINTENANCE CONSIDERATION

5.1 To address concern of increased potential of elastomer deterioration, the following periodic checks and modification should be incorporated:

(a) GENERAL: The frequency of functional checks on all fuel system control devices (fuel selector valves, fuel tank floats etc.) should be increased while operating on MOGAS.

(b) CARBURETOR: The composite floats should be replaced by metal float as per the applicable Service Bulletin, prior to operations with MOGAS.

(c) FUEL SUMP DRAINS : Swelling or disintegration of the O-ring may result in blockage of the drain when, it is opened or a constant slow leak when closed. This component is easily accessible and can therefore be frequently inspected.

(d) FUEL FUTER; Check frequently for particle accumulation. Deterioration of O-rings and elastomer type bladder fuel tanks may appear as sediment in the filter element.

(e) FUEL PRIMER: Sticking may indicate swelled O-ring. Replace O-ring ensuring that replacement has the proper specifications and is compatible with the fuel in use. Monitor Closely.

(f) NON-METALIC FUEL PIPES SECTION: In the course of the daily check and other routine inspections, pay particular attention to non-metallic fuel pipes and seals for signs of leaks of deterioration.

5.2 Test the fuel to ensure that it contains No alcohol. Test of alcohol may be carried out as per section 6 of this ANO.

6. FIELD TEST METHOD FOR DETERMINING THE PRESNCE AND AMOUNT OF ALCOHOL IN FUEL:

6.1 The two methods described hereunder, are equivalents and are based on the property of alcohol to combine with water or ethylene glycol and therefore separate from gasoline. Alcohol fuels could damage fuel systems and engines and therefore should not be used.

a) WATER METHOD:

1) In a small diameter transparent cylinder, put approximately 10 ML of water and clearly mark the level.

2) Add approximately, 100 ML of test fuel.

3) Shake vigorously, then let stand.

4) If after settling it is apparent that the fuel volume at the bottom has increased, alcohol is present.

b) ETHYLBNE GLYCOL METHOD:

1) In a small diameter transparent cylinder, put approximately 100 ML of test fuel and clearly mark the level.

2) Add approximately 10 ML of ethylene glycol.

3) Shake vigorously, then let stand.

4) If after settling it is apparent that the volume at the bottom has—' decreased, alcohol is present.

6.2 In the interest of most conservative operation the following observations are offered (a)

If alcohol content is less than 1% fuel will probably have no effect on aircraft.

(b) If fuel contains up to 5% alcohol, caution must be exercised. Do not permit it to remain in tanks or fuel system more then 24 hours, then drain and refill with alcohol free fuel, insuring that no alcohol concentration remains in fuel lines or sump.

(c) If alcohol content is more than 5% drain fuel system, flush all parts, replace with clean alcohol free fuel and run up engine long enough to exchange fuel in carburetor bowl.

(d) Known problems are-alcohol attacks some seal materials and varnishes on cork floats of fuel level indicators. This could cause leakage of seals, release particles of varnish from floats, causing blocked screens in the fuel line blockage at screens or valves when operating at low ambient temperatures at ground level or at high altitude. Fuel volatility is also increased with the addition of alcohol. These effects of alcohol in turn could cause engine power loss and even engine damage from high combustion temperatures caused by excessively lean operation.

6.3 Ethylene glycol is harmful or fatal if swallowed. Induce vomiting if swallowed. Wash thoroughly after handling.

7. PLACARDS AND RECORDING

7.1 Before operating on MOGAS an entry shall be made in aircraft and engine log book, indicating that a MOGAS STC has been installed and/or the MOGAS is being used under the acceptance of the ANO Chapter E.4.

7.2 The engine log shall contain a complete record of all hours on MOGAS including a Record of mixtures, if any.

7.3 The following placards shall be installed at the indicated locations:
Clearly visible at each fuel filler cap:

UNLEADED MOGAS

(Minimum anti-knock index 87)

DO NOT USE GASOLINE CONTAINING ALCOHOL

Clearly visible in the cockpit:

THIS AIRCRAFT MAY BE OPERATED ON

UNLEADED MOGAS

MIXER OF MOGAS / AVGAS Clearly

visible in the cockpit: **RESTRICTED**

FLIGHT ENVELOPE WHILE OPERATING

ON MOGAS

MAX PRESS ALT = 6OOO FT.

8. CLASSIFICATION OF OPERATION

8.1 Aircraft operating on MOGAS shall be employed only in the following category of operations:

(a) Private category operations.

(b) Aerial work operations, only for the purpose of Flying Training and Flight Checks for the purpose of issue and Renewal of Licences.

9. APPROVAL BY CAAB

9.1 All Bangladeshi Operators shall obtain Chairman's approval for specific aircraft/engine combination before operating on MOGAS. Availability of STC does not authorize the Operator to operate Bangladesh Registered aircraft on MOGAS.

9.2 Any unsatisfactory engine operation or failure which may be attributed by the use of MOGAS shall be immediately reported to CAAB.

10. LABORATORY TEST OF MOGAS

10.1. A sample from each delivery (batch number) must be analysed by authorized analyst of either of the following organizations:

(a) Bangladesh Standards Testing Institute, Dhaka,

(b) Eastern Refinery, Chittagong.

10.2 The Laboratory Test should state that the fuel sample (quoting batch number as printed on the fuel barrel) is tested as per specification ASTM-D-439 (superseded by ASTM-D-4814). The analyst may follow alternate methods to determine conformity of the fuel to meet specification ASTM-D-4814. A copy of the Laboratory Test Report shall be available with the operator.

Issued in pursuance of the Rules 4, 105,106,107, 166, 185, 191 and 193 of the Civil Aviation Rules 1984. This ANO is a complete re-issue and supersedes Issue-1, September 12, 1996.

CIVIL AVIATION AUTHORITY OF BANGLADESH
AIR NAVIGATION ORDERS

AIRWORTHINESS REQUIREMENTS

PART - E. OPERATIONAL AND AIRWORTHINESS REQUIREMENTS

CHAPTER E.5	**AIRWORTHINESS AND OPERATIONS REQUIREMENTS FOR EXTENDED RANGE OPERATIONS WITH TWIN ENGINE AEROPLANES**

Sections	Titles
1	GENERAL
2	DEFINITIONS
3	ETOPS RANGE CATEGORIES AND EXPERIENCE REQUIREMENTS
4	APPROVAL BASIS
5	ETOPS OPERATIONAL APPROVAL REQUIREMENTS: CONTINUED AIRWORTHINESS (Maintenance)
6	ETOPS OPERATIONAL APPROVAL REQUIREMENTS (Flight Operations)
7	ETOPS DEMONSTRATION AND VALIDATION FLIGHT
8	ETOPS APPROVAL
9	CONTINUING SURVEILLANCE
10	REPORTING OF DEFECTS OF FLIGHTS ON ETOPS
APPENDIX-1	APPLICATION FOR GRANT OF APPROVAL FOR ETOPS
APPENDIX-2	ETOPS OPERATIONAL APPROVAL CHECK LISTS (Flight Operations and Maintenance)
APPENDIX-3	EXAMPLE OF ETOPS OPERATIONAL APPROVAL PROGRAMME (6 Month Timeline – Typical)

1. GENERAL

1.1 This Order prescribes the requirements for obtaining Civil Aviation Authority, Bangladesh (CAAB) approval for commercially operated twin engine airplanes to operate over a route that contains a point further than 60 (sixty) minute flying time at the approved one-engine-inoperative cruise speed (under standards conditions in still air) from an adequate aerodrome. Extended Twin Engine Operations (ETOPS) requirements are applicable to routes over water as well as remote areas over land. The purpose of ETOPS is to provide very high level of safety while facilitating the use of twin engine on routes, which were previously restricted to three and four engine aircraft. ETOPS operation also permits more effective use of an airline resource.

1.2 The requirements are applicable to all twin engine turbo propeller, turbojet and turbofan aero planes transiting oceanic areas or routes entirely over land. Operators can not operate a twin engine aircraft of MTOW more than 5700 Kg beyond 60 minutes using an approved one-engine-inoperative cruise speed unless approved by the Chairman, CAAB. The sequence of operation beyond 60 minutes will be termed as Extended Twin Engine Operations (ETOPS) and this will require prior approval of the Chairman, CAAB. To be eligible for extended range operations the specified airframe engine combination must be certificated to the airworthiness standard of transport category aero planes by FAA of USA, EASA of European Union or other regulatory authority acceptable to the CAAB.

2. DEFINITIONS

2.1 For the purpose of this Order, the following definitions shall apply:

(a) **"Adequate Aerodrome"** means an alternate aerodrome meeting the safety requirements for take off and landing for commercial and non-commercial operations. It should be anticipated that at the expected time of use:

(i) the aerodrome will be compatible with the performance requirements for the expected landing weight and will be available and equipped with necessary ancillary services such as ATC, sufficient lighting, communications, weather reporting, navigation aids, refueling and emergency services and

(ii) at least one let down aid (ground radar would so qualify) will be available for an instrument approach.

(b) "**Aeroplane Systems"** means all elements of equipment of an aeroplane necessary for the control and performance of a particular major function. It includes both the equipment specifically provided for the function in question and other basic related aeroplane equipment such as that required to supply power for the equipment operation. As used herein the power for the power-unit is not considered to be an aeroplane system.

(c) **"Authority"** means the Civil Aviation Authority, Bangladesh.

(d) **"Alternate Aerodrome"** means an aerodrome to which an aircraft may proceed when it becomes either impossible or inadvisable to proceed to or to land at the aerodrome of intended landing. Alternate aerodromes include the following:

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

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

(ii) **En-route alternate:** An alternate aerodrome at which an aircraft would be able to land in the event that a diversion becomes necessary while en-route.

(iii) **ETOPS Alternate:** A suitable and appropriate alternate aerodrome at which an aeroplane would be able to land in the event that a diversion becomes necessary while en-route in an ETOPS operation. An ETOPS Alternate Aerodrome is an Adequate Aerodrome where, for the anticipated time of use, weather reports, or forecasts, or any combination thereof, indicate that the weather conditions will be at or above the ETOPS weather minima, and the runway surface condition reports indicate that a safe landing will be possible.

Note: The check for the ETOPS Alternate weather minima is done at the time of flight dispatch.

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

(e) **"Critical Point (CP)"** means one of the Equitime Point (ETP) of the route which is critical with regard to the ETOPS critical fuel requirements if a diversion has to be initiated from that point. The CP is usually, but not always (depending on the configuration of the area of operation and of the weather conditions), the last ETP within the ETOPS segment. Therefore, the CP has to be carefully determined by computation of the ETOPS critical fuel scenario and must be applied to each ETP.

(f) **"Dual Maintenance"** means maintenance on the "same" ETOPS significant system. Dual maintenance is maintenance action performed on the same element of identical, but separate ETOPS Significant Systems during a scheduled or unscheduled maintenance visit. Dual maintenance on "substantially similar" ETOPS significant systems means maintenance actions performed on engine-driven components on both engines during the same maintenance visit.

(g) **"ETOPS Area of Operations"** means an area where an Operator is authorized by the CAAB to conduct an ETOPS flight. This area is within the Maximum Diversion Time from an Adequate Aerodrome.

(h) **"ETOPS Configuration, Maintenance and Procedures (CMP) standard"** means the particular aircraft configuration minimum requirements including any special inspection, hardware life limits, Master Minimum Equipment List (MMEL) constraints and maintenance practices provided by the aeroplane manufacturer that establishes the suitability of an airframe engine combination for extended range operation.

(i) **"ETOPS Entry Point"** means the first point on the aero plane's out bound route which is more than 60-minute flying time at the approved one-engine-inoperative cruise speed (under standard conditions in still air) from an adequate aerodrome.

(j) **"ETOPS Exit Point"** means the first point in the ETOPS flight where the remainder of the flight is entirely within 60 minutes of an Adequate Aerodrome.

(k) **"Equitime Point (ETP)"** means **a** point on the aircraft route, which is located at the same flying time (in forecasted atmospheric conditions) from two suitable diversion aerodromes. The ETP position can be determined using a computerized flight planning, or graphically on a navigation or plotting chart. The flight crew may update in flight the position of the ETP using the flight management function.

(l) **"ETOPS Portion of the Flight"** means that portion of flight that begins the first point an aircraft is greater than 60 minutes flying time (computed at the approved one-engine-inoperative cruise speed in standard conditions and still air) from the nearest Adequate Aerodrome, and ends at the point where the remainder of the flight is entirely within 60 minutes of an Adequate Aerodrome. It is the segment between the ETOPS Entry Point and the ETOPS Exit Point.

(m) **"ETOPS Significant System"** means an airplane system, including the propulsion system, the failure of malfunctioning of which could adversely affect the safety of an ETOPS flight, or the continued safe flight and landing of an airplane during and ETOPS diversion, Each ETOPS significant system is either an ETOPS Group 1 significant system or an ETOPS Group 2 significant system.

(a) An ETOPS Group 1 Significant System:

(i) Has fail-safe characteristics directly linked to the degree of redundancy provided by the number of engines on the airplane;

(ii) Is a system, the failure of malfunction of which could result in an in-flight shutdown (IFSD), loss of thrust control, or other power loss;

(iii) Contributes significantly to the safety of an ETOPS diversion by providing additional redundancy for any system power source lost as a result of an inoperative engine; and

(iv) Is essential for prolonged operation of an airplane at engine inoperative altitudes.

(b) An ETOPS Group significant system is an ETOPS significant system that is not an ETOPS Group 1 significant system. Group 2 system failures will not cause aircraft flight performance loss or cabin environment problems but may result in diversions or turn backs.

(n) **"Extended Range Operation (ETOPS)"** means any flight by an aeroplane with two turbine powered engines where the flight time at the one-engine-inoperative cruise speed (under standard conditions in still air) from a point on the route to an Adequate aerodrome, is greater than 60-minutes.

(o) **"In Flight Shut Down (IFSD)"** means when an engine ceases to function (when the airplane is airborne) and is shut down, whether self induced, flight crew initiated or caused by an external influence. The Authority considers IFSD for all causes, such as flameout, internal failure, flight crew initiated shutdown, foreign object ingestion, icing, inability to obtain or control desired thrust or power, and cycling of the start control; however briefly, even if the engine operates normally for the remainder of the flight. This definition excludes the airborne cessation of the functioning of an engine when immediately followed by an automatic engine relight and when an engine does not achieve desired thrust or power but is not shut down.

(p) **"Maximum Diversion Distance (MDD)"** means the distance covered in still air and ISA (or delta ISA) conditions within the maximum diversion time at the approved one-engine-inoperative diversion speed schedule and at the associated cruise altitude (including the drift down from the initial cruise altitude to the diversion cruise altitude). It is used for dimensioning the Area of Operations.

(q) **"Maximum Diversion Time (MDT)"** means the longest diversion time authorized for a flight under the Operator's ETOPS authority. It is the maximum diversion time from any point of the route to the nearest adequate aerodrome for landing. It is calculated under standard conditions in still air at the approved one-engine inoperative speed. It is only used for determining the ETOPS Area of Operations, and therefore is not an operational time limitation for conducting a diversion which has to cope with the prevailing weather conditions.

(r) **"Power Unit"** means a system consisting of an engine and all ancillary parts installed on the engine prior to installation on the aeroplane to provide and control power/thrust and for the extraction of energy for aeroplane systems, but not including independent short-period thrust-producing devices.

(s) **"Propulsion System**" means a system consisting of a power-unit and all other equipment utilized to provide those functions necessary to sustain, monitor and control the power-unit following installation on the airframe.

3. ETOPS RANGE CATEGORIES AND EXPERIENCE REQUIREMENTS

3.1 Before the Authority grants ETOPS operational approval to an applicant for ETOPS, the Operator must be able to demonstrate the ability to achieve and maintain the level of propulsion system reliability that is required for the ETOPS-approved airplane-engine combination to be used. The Operator must also demonstrate that it can operate the particular airframe and other airplane systems at levels of reliability appropriate for the intended operation. This can be achieved directly by a successful in-service operational history or by successfully validating all the required ETOPS processes according to the Accelerated ETOPS Application Method. The ETOPS are covered under categories viz. 75 minutes, 120 minutes, 180 minutes, 240 minutes, and beyond 240 minutes diversion time.

3.2 **Up to 180 minutes Operational Approval:** An Operator requesting ETOPS up to 180 minutes may select one of the following two application methods best suited to their proposed operation:

(a) In-service experience method, or
(b) Accelerated ETOPS method.

3.2.1 **In-service experience method**

(a) **75 Minutes Operation:** Approval to carry out extended range operation with 75 minutes diversion time may be granted by CAAB to an operator with minimal or no in-service experience with particular airframe-engine combination. This approval will be based on such factors as the proposed areas of operation, the operator demonstrated ability to successfully introduce aircraft into operation, and the quality of the proposed Maintenance and Operation programme.

(b) **Up to 120 Minutes operation:** Each operator requesting approval to conduct ETOPS with a maximum diversion time of 120 minutes (under standard conditions in still air) should have minimum of 12 consecutive months of operational service experience with the specified airframe engine combination. Normally, the accumulation of at least 2, 50,000 engine hours in the world fleet (not necessarily on a particular airframe) will be necessary before the proposal is considered. Engine reliability data also needs to be considered.

(c) **Above 120 minutes and up to 180 minutes operation:** Each operator requesting approval for maximum diversion time of 180 minutes (under standard conditions in still air) should have held current approval for 120 minutes ETOPS for a minimum period of 12 months with a corresponding high level of demonstrated propulsion system reliability.

3.2.2 **Accelerated ETOPS up to 180 minutes method: V**alidation of an applicant with no previous operational experience should be more robust than would be necessary for a certificate holder with operational experience. An Operator applying for ETOPS authority at entry into service under the Accelerated ETOPS application method must comply with all the ETOPS requirements outlined in this Order except for the in-service experience requirements and the Operator shall:

(a) Have "Propulsion system performance monitoring cell" staffed by qualified and experienced person(s) and functioning for at least 12(twelve) months;

(b) Have "Aircraft Reliability assessment cell" staffed by qualified and experienced person(s) and functioning for at least 12(twelve) months.

(c) Ensure that documents and Manuals (both Airworthiness and Flight Operations) as required under this orders are preferably vetted and recommended by the Manufacturer of the aircraft or alternately by concerned personnel from major international airlines having at least 2 (two) years of experience in operating minimum 120 minutes ETOPS operation, before submitting the required documents and manuals to the Chairman for approval.

Note: The Operator failing to meet the above requirements shall seek ETOPS approval through in-service experience method.

3.3 ETOPS Beyond 180 Minutes, up to and including 240 Minutes: The Authority grants approval for ETOPS beyond 180 minutes only to Operators with existing 180minute ETOPS operating authority for the airplane-engine combination to be operated in the application. The Operator must have 180 minutes ETOPS authority and demonstrate to the regulator her ability and competence to support beyond 180-min operations.

3.4 ETOPS Beyond 240 Minutes: This authority is only granted to operators between specific city pairs. The Operator must have been operating at 180 minute or greater ETOPS authority for at least 24-consecutive months, of which at least 12-consecutive months must be at 240-minute ETOPS authority with the airplane-engine combination in the application.

4. APPROVAL BASIS

4.1 **ETOPS Type Design Approval:** Evidence that the type design of the aeroplane is eligible for ETOPS and must be reflected by a statement in the approved Aeroplane Flight Manual (AFM) or supplement to AFM and Type Certificate Data Sheet (TCDS) or supplement to TCDS or other approved document to the effect "The type design is certificated to the airworthiness standard of transport category aero planes" by FAA of USA, EASA of European Union or other regulatory authority acceptable to the CAAB.

4.2 **ETOPS Operational Approval:** Operator shall demonstrate to the Chairman, CAAB the ability to maintain and operate the aeroplane so as to achieve the necessary reliability required for ETOPS and to train its personnel to achieve the required competency in ETOPS.

4.2.1 An operator seeking approval for ETOPS under the in-service experience method shall submit application on prescribed form (shown in **Appendix '1'** to this Order) at least 90 (ninety) days before the intending date of operation. The prospective Operators' may find the Check Lists (shown in **Appendix-2**) as useful.

4.2.2 An operator seeking approval for ETOPS under the Accelerated ETOPS method shall submit a detailed Accelerated ETOPS Operational Approval Plan at least 180 (one hundred eighty) days, or a period of time approved by the Chairman, CAAB, before the intending date of operation. The Plan shall also include the elements described under **Appendix '1'** to this Order and the schedule for the submission of the Documents, Manuals & Training Curricula to the Chairman, CAAB, as required under the Sections 5 and 6 of this Order. An example of typical 6 month timeline ETOPS Operational Approval Programme is shown in **the Appendix-3.**

4.2.3 The operator shall comply in complete with the ETOPS Operational Approval Requirements for Continued Airworthiness & Flight Operations, as detailed in Sections 5 and 6 of this Order.

NOTE: The Operator desiring to operate ETOPS flight may refer to the current issue of the following publications for detailed guidelines:

a) ICAO Annex-6, Part-1

b) FAA AC 120-42B

c) EASA AMC 20-6 & AMC to Part M

5. ETOPS OPERATIONAL APPROVAL REQUIREMENTS: CONTINUED AIRWORTHINEES (Maintenance)

5.1 **Maintenance documents:** The operator has to comply in complete with the Airworthiness requirements mentioned in this Section and the under mentioned Documents and Manuals are required to be submitted by the Operator for information and approval of the Chairman, CAAB as applicable:

(a) Copy of ETOPS Type Design Compliance in respect of the airframe engine combination (AFM and TC including TCDS)

(b) CMP document Programme and its supplement to ETOPS operations.

(c) Operator's MEL for ETOPS

(d) Engineering Modifications Record of aircraft to substantiate the incorporation of CMP standard in the airplanes to be used for ETOPS.

5.2 ETOPS CMP: The operator has to submit ETOPS Continuous Maintenance Procedures. This may be supplemental to the Maintenance Programme and will include but not limited to:

(a) ETOPS Maintenance Task procedures.

(b) Verification Programme and Resolution of airplane discrepancies procedures, which should include at least:

(i) A list of ETOPS Significant Systems;

(ii) Conditions that require verification flights;

(iii) Procedures for initiation of verification action;

(iv) Procedures that monitor and evaluate corrective action;

(v) Procedures that verify the implementation of corrective action;

(vi) Procedures that preclude repeat items from occurring; and

(vii) Procedures that identify and reverse the adverse trends.

(c) Engine Condition Monitoring Programme, which should include at least:

(i) Scope of program. e. g. data collection and analysis;

(ii) Notification procedures for deterioration;

(iii) Deterioration monitoring limits for internal;

(iv) Actions to be taken when IFSD exceeds 0.05/1000 engine hours for 120 minutes ETOPS;

(v) Actions to be taken when IFSD exceeds 0.03/1000 engine hours for 180 minutes ETOPS (including 207 minutes flight by flight exception basis);

(vi) Actions to be taken when IFSD exceeds 0.02/1000 engine hours for greater than 180 minutes ETOPS (except for 207 minutes flight by flight exception basis); and

(vii) Unscheduled engine removal rate & engine reliability.

(d) Aircraft Reliability Programme, which should include at least:

(i) Reporting criteria; and

(ii) Procedures to ensure reporting of significant individual events (engine shutdowns, flight diversions etc.) associated with any ETOPS Significant Systems.

(e) Engine /APU Oil Consumption Monitor Programme, which should include at least:

(i) Established limits of consumption; and
(ii) Procedures for use and verification prior to the start of each extended range leg.

(f) Extended Range Parts Control Program, which should include at least:

(i) Methods of verification of proper parts; and

(ii) Control procedures during parts pooling and borrowing.

(g) Maintenance Training Program, which should include at least:

(i) ETOPS regulations/Operational Approval and ETOPS philosophy;

(ii) Dispatch considerations and MMEL constraints;

(iii) Aircraft configuration and additional maintenance tasks (CMP); ANO E.5

(iv) ETOPS service checks:

- Spare parts control;

- Engine/APU preventive maintenance;

- IFSD prevention programme;

- Use of on-board maintenance facilities; and

(v) ETOPS Maintenance Certification Authorization.

(h) Continuous Surveillance Programme.

(i) ETOPS maintenance release statement. This will include at least Certification Procedures (AML/Special Form) by authorized and approved AMEs.

(j) Sub-Contract Maintenance: When maintenance is sub-contracted, the operator must ensure that:

(i) The Maintenance personnel of the sub-contractor involved are qualified for ETOPS; and

(ii) All airworthiness flight dispatch procedures and additional maintenance requirements as identified in the operators maintenance system manual is complied with.

5.3 **ETOPS Maintenance Training Requirements**

5.3.1 The certificate holder is responsible for ensuring that all maintenance personnel who perform maintenance on its ETOPS airplanes, including repair stations, vendors, and contract maintenance, have received adequate technical training for the specific airplane-engine combination it intends to operate in ETOPS. The certificate holder should review the existing airplane-engine combination maintenance training program with its CHDO to ensure that it adequately provides the necessary training.

5.3.2 Additionally, the certificate holder must develop ETOPS specific training that focuses on the special nature of ETOPS and take measures to insure that this training is given to all personnel involved in ETOPS. ETOPS specific training is in addition to the certificate holder's accepted maintenance training program used to qualify individuals for specific airplanes and engines and may be included in the accepted maintenance training curricula. It thus, becomes the certificate holder's ETOPS training program. The goal of this training is to ensure that all personnel involved in ETOPS properly accomplish ETOPS maintenance requirements. The certificate holder is responsible with acceptance from the Airworthiness and Engineering Licensing Division (AELD) to determine which personnel are included in ETOPS, and ensure that each person's levels of ETOPS training is commensurate with their level of involvement with ETOPS airplanes.

5.3.3 Customarily, ETOPS training is intended for Line and Hangar Maintenance personnel, Centralized Maintenance Control personnel and Engineering personnel, where applicable, but it dose not necessarily include the various shops be required to have a higher level of ETOPS training and qualification than a mechanic performing routine tasks on non ETOPS significant systems during a heavy maintenance check. A technician working ETOPS significant systems in an HMV (Heavy Maintenance Visit) Environment must be appropriately trained for ETOPS, but need not be ETOPS qualified. Recurrent training in all maintenance areas should be established and used to inform personnel involved in ETOPS about new equipment, requirements, operator programs, etc. Experience has shown recurrent raining is a valuable instrument in "lessons learned" for ETOPS operations.

5.3.4 In the line maintenance environment, ETOPS-qualified maintenance personnel are those who have successfully completed the certificate holder's ETOPS qualification program, and who have satisfactorily performed extended range tasks under the direct supervision of an aircraft maintenance engineer (AME) having ETOPS authorization acceptable to the Chairman. The ETOPS authorized AME giving the direct supervision must have had previous experience with maintaining the particular make and model airplane being used by the certificate holder. For new airplanes, it is understood the certificate holder may not have an authorized AME available who has previous experience with the newly introduced make and model airplane. In this instance, the training received from the manufacturer's make and model airplane. In this instance, the training received from the manufacturer's maintenance training program, or a comparable program would be acceptable.

6. ETOPS OPERATIONAL APPROVAL REQUIREMENTS (Flight Operations)

6.1 The operator has to comply in complete with the Flight Operations requirements mentioned in this Chapter and under mentioned Documents and Manuals are to be submitted by the Operator for information and approval of the Chairman, CAAB**:**

6.1.1 **Company Operations Manual:** This should include in detail at least:

(a) Designation of the particular airframe engine combination, including specification of modifications required for ETOPS;

(b) Approval area of operation, and all relevant ATC requirements;

(c) Minimum altitudes to be flown along planned and diversionary routes, and maximum altitudes if restricted by ETOPS considerations (e.g. APU start capability);

(d) Maximum Diversion Distance, ETOPS Area of Operations;

(e) The power settings, speeds, and flight levels to be used after the failure or shut-down of an engine;

(f) Aerodromes authorized for use, including alternates and associated instrument approaches, operating minima, and planning minima;

(g) A clear statement that it is the commander's responsibility not to accept ATC clearances that would take the aeroplane outside the approved ETOPS envelope in terms of Rule Distance and Flight Level;

(h) Reference to the approved maintenance schedule requirements for ETOPS including those items specified in ETOPS type design approval of the ETOPS variant;

(i) Identification of these aero planes designated for ETOPS by make and model, as well as by serial number and registration marks;

(j) Flight Dispatch Procedures limitation including criteria for and use of maximum Diversion Time (MDT);

(k) Reference to current CAP documents;

(l) Reference to ETOPS Maintenance Procedures Manual;

(m) ETOPS dispatch and Normal/Company en-route weather;

(n) Minimum for each alternate aerodrome;

(o) Fuel requirement Policy;

(p) Minimum Crew qualifications and recent experience to other than to operate unsupervised on ETOPS;

(q) Pre-flight and in flight Crew Procedures;

(r) Guidelines for diversion decision making; and

(s) Flight Documentation for ETOPS flight.

6.1.2 Flight Crew Operations Manual /Aircraft Operations Manual: The operative's manuals (FCOM/AOM) should incorporate the aircraft single engine performance data for the speed schedules being considered for an ETOPS diversion:

(a) Altitude capability (en-route gross flight paths);

(b) Descent, cruise and holding performance data (including fuel, time and distance as well as correction factors for the effect of anti-ice systems);

(c) Data relative to any other conditions relevant to ETOPS which could cause significant deterioration of performance, for example ice accretion on non-heated surfaces, RAT deployment etc.;

(d) Data relative to altitude, airspeed and distance used in establishing the ETOPS area of operations.

6.1.3 **Flight Crew Training and Evaluation:** The operator's training programme should include initial, line and re-current training in at least the following areas:

(a) Introduction to ETOPS regulation/Operational approval;

(b) Area of operations, routes and aerodromes to be used;

(c) Aircraft and Flight performance:

(i) Flight planning including all contingencies;
(ii) Flight performance monitoring.

(d) Procedures:

(i) Diversions, diversion strategies and decision making;
(ii) Use of navigation & communication systems;
(iii) Normal procedures - all types.

(e) Use of Emergency Equipment;

(f) Fuel requirement and management;

(g) Dispatch considerations: MEL, CDL, Weather Minimum etc;

(h) Flight Crew Documentations;

(i) Simulator Sessions;

(j) ETOPS Flight Check programme.

6.1.4 **Flight Dispatcher (Flight Operations Officer) Training:** The Operator's training programme should include initial training and re-current training at least in the following areas:

(a) Introduction to ETOPS regulation/Operational approval;

(b) Area of operations, routes and aerodromes to be used;

(c) Aircraft and Flight performance:

(i) Flight planning including all contingencies;

(ii) Flight performance monitoring.

(d) Procedures:

(i) Diversions, diversion strategies and decision making;

(ii) Use of navigation & communication systems;

(iii) Normal procedures - all types.

(e) Use of Emergency Equipment;

(f) Fuel requirement and management;

(g) Practical Exercises.

6.1.5 Sub-Contract Flight Dispatch

(a) Flight Dispatchers (Flight Operations Officer) are qualified and authorized;
(b) Aware of the Operator's Procedures.

7. ETOPS DEMONSTRATION AND VALIDATION FLIGHT

7.1 The operator shall demonstrate to CAAB using the specified airframe-engine combination that the intended ETOPS operation can continue to a safe landing under anticipated degraded operating conditions, which could arise from (unless successful demonstration of these conditions has been approved and witnessed by the CAAB in an acceptable simulation):

(a) total loss of thrust from one engine; or
(b) total loss of engine generated electric power; or
any other condition which CAAB considers to be equivalent in airworthiness and performance risks.

7.2 When the operational validation flight has been evaluated and found acceptable, only then the operator may be authorized to conduct ETOPS with the specified airframe-engine combinations.

8. ETOPS APPROVAL

8.1 Following satisfactory application of criteria in the section 5 of this Order by Airworthiness & Engineering Licensing Division (AELD) and the section 6 of this Order by the Air Crew Inspection & Licensing (F.I) review and concurrency by the Director (Flight Safety and Regulations), the Operator shall demonstrate through operating validation/demonstration flight(s) to Chairman, CAAB his ability and competency to conduct ETOPS flight safely during which submitted Emergency drill may be carried out. The number of persons on board the validation flight(s) shall be decided by the Chairman, CAAB.

8.2 Approval to Conduct ETOPS is made by the issuance of Operations Specification confirming appropriate limitation by the Chairman, CAAB.

9. CONTINUING SURVEILLANCE

9.1 The fleet average IFSD rate for the specified airframe-engine combination shall continue to be monitored in accordance with the propulsion system reliability assessment and ETOPS maintenance requirements.

9.2 With respect to maintenance, the purpose of monitoring IFSD rates is to provide Authority and operators with a tool for measuring the health of a fleet of ETOPS-approved airplanes in service. Causes of IFSDs or other engine and propulsion system problems may be associated with type design problems and/or maintenance and operational procedures applied to the airplane. It is very important that the Operator identify the root cause of events so that an indication of corrective action is available, such as a fundamental design problem that requires an effective hardware (or software) final fix. Repetitive inspections may be satisfactory as interim solutions, but longer-term design solutions, such as terminating actions, may be required if possible. Design problems can affect the whole fleet.

9.3 The Authority will not revoke an existing ETOPS operational approval solely because of a high IFSD rate. An Operator who experiences a type design related event need not be operationally penalized for a problem that is design-related and may not be of their own making. If an Operator has an unacceptable IFSD rate risk attributed to common cause or a systemic problem in operational practices or the maintenance program, then action carefully tailored to that Operator may be required, and may include a reduction of the Operator's diversion limit by the CAAB.

9.4 The Operator must investigate an IFSD rate higher than the 12-month rolling average standard (as listed under Chapter 5.2 (c) (iv) to (vi) of this Order) that occurs for a mature fleet after the commencement of ETOPS. The Operator must investigate any indication of a high IFSD rate; however, it should consider that in the case of the smaller fleet, the high IFSD rate may be because of the limited number of engine operating hours used as the denominator for the rate calculation. This can cause an IFSD jump well above the standard rate because of a single IFSD event. On occasion, a particular event may also warrant implementation of corrective action even though the overall IFSD rate is not being exceeded.

9.5 The Operator should provide the CAAB a timely notification of the status of an event investigation.

9.6 The certificate holder may designate a sub-fleet engine/airframe combination for the purposes of the IFSD monitoring/rate program. The operator may include the IFSD statistics of all engines that are ETOPS configured and are maintained in accordance with the operators ETOPS program even if used on non-ETOPS airplanes.

9.7 As with all other operations Airworthiness Division of CAAB will monitor all aspects of the extended operations. In the event that an acceptable level of reliability is not maintained, significant adverse trend exists or if significant deficiencies are detected in the conduct of ETOPS operations Airworthiness Division of CAAB shall initiate a special evaluation, impose operational restriction if necessary, to resolve the problem in a timely manner so as to ensure safe ETOPS operation.

10. REPORTING OF DEFECT OF FLIGHTS ON ETOPS

10.1 In addition to the requirements of the ANO (Airworthiness) Chapter B.5. The Operator (person to be designated) shall intimate the CAAB immediately as soon as possible (over telephone/fax) followed by submission of CA form 31 within 72 hours if the following defect/abnormal events occurred:

(a) In flight engine shut down;

(b) Diversion or turn back;

(c) Un-commanded power change or surges;

(d) Problems with systems critical to ETOPS;

(e) Inability to control the engine or obtain desired power;

(f) Any other event detrimental to ETOPS.

10.2 The report shall identify the following:

(a) The aircraft identification including make, serial number and registration marks;

(b) Engine identification including make and serial number;

(c) Total time, cycles and time since last shop visit;

(d) For system, time since overhaul or last inspection of the defective unit;

(e) Phase of flight;

(f) Corrective action(s).

This Order is issued in pursuance of the Rules 4 and 123(20) of the Civil Aviation Rules 1984, is a complete re-issue and supersedes the issue 1, dated 22 November 2004.

Air Cdre Mahmud Hussain, ndc, psc
Chairman
Civil Aviation Authority, Bangladesh

CIVIL AVIATION AUTHORITY, BANGLADESH

APPLICATION FOR GRANT OF ETOPS OPERATIONAL APPROVAL

1. Name of the operator:

2. Aircraft registration number:

3. Type and Serial Number of the Aircraft:

4. Type and model of the Engines fitted:

5. Maximum diversion time certified by the manufacturer for the applicant's aircraft:

6. (a) Route of operation:
   (b) Maximum diversion time:
   (c) Minimum altitude to be flown:

7. Proposed ETOPS Area of Operations, Adequate Aerodromes in the ETOPS Area of Operations:

8. Copy of the ETOPS Manual:

9. Details of Crew Training:

10. For Applicants with in service operational experience:

    (a) Total engine hours of the type in the world fleet:
    (b) Proof of propulsion system reliability in the world fleet:
    (c) Propulsion system reliability of the applicant in terms of IFSD:

11. For Applicants seeking ETOPS Operational Approval under Accelerated ETOPS Method:

    (a) Submit the Accelerated ETOPS operational Approval Plan that provides a documented plan for compliance with all the elements of ETOPS.

    (b) The Plan shall include a comprehensive validation plan to validate the effectiveness of all ETOPS process elements ("proven process")

Date :_____ Signature of the applicant

ETOPS OPERATIONAL APPROVAL CHECKLIST (Flight Operations)

1. Define ETOPS routes that will be covered by application.

2. For each route, establish a list of Adequate En-route, Alternate Airports.

3. Determine ETOPS diversion time required and ETOPS engine inoperative planning speed.

4. Establish ETOPS Area of Operations.

5. Establish a system for obtaining ETOPS flight plan data.

5.1 ETOPS en-route alternates,

5.2 Calculation of Equal Time Points,

5.3 ETOPS Critical Fuel Scenario,

5.4 Time Limited Systems.

6. Arrange to obtain weather data for ETOPS en-route alternates.

7. Ensure there is a method of communication between the airplane and the airline during the flight (flight following)

8. Review ETOPS provisions in the MMEL to establish the airline's MEL.

9. Establish a method to check APU in-flight start reliability.

10. Designate an ETOPS Check AME.

11. Establish and document airline operating procedures for ETOPS.
Note: If the airline plans to change Manufacturer's FCOM procedures, determine if changes need to be re-validated

12. Revise the airlines flight crew guidance material to include ETOPS practices and procedures.

13. Train flight dispatchers and flight crew on ETOPS requirements, performance data, MEL and airline unique ETOPS processes.

ETOPS OPERATIONAL APPROVAL CHECKLIST (Maintenance)

1. **Configuration Maintenance & Procedures** : ensure the airframe/engine to be used on ETOPS routes complies with the ETOPS CMP configuration requirements.

2. **ETOPS Supplemental Maintenance Program** : this 14-point ETOPS maintenance program is a "supplement" to an operator's existing and approved maintenance program and therefore must be added.

2.1 **ETOPS Maintenance Document** : document airline ETOPS practices and procedures.

2.2 **ETOPS Pre-departure Service** : unique check before each ETOPS flight.

2.3 **Limitations on Dual Maintenance** : avoidance of human factors errors.

2.4 **Verification Program** : ensure that all ETOPS significant faults are analyzed and corrections made.

2.5 **Task Identification** : identify ETOPS specific procedures or tasks that must be accomplished or verified by ETOPS qualified personnel.

2.6 **Centralized Maintenance :** Control Procedures – establish and document procedures for centralized Maintenance Control related to ETOPS.

2.7 **Parts Control Program** : ensure that only approved components are used on ETOPS configured aircraft.

2.8 **Reliability Program** : develop an event-driven reliability program that ensures reporting of ETOPS significant events to regulatory authority.

2.9 **Propulsion System Monitoring** : track in-flight engine shut downs.

2.10 **Engine Condition Monitoring** : ensure engines have adequate margins.

2.11 **Oil Consumption Monitoring** : engine/APU oil servicing and usage analysis.

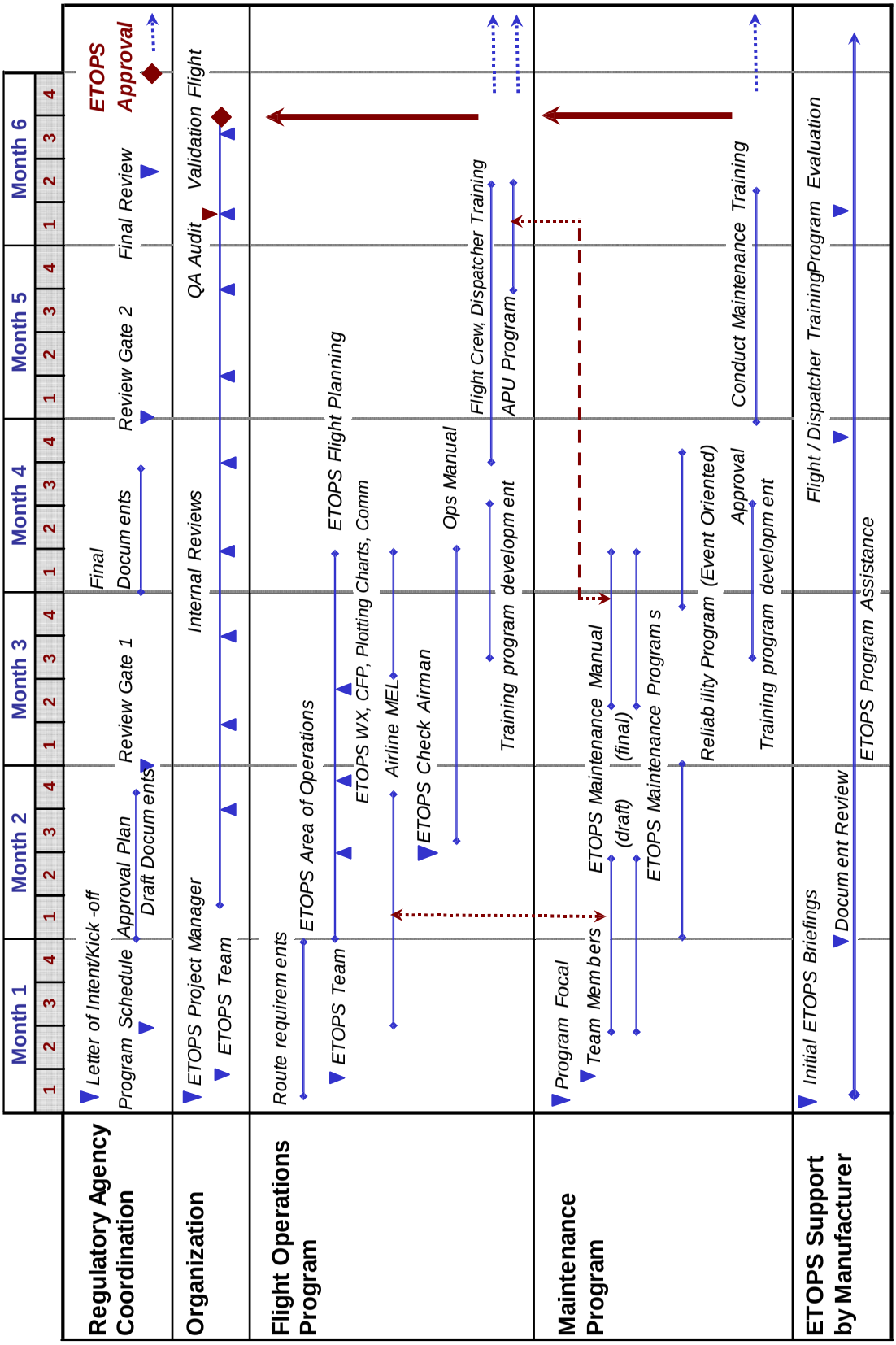
2.12 **APU In-flight Start Program** : ensure that APUs used on ETOPS aircraft will perform reliable in-flight starts.

2.13 **Maintenance Training** : train maintenance personnel on the airline ETOPS practices and procedures.

2.14 **Procedural Changes**: changes to maintenance or training procedures must be submitted to the CAAB for approval prior to adoption.

Example ETOPS Operational Approval Program

6 Month Timeline (Typical)



Accelerated ETOPS Operational Approval Process Flow

Regulatory Requirements
Ø Ø

Flight Ops Ö	*Approval Plan**	Õ Maintenance
	Ø Ø	
- Area of Operations		- ETOPS Significant Systems
- Routes, Alternates, Speed, Time		- Task Cards, Parts Control
- Flight Planning, WX, Com	***Review Gates***	- Oil Consumption, ECM*
- MEL*, APU Start*	Ø Ø	- Problem Resolution*
- Check Airman, Training		- Training
	ETOPS	
Demonstrated Processes Ö		Õ Demonstrated Processes
	Approval	
Operations Manual Ö		Õ ETOPS Manual
	(ops spec)	
*Validation Flight Ö		Õ *Validation Flight
	Ø Ø	
Dispatch Planning Ö	*Continuing*	Õ ECM/IFSD Rate
Training Ö	*Surveillance*	Õ Reliability Reporting

** Involves coordination between departments*

CIVIL AVIATION AUTHORITY OF BANGLADESH
AIR NAVIGATION ORDERS

AIRWORTHINESS REQUIREMENTS

PART E - AIRCRAFT EQUIPMENT

CHAPTER E.6	AIRCRAFT EQUIPMENT, SYSTEM AND INSTRUMENTS

Section No.	Title	Section No.	Title
1.	GENERAL	11.	FLIGHT AND NAVIGATIONAL INSTRUMENTS FOR OPERATIONS AEROPLANE UNDER VFR
2.	DEFINITIONS	12.	FLIGHT AND NAVIGATIONAL INSTRUMENTS FOR OPERATIONS AEROPLANE UNDER IFR
3.	AIRCRAFT EQUIPMENT, SYSTEMS AND INSTRUMENTS STANDARD	13.	EQUIPMENT, SYSTEMS AND INSTRUMENTS FOR HELICOPTER
4.	MINIMUM INSTRUMENTS AND EQUPMENTS	14.	EQUIPMENT AND INSTRUMENTS FOR SAIL PLANES AND TOW GLIDERS
5.	GENERAL EQUIPMENT, SYSTEMS AND INSTRUMENTS	15.	EQUIPMENT AND INSTRUMENTS FOR MOTORS GLIDER
6.	EMERGENCY AND SURVIVAL EQUIPMENT	16.	OPERATIONS IN RNP DESIGNATED AIRSPACE
7.	OXYGEN AND PROTECTIVE BREATHING EQUIPMENT	17.	OPERATIONS IN MNPS AIRSPACE WITH RVSM
8.	COMMUNICATION AND RADIO NAVIGATION EQUIPMENT	18.	CATEGORY II PRECISION APPROACH EQUIPMENT
9.	ELECTRIC LIGHTING EQUIPMENT	App. 1	SUPPLEMENTAL OXYGEN FOR UN-PRESSURISED AEROPLANES
10.	ENGINE INSTRUMENTS	App. 2	SUPPLEMENTAL OXYGEN FOR PRESSURISED AEROPLANES

1. GENERAL

1.1 This Order prescribes the requirements for installation of equipment, systems and instruments on all aircraft registered in Bangladesh and also foreign registered aircraft to be operated under Air Operator Certificate (AOC) issued by the Chairman CAAB.

1.2 An Operator shall not operate an aircraft unless the required equipment, systems and instruments as specified in the Order are installed according to the type(s) of aircraft(s) used, type of operations (rule 106 of the CARs, 1984), the operating rules for the flight(s) (VFR/IFR), the circumstances under which the flight(s) is to be conducted and are airworthy. In case requirements for a particular class of operations and/or type of aircraft are not mentioned in this order, the operator(s) shall contact the Chairman for specific requirements before operating any flight.

1.3 The Operator(s) and Owner(s) of aircraft should note that the ANO shall be studied on its totality and the applicable requirements shall depend on type of aircraft, engine, equipment, systems and instruments installed.

1.4. If an equipment is to be used by one flight crewmember at his station during flight, it must be readily operable from his station. When a single item of equipment is required to be operated by more than one flight crewmember it must be installed so that the equipment is readily operable from any station at which the equipment is required to be operated.

1.5 Those instruments that are used by any one-flight crewmember shall be so arranged as to permit the flight crewmember to see the indications readily from his station, with the minimum practicable deviation from the position and line of vision, which he normally assumes when looking forward along the flight path. Whenever a single instrument is required in an aeroplane operated by more than one flight crewmember it must be so installed that the instrument is visible from each applicable flight crew station.

1.6 Where more than one-flight crewmember are required or whenever duplicate instruments are required, the requirement embraces separate displays for each pilot and separate selectors or other associated equipment where appropriate.

1.7 An aircraft that is not equipped with an automatic pilot in accordance with the paragraph 12.2 of this order may be operated under the Instrument Flight Rules, provided the aircraft:

(a) is equipped with fully functioning dual controls; and

(b) has 2 (two) control seats, with one control seat occupied by the pilot in command of the aeroplane and the other by a person who holds a commercial pilot (aeroplane or helicopter as appropriate) licence or an air transport pilot (aeroplane or helicopter as appropriate) licence with :

(i) an endorsement for that type of aircraft; and

(ii) at least a co-pilot (aeroplane/helicopter as appropriate) instrument rating.

1.8 The number/quantity of equipment, system and instruments already installed on an aircraft in accordance with Type Certificate Data Sheet or TC specifications or as mentioned in Approved Flight Manual (AFM) of the aircraft shall not be reduced or altered unless otherwise approved or allowed by the Chairman as a modification. Reference is made to the ANO (airworthiness) chapter A. 7 on Modification and Repair Design Data Approval.

1.9 The holder of an Air Operator Certificate (AOC) operating air service operations under Scheduled public transport operations or Charter (Passenger) operations must:

(a) have a minimum equipment list or lists (MEL) approved by the Chairman CAAB; and

(b) including each list in the operations manual for the aircraft to which that list applies.

1.10 The holder of an Air Operator Certificate (AOC) operating Charter (Cargo), Aerial Work or Private

category operations:

(a) may have a minimum equipment list or lists (MEL) approved by the Chairman CAAB; and

(b) must include each list in the operations manual for the aircraft to which that list applies.

1.11 The chairman may at any time direct installation of additional equipment and/or instruments (other than as mentioned in this order) in the interest of flight safety.

2. DEFINITIONS

2.1 For the purpose of this Order, the definitions as mentioned under the Rule 2 and 183 of the Civil Aviation Rules, 1984 shall apply. Where a particular definition is not given under the Rule, the under mentioned definitions shall apply:

(a) **"ACAS II"** means, an Airborne Collision Avoidance System (ACAS) that utilizes interrogations of, and replies from airborne radar beacon transponders and provides traffic advisories and resolution advisories in the vertical plane.

(b) **"Aircraft"** means, any machine that can derive support in the atmosphere from reactions of the air other than the reactions of the air against the earth's surface. (e.g. Aircraft includes, aeroplanes, balloons, gliders, helicopter etc.)

(c) **"Aircraft engine"** means, an engine that is used or intended to be used for propelling aircraft. It includes turbo-supercharger, appurtenance, and accessories necessary for its functioning, but does not include propeller and independent short-period thrust-proceeding devices.

(d) **"Area navigation"** (RNAV) means, a method of navigation that permits aircraft operations on any desired course within the coverage of station-referenced navigation signals or within the limits of self-contained system capability.

(e) **" AOC holders"** a person or organisation holding Air Transport Operating Licence issued by or on behalf of the Chairman CAAB.

(f) **"Brake horse power"** means, the power delivered at the propeller shaft (main drive or main output) of an aircraft engine.

(g) **"Cabin crew/attendant"** means, a crewmember, other than a flight crewmember assigned to duty in an aircraft during flight time and is qualified in the execution of emergency procedures in accordance with the rule 157 of the Civil Aviation Rules, 1984.

(h) **"Category II operation"** means 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.

(i) **"Class of cargo or baggage compartment"** means, the classifications as defined under the FAR/JAR 25.852.

(j) **"Classes or types of operations"** means, the classification as mentioned in the rules 105 and 106 of the Civil Aviation Rules, 1984.

(k) **"Commercial operator"** means, a person who, for hire or reward, engages in the carriage by aircraft in air commerce of person or property.

(l) **"Equipment"** means, any instrument, mechanism, equipment, part, apparatus, appurtenance, or accessory, including communications equipment, that is used or intended to be used in operating or controlling an aircraft in flight, is installed in or attached to the aircraft, and is not part of an airframe, engine, or propeller.

(m) **"Flight crew"** means, a pilot, flight engineer, or flight navigator assigned to duty in an aircraft during flight time and is qualified in accordance with the rule 21 Of the CARs, 1984.

(n) **"FDR"** means, the type of Flight Data Recorder which meets the applicable specifications as mentioned in the ICAO Annex-6, Part I, Part II and Part III.

(o) **"IFR Conditions"** means, weather conditions below the minimum for flight under visual flight rules.

(p) **"Instrument"** means, a device using an internal mechanism to show visually or aurally the attitude, or operation of an aircraft or aircraft part. It includes electronic devices for automatically controlling an aircraft in flight.

(q) **"Long range navigation system (L.R.N.S)"** means, an electronic navigation unit that is approved for use under instrument flight rules as a primary means of navigation, and has at least one source of navigational input, such as inertial navigation system, global positioning system, omega/very low frequency, or Loran C.

(r) **"Long range over water flight"** means, an operation by an aeroplane when used over routes on which the aeroplane may be over water and at more than a distance corresponding to 120 minutes at cruising speed or 740 km (400 NM), whichever is the lesser, away from land suitable for making an emergency landing in case the critical power unit(s) becoming inoperative at any point along the route or planned diversions or 30 minutes at cruising speed or 185km (100 NM), whichever is the lesser, for all other aeroplanes.

(s) **"Manifold pressure**" means, absolute pressure as measured at the appropriate point in the induction system and usually expressed in inches of mercury.

(t) **"Modification "** means, in respect of an aeronautical product, a subordinate change to the original type design which may effect airworthiness, and which may involve alteration to the basic structure of an aircraft or component, or changes or additions to embodied systems, equipment, or accessories, but which will not alter the basic function or classification of the aeronautical product.

(u) **"Performance class 1 helicopter"** means, a helicopter with performance such that, in case of critical power-unit failure, it is able to land on the rejected take-off area or safely continue the flight to an appropriate landing area, depending on when the failure occurs.

(v) **"Performance class 2 helicopter"** means, a helicopter with performance such that, in case of critical power-unit failure, it is able to safely continue the flight, except when the failure occurs prior to a defined point after take-off area or after a defined point before landing, in which cases a forced landing may be required.

(w) **"Performance class 3 helicopter"** means, a helicopter with performance such that, in case of power-unit failure at any point in the flight profile, a force landing must be performed.

(x) **"Protective breathing equipment (PBE)"** means, equipment used to protect crewmembers from the effects of smoke and toxic fumes and gases, being equipment that complies with the FAA (USA) TSO-C116 or equivalent design standards mentioned in the ANO (Airworthiness) Chapter A. 1.

(y) **"Repair"** means, the restoration to an airworthy condition of an aircraft, installed engines and propellers, parts thereof and other installed aeronautical products.

(z) **"Runway visual range (RVR)"** means 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.

3. AIRCRAFT EQUIPMENT, SYSTEMS AND INSTRUMENTS STANDARD

3.1 Equipment, systems and instruments required to be installed as per this Order must be of approved type, applicable design standards mentioned in the ANO (Airworthiness) Chapter A. 1 and shall be installed in accordance with the airworthiness requirements applicable to them.

3.2 Each instrument must be calibrated in unit (s) as mentioned in the ANO chapter A.6 or in unit acceptable to the Chairman CAAB.

3.3 All maintenance, preventive maintenance, inspection, alteration, modification, repair shall be performed in accordance with applicable aircraft maintenance manual and/or component maintenance manual as per maintenance schedule/program and procedures approved by or/acceptable to the Chairman CAAB.

3.4 Where specific intervals are not mentioned in the applicable Maintenance Schedule or Component Maintenance Manual (CMM), the periodic inspection and test of instruments of pilot and static system shall be made according to the ANO (airworthiness) chapter B.I2.

4. MINIMUM INSTRUMENTS AND EQUIPMENTS

4.1 Each powered aircraft, except a powered glider, shall be equipped with the under mentioned minimum means of indicating:

(a) airspeed;

(b) mach number, if the speed limitation prescribed by the aircraft flight manual is expressed in terms of Mach number;

(c) altitude in feet;

(d) magnetic heading;

(e) fuel contents, other than auxiliary fuel tank's contents;

(f) engine revolutions of each engine;

(g) oil pressure of each engine using a pressure lubricating system;

(h) coolant temperature of each liquid-cooled engine;

(i) oil temperature of each engine rated at over 250 (two hundred fifty) brake horsepower using a pressure system;

(j) manifold pressure of each supercharged, or turbocharged, engine or each engine fitted with a constant speed propeller;

(k) cylinder head temperature of each air-cooled piston engine rated at over 250 (two hundred fifty) brake horsepower;

(l) flap position, if flaps are fitted, unless the position of the flaps can be determined visually by the crew;

(m) landing gear position, if the aircraft has retractable undercarriage; and

(n) the correct functioning of electrical power generation equipment.

5. GENERAL EQUIPMENT, SYSTEMS, AND INSTRUMENTS

5.1 Seats or berth, seat safety belts, harness and child restraint devices

5.1.1 Each aircraft other than a balloon shall be equipped with:

(a) a seat or berth for each person on board, who is aged two years or more;

(b) a safety belt for each seat and restraining belts for each berth;

(c) except as mentioned in the note (2) below, a shoulder harness for each pilot seat incorporating a device, which will automatically restrain the occupant's torso in the event of rapid deceleration;

(d) except as mentioned in the note (2) below, a safety belt with shoulder harness for each cabin crew seat and observer's seats. However, this requirement does not preclude use of passenger seats by cabin crew members carried in excess of the required cabin crew complement; and

(e) seats for cabin crew members at other locations are acceptable in place of those located near required floor level emergency exits, if the emergency evacuation of passengers, would be enhanced by seating cabin crew members elsewhere. The seats shall be forward or rearward facing within 15 degrees of the longitudinal axis of the aircraft.

Note: (1) All safety belts with shoulder harness must have a single point release.

(2) A safety belt with a diagonal shoulder strap for aircraft with a Maximum Certificated Take-off Mass (MCTM) not exceeding 5700 kg or a safety belt for aircraft with a MCTM not exceeding 2730 kg may be permitted in place of a safety belt with shoulder harness if it is not reasonably practicable to fit the latter.

5.2 Means of conveying safety information and safety briefings to passengers

(a) each aircraft, other than a balloon, having a maximum approved passenger seating configuration (MAPSC) of more than 9(nine) seats in passenger compartments separated from direct view or communications from the flight crew compartment, shall be equipped with means of indicating the following safety information and the passengers shall be given safety briefings before take-off regarding:

(b) when and how seat belts are to be fastened and unfastened;

(c) when and how oxygen equipment is to be used if the carriage of oxygen is required;

(d) restrictions on smoking;

(e) location and use of life jackets or equivalent individual floatation devices where their carriage is required;

(f) location and use of life rafts; and

(g) location and method of opening emergency exits.

5.3 Spare electrical fuses

5.3.1 Each aircraft shall be equipped with:

(a) at least 10% of the number of the fuses of each rating or three of each rating whichever is the greater is available for replacement of those accessible in flight.

5.4 Sea anchor (drogue)

5.4.1 All Sea planes and amphibians appropriate to its size, weight and handling characteristics shall be equipped with 1 (one) sea anchor.

5.5 Equipment for making sound signal

5.5.1 All seaplanes and amphibians shall be equipped for making sound signals prescribed in the international regulations for preventing collisions at sea

5.6 Windshield clear vision equipment

5.6.1 An aeroplane of a MCTM of more than 5700 kg or aeroplanes engaged in Scheduled public transport operations or Charter operations (passengers) shall be equipped with Windshield Wipers or equivalent means at each pilot station.

5.7 Marking of break -in points

5.7.1 If designated areas of the fuselage suitable for break-in by rescue crews in emergency are available on an aeroplane or helicopter, such areas shall be marked. The colour of the Marking of Break- in Points shall be red or yellow, and if necessary they shall be outlined in white to contrast with the background. If the corner markings are more than 2 meters apart, intermediate lines 9 cm x 3 cm shall be inserted so that there is no more than 2 meter between adjacent marks. (The markings shall be in compliance with the specification mentioned in the ICAO Annex-6, Part-I, Part II and Part III as may be appropriate).

5.8 Equipment for operating in icing condition

5.8.1 Each aircraft shall be equipped with:

(a) Suitable Anti-Icing and/or De-Icing Devices when operated in circumstances in which icing conditions are reported to exist or are expected to be encountered; and

(b) Means to illuminate or detect the formation of ice. Any illumination that is used must be of a type that will not cause glare or reflection that would handicap crewmembers in the performances or their duties.

5.8A Equipment for flights over designated land areas

5.8A.1 Each Aeroplane shall be equipped with such signaling devices and life-saving equipment (including means of sustaining life) as may be appropriate to the area over flown.

5.8A.2 From 1 January 2005, each aeroplanes on flights over designated land areas shall be equipped with at least 1(one) automatic ELT. The ELT equipment installed or carried shall operate simultaneously on 406 MHz and 121MHz and shall meet the technical characteristics contained in Radio Technical Commission for Aeronautics (RTCA) of USA document DO-304 and DO-183 respectively or European Organization for Civil Aviation Equipment (EUROCAE) document ED-62. Also refer the ICAO Annex 10, Volume III, Part II, Chapter 5 on “ELT for Search and Rescue”.

5.9 Internal doors and curtains

5.9.1 Each aircraft with a MAPSC of more than 19 (nineteen) passengers shall have:

(a) An internal door(s) between the passenger compartment and the flight deck compartment with a placard 'CREW ONLY' and a locking means to prevent passengers from opening it without the permission of a member of the flight crew;

(b) A means for opening each door that separates a passenger compartment from another compartment that has emergency exit provisions. The means for opening must be readily accessible;

(c) if it is necessary to pass through a doorway or curtain separating the passenger cabin from other areas to reach any required emergency exit from any passenger seat, the door or curtain must have a means to secure it in the open position;

(d) a placard on each internal door or adjacent to a curtain that is the means of access to a passenger emergency exit, to indicate that it must be secured open during take off and landing; and

(e) a means for any member of the crew to unlock any door that is normally accessible to passengers and that can be locked by passengers.

5.10 Flight recorders (FDR and CVR)

5.10.1 All applicable aircraft as mentioned in the ANO (airworthiness) E.3 and E.4, shall be equipped with:

(a) Flight Data Recorder (FDR) or Digital Flight Data Recorder (DFDR) in accordance with the ANO (airworthiness) Chapter E.2; and

(b) Cockpit Voice Recorder (CVR) in accordance with the ANO (airworthiness) Chapter E.3.

Note: Detailed guidance regarding type of Flight Recorders and recording requirements are mentioned in the ICAO Annex 6, Part-1, Part-II and Part-Ill.

5.11 Altitude reporting SSR transponder and Altitude Alerting System.
Installation of modes A, B and S Transponders

5.11.1 From 1 January 2003, unless exempted by the Chairman, each aircraft except gliders and manned free balloons operating in designated transponder mandatory airspace, shall be equipped with a pressure altitude reporting transponder having:

(a) Mode 3/A 4096 code capabilities replying to mode3/A interrogation with the code specified by the ATC; Mode 3/A provides a 4 digit octal identification code for the aircraft, assigned by the air traffic controller. Transponder codes are squawk codes four-digit octal numbers from zero to seven inclusive. thus the lowest possible squawk is 0000 and the highest is 7777. There are 4096 combinations of these four digit codes, which is why they are often called 4096 code. when a transponder receives a radar signal it sends back a transponder code (or squawk code). This is referrers to as mode 3A or commonly Mode A.

(b) Mode C capabilities that automatically replies to mode C interrogation by transmitting pressure altitude information in 100 (one hundred feet increments). Mode 3A and C are used to help air traffic controllers to identify the aircraft and to maintain separation.

5.11.2 As part of the modernization of Air Traffic Control Facilities, secondary surveillance radars are being provided to cover the major air routes in the country and also to provide the Minimum Safety Altitude Warning (MSAW) system. To derive full benefit of these facilities, it is necessary that the aero planes operating in Bangladesh airspace are fitted with the altitude reporting transponders.

5.11.3 ICAO Annex 6 Part II relating to operation of general aviation aero planes also requires that:

"all aero planes shall be equipped with a pressure-altitude reporting transponder which operates in accordance with the relevant provision of annex 10 VOL. IV".

Further, the Asia Pacific Air Navigation Planning and Implementation Regional Group (APANPIRG), have also recommended in their report of eighth meeting held from 23rd to 29th September, 1997 that: "from 1st January, 1999 all airplanes shall be equipped with a pressure altitude reporting transponder"

5.11.4 Transponder

5.11.4.1 A Transponder is a radio transmitter in a cockpit that works with a ground radar. When a transponder receives a signal from a more sophisticated ground secondary radar, it returns a squawk code with the aircraft's position, it's altitude and call sign.

5.11.4.2 Mode A transponder are one dimensional, they only give the aircraft identification. No other information is given out. If the aircraft is equipped with a TCAS, it will only give traffic advisories and will not call' 'traffic, 'traffic' in the annunciation. A mode A transponder codes response can be augmented by a pressure altitude response, which is then referred to as mode C operation. Pressure altitude is obtained from an altitude encoder, either a separate self contained unit mounted in the aircraft or an integral part of the transponder.

5.11.4.3 A mode C transponder gives both the identification and altitude of the aircraft. This is what it is called two dimensional. The TCAS, if installed in the aircraft will now not only give Traffic Advisories but Resolution Advisories as well. ATC will actually see flight level altitude on their Radar screen if the transponder installed in the aircraft is operating in the C mode or ALT (ALTITUDE). Mode C is an interrogation that elicits reply from transponder for automatic pressure altitude transmission and surveillance. Mode C refers to aircraft equipped with an altitude encoder and altimeter. Mode C provides 4 digit octal code for aircraft's pressure altitude.

5.11.4.4 Aircraft operating in airspace where mode S transponder equipment is required shall be equipped with transponder with the mode S capabilities; replying to Mode S interrogation.

5.11.4.5 If two aircraft are equipped with a mode S transponder both will establish a discreet communication between them. If the TCAS of the aircraft 1 says to descend, the TCAS of aircraft number 2 will say to climb. Mode S transponder transmits information about the aircraft to the secondary surveillance radar system, to TCAS receivers on board the aircraft. This information includes the call sign of the aircraft and /or transponder permanent 24 bit address to the form of hex code.

Primary Radar transmits a beam of radio frequency and subsequently and subsequently receives the minute proportion of this energy which has been echoed back to it by the target. This reflected signal is picked up and processed to provide a display which shows the location of the target.

Secondary Radar transmits a characteristics group of pulses recognizable to the transponder in the target aircraft which then responds after a predetermined precise interval with a coded train of pulses which identifies and /or provides information about the aircraft.

Mode S is a mode select. A transponder format to allow discrete interrogation and data link capability. The mode S ground equipment operates on the same frequency as SSR and comprises an interrogator and a receiver. In addition to mode S function, the ground station will also radiate standard SSR mode and will therefore be capable of operating in conjunction with aircraft carrying standard SSR equipment. In the same way, mode S transponder will be compatible with SSR ground station.

Mode S transponder provides the communication capabilities required for ACAS/TCAS as well as for air traffic function (mode A and mode C operation).

5.11.5 procedure for allotment of mode S address

Aircraft fitted with mode S transponder will be provided with mode S address by the CAAB which consists of 24 bits. The first 12 bits indicate the country code and the remaining 12 bits give the mode S address.

whenever an aircraft is equipped with mode S transponder, the aircraft operator/owner shall apply to the Chairman, Civil Aviation Authority, Bangladesh (attention; Director Flight Safety & Regulations) headquarters, kurmitola, Dhaka for allotment of specific mode S code address giving the following information and undertaking;

(a) aircraft type and registration number

(b) serial number of the aircraft

(c) name and address of the operator

After the above information is received, the specific code shall be allotted by the CAAB. The CAAB shall maintain file of all aircraft allotted with mode S address. All Bangladesh registered civil aircraft fitted with mode S transponder shall be issued with mode S address by the CAAB. mode S address issued by any other foreign regulatory authority shall stand cancelled after issue of Bangladesh registration.

5.11.6 **operational requirements**

prior to commencing operation of the aircraft fitted with mode A, mode C or mode S transponder, the aircraft flight manual shall be amended to include**:**

(a) appropriate procedure for the use of transponders;

(b) necessary amendment to the checklist

5.11.7 **Maintenance and certification of transponder**

The transponder shall be of approved type and meet the specification given in ISO-C74C for mode a/c transponder and ISO-C112 for mode S transponder if otherwise not specified by the CAAB.

The transponder shall be installed in an approved manner by an approved manufacturer/organization.

The transponder shall be maintained in serviceable condition. For release of aircraft under MEL due to defect in the transponder system, an entry shall be made in the maintenance record that includes the date and time of invoking the MEL and proper placarding in the cockpit.

Engineers inspecting/ certifying the transponders should hold appropriate rated license in category B2 (Avionics) and shall adequately be trained on the equipment.

5.12 Ground proximity warning system (GPWS)

5.12.1 All turbine-engined aeroplanes of a maximum certificated take-off mass in excess of 5700 kg or authorized to carry more than nine passengers shall be equipped with a ground proximity warning system which has a forward-looking terrain avoidance function.

5.12.2 The operator shall implement database management procedures that ensure the timely distribution and update of current terrain and obstacle data to the ground proximity warning system.

5.12.3 All piston-engined aeroplanes of a maximum certificated take-off mass in excess of 5700 kg or authorized to carry more than nine passengers shall be equipped with a ground proximity warning system which provides the warnings in 5.12.5 (a) and (c), warning of unsafe terrain clearance and a forward looking terrain avoidance function.

5.12.4 A ground proximity warning system shall provide automatically a timely and distinctive warning to the flight crew when the aeroplane is in potentially hazardous proximity to the earth's surface.

5.12.5 The ground proximity warning system shall provide unless otherwise specified herein, warnings of the following circumstances:

(a) excessive descent rate;

(b) excessive terrain closure rate;

(c) excessive altitude loss after take-off or go-around

(d) unsafe terrain clearance while not in landing configuration; and

1. gear not locked down;
2. flaps not in a landing position; and

(e) excessive descent below the instrument glide path.

5.13 Airborne Collision Avoidance System (ACAS II)

5.13.1 All Turbine-engine aeroplane of a MCTM of more than 5700 kg or a MAPSC of more than 19 (nineteen), shall be equipped with an airborne collision avoidance system (ACAS II).

5.14 Airborne weather radar system

5.14.1 Each pressurised aircraft of MCTM of more than 5700 kg or MAPSC of more than 9(nine), engaged in Scheduled public transport operations when operating under IFR or in areas where thunderstorms or hazardous weather conditions may exist shall be equipped with an operative Airborne Weather Radar System,

5.15 Cosmic radiation detection indicator

5.15.1 Each aeroplane intended to be operated above 15000 m (49000 ft) shall be equipped with an Indicator (instrument) to measure and indicate continuously the dose rate of total Cosmic Radiation being received (i.e. the total of ionizing and neutron radiation of galactic and solar origin) and the cumulative dose on each flight. The display unit shall be readily visible to a flight crew member.

5.16 Flight crew microphones and interphone system

5.16.1 Each aircraft on which a flight crew of more than one is required and engaged in Scheduled public transport operations or Charter operations shall be equipped with:

(a) flight crew interphone system including headsets and microphones; and

(b) transmission button on each pilot's control wheel.

5.16.2 All flight crew members of an aircraft engaged in Scheduled public transport operations or Charter operations and when operating below the transition level/altitude, shall communicate through:

(a) boom or throat microphones.

Note: (1) For aeroplanes and helicopters already registered in Bangladesh and issued with an individual certificate of airworthiness before publication of the ANO, this requirement will not be applicable.

5.17 Crew member interphone system

5.17.1 Each aircraft with a MCTM of more than 15000 kg or having a MAPSC of more than 19(nineteen), shall be equipped with a Crew Member interphone System, and the system must:

(a) operate independently of the public address system except for handsets, headsets, microphones, selector switches and signalling devices;

(b) provide a means of two-way communication between the flight crew compartment and:

(i) each passenger compartment;

(ii) each galley located other than on a passenger deck level; and

(iii) each remote crew compartment that is not on the passenger deck and is not easily accessible from a passenger compartment;

(c) be readily accessible for use from each of the required flight crew stations in the flight crew compartment;

(d) be readily accessible for use at required cabin crew member stations close to each floor level emergency exits;

(e) have an alerting system incorporating aural or visual signals for use by flight crew members to alert the cabin crew and for use by cabin crew members to alert the flight crew;

(f) have a means for the recipient of a call to determine whether it is a normal call or an emergency call; and

(g) provide on the ground a means of two-way communication between ground personnel and at least two-flight crewmembers.

5.18 Public address system

5.18.1 Each aircraft with MAPSC of more than 19 (nineteen) shall be equipped with a Public Address System, which must:

(a) operate independently of the interphone system except for handsets, headsets, microphone, selector switches and signalling devices;

(b) be readily accessible for immediate use from each required flight crew member station;

(c) for each required floor level passenger emergency exit which has an adjacent cabin crew seat, have a microphone which is readily accessible to the seated cabin crew member, except that one microphone may serve more than one exit, provided the proximity of the exits allows unassisted verbal communication between seated cabin crew members;

(d) be capable of operation within 10 (ten) seconds by a cabin crew member at each of those stations in the compartment from which its use is accessible;

(e) be audible and intelligible at all passenger seats, toilets and cabin crew seats and workstations, and

(f) must have priority over entertainment system

6. EMERGENCY AND SURVIVAL EQUIPMENT

6.1 First -aid kits

6.1.1 A First-aid Kit be installed on each aircraft in accordance with the ANO (airworthiness) chapter E.1.

6.2 Emergency medical kit

6.2.1 Each aircraft engaged in international Scheduled public transport operations shall carry Emergency Medical Kit in accordance with the ANO (airworthiness) chapter E.1.

6.3 Portable (hand) fire extinguishers

6.3.1 At least one Portable Fire Extinguisher, containing Halon 1211 (bromo-chlorodifluoro-methane, CBr CIF2), or equivalent as the extinguishing agent, must be conveniently located on the flight deck of each aircraft for use by the flight crew;

6.3.2 At least one Portable Fire Extinguisher must be located in, or readily accessible for use in, each galley not located on the main passenger deck;

6.3.3 At least one readily accessible Portable Fire Extinguisher must be available for use in each Class A or Class B cargo or baggage compartment and in each Class E cargo compartment that is accessible to crew members in flight;

6.3.4 At least the following number of Portable Fire Extinguisher must be conveniently located in the passenger compartment (s):

Maximum approved passenger seating configuration	**Number of Extinguishers**
7 to 30	1
31 to 60	2
61 to 200	3
201 to 300	4
301 to 400	5
401 to 500	6
501 to 600	7
601 or more	8

6.3.5 At least one of the required Portable Fire Extinguishers located in the passenger compartment of an aircraft with a MAPSC of at least 31, and not more than 60, and at least two of the fire extinguishers located in the passenger compartment of an aircraft with a MAPSC of 61 or more must contain Halon 1211 (Bromo-Chloro-di-Fluoro-Methane, CBrCIF2), or equivalent as the extinguishing agent; and

6.3.6 When two or more Portable Fire Extinguishers are required, they must be evenly distributed in the passenger compartment.

6.4 Crash axes or crowbars

6.4.1 Each aircraft with a MCTM of more than 5700 kg or having a MAPSC of more than 9 (nine) seats shall be equipped with at least one Crash Axe or Crowbar located on the flight deck. If the MAPSC is more than 200 (two hundred), an additional Crash Axe or Crowbar must be carried and located in or near the most rearward galley area; and

Note: Crash Axes and Crowbars or signs thereof located in the passenger compartment must not be visible to passengers.

6.5 Equipment for emergency evacuation (Escape slides/Escape ropes etc.)

6.5.1 An aeroplane with passenger emergency exit sill heights more than 1.83 metres (6 feet) above the ground with the aeroplane on the ground and the landing gear extended; or

6.5.2 More than 1.83 metres (6 feet) above the ground after the collapse of, or failure to extend of, one or more legs of the landing gear and for which a type certificate was first applied for on or after 1 April 2000, must be equipped with:

(a) Equipment or Device (Escape Slide or accepted equivalent) at each emergency exit for passengers and crews to reach ground safely in emergency.

6.5.3 An aeroplanes having separate emergency exit for the flight crew for which the lowest point of the emergency exit is more than 1.83 metres (6 feet) above the ground with the landing gear extended; or

6.5.4 For which a Type Certificate was first applied for on or after 1 April 2000 and would be more than 1.83 metres (6 feet) above the ground after the collapse of, or failure to extend of, one or more legs of the landing gear, must be equipped with:

(a) a device (Escape Ropes or accepted equivalent) to assist all members of the flight crew in descending to reach the ground safely in an emergency.

Note: Emergency equipment or devices need not be provided at over wing exits if the designated places on the aeroplane structure at which the escape route terminates is less than 1.83 metres (6 feet) from the ground with the aeroplane on the ground, the landing gear extended, and the flaps in the take-off or landing position, whichever flap position is higher from the ground.

6.6 Life jackets

6.6.1 Land aeroplanes shall carry a Life Jacket or equivalent Floatation Device for each person on board:

(a) when flown beyond the gliding distance; or

(b) When flying over water and at a horizontal distance of more than 50 nautical miles from the nearest shoreline; or

(c) when taking-off and landing from/at Chittagong and Coxbazar airports; or

(d) on all flights where the take-off or approach path is so disposed over water that in the event of a mishap occurring during the departure or the arrival, it is reasonably possible that the aircraft would be forced to land onto water or ditch.

6.6.2 Seaplanes and amphibians shall carry a Life Jackets or equivalent floatation device for each person on board.

Note: (1) Life jackets be equipped with a survivor locator light.

(2) Life jackets be stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.

(3) Other approved floatation device may substitute Life Jackets for infants.

6.7 Life rafts, life saving equipment and survival emergency locator transmitters (ELTs)

6.7.1 Each aircraft engaged in long range over water operation shall carry sufficient numbers of Life Rafts to carry all persons on board, stowed so as to facilitate their ready use in an emergency and at least two Survival Emergency Locator Transmitters (ELT-S). Unless excess Life Rafts of enough capacity are provided, the buoyancy and seating capacity beyond the rated capacity of the rafts must accommodate all occupants of the aeroplane in the event of a loss of one raft of the largest rated capacity. Each Life Rafts shall be equipped with:

(a) a survivor locator light; and

(b) the following Life Saving Equipment including means of sustaining life as appropriate to the flight to be undertaken contained in a pack: -

- means of maintaining buoyancy;
- a sea anchor;
- lifelines, and means of attaching one life raft to another;
- paddles for life rafts with a capacity of 6 or less person;
- means of protecting the occupants from the element;
- a water resistant torch;
- signaling equipment to make the pyrotechnical distress signals described in ICAO Annex 2;
- first- aid equipment;
- for each 4, or fraction of 4, person which the life-raft is designed to carry;
- 100 gram glucose tablets; and
- 500 ml. of water. This water may be provided in durable containers or by means of making sea water drinkable or a combination of both.

(c) first-aid kit

Note: A survival emergency locator transmitter (ELT-S) should be stowed so as to facilitate its ready removal from the aeroplane and activated for use in an emergency. It may be activated manually or automatically (e.g. by water activation) and should designed to be tethered to a life raft or a survivor.

6.8 Emergency locator transmitter (ELT)

6.8.1 Except as provided for in the paragraph 6.8.2 until 1 January 2005, each aeroplanes operated on long-range over-water flights shall be equipped with at least two ELT(S).

6.8.2 An aeroplane for which the individual certificate of airworthiness is first issued after 1 January 2002, operated on long-range over-water flights shall be equipped with at least two ELTs, one of which shall be automatic.

6.8.3 From 1 January 2005, each aeroplanes operated on long-range over-water flights shall be equipped with at least two ELTs, one of which shall be automatic.

Note: (1) ELTs should comply with the specification TSO C91a issued by FAA of the USA or equivalent specification.

(2) Until 1 January 2005 emergency locator transmitters carried in compliance with Standards of Annex 6, Parts I, II and III shall operate either on both 406 MHz and 121.5 MHz or on 121.5 MHz.

(3) All emergency locator transmitters installed on or after 1 January 2002 and carried in compliance with Standards of Annex 6, Parts I, II and III shall operate on both 406 MHz and 121.5 MHz.

(4) From 1 January 2005, emergency locator transmitters carried in compliance with Standards of Annex 6, Parts I, II and III shall operate on both 406 MHz and 121.5MHz.

(5) An operator shall ensure that all ELTs that are capable of transmitting on 406 MHz shall be coded in accordance with ICAO Annex 10 and registered with the CAAB for initiating search and rescue (SAR).

(6) Types of ELTs are defined below:

Automatic fixed (ELT-AF):

An automatically activated ELT, which is permanently attached to an aircraft.

Automatic portable ELT (ELT-AP):

An automatically activated ELT which is rigidly attached to an aircraft but readily removable from the aircraft.

Automatic deployable ELT (ELT-AD):

An ELT which is rigidly attached to an aircraft and which is automatically deployed and activated by impact, and , in some cases, also by hydrostatic sensors. Manual deployment is also provided.

Survival ELT (ELT-S):

An ELT which is removable from an aircraft, stowed so as to facilitated its ready use in an emergency, and manually activated by survivors.

6.9 Megaphones

6.9.1 Each aeroplane with a MAPSC of more than 60 (sixty) and carrying one or more passengers shall be equipped with portable battery-powered Megaphones readily accessible for use by crew members during an emergency evacuation, to the following scales:

(a) For each passenger deck:

Passenger seating configuration	Number of Megaphones Required
61 to 99	1
1 00 and more	2

(b) For aeroplanes with more than one passenger deck, in all cases when the total passenger-seating configuration is more than 60(sixty), at least l(one) Megaphone is required

7. OXYGEN AND PROTECTIVE BREATHING EQUIPMENT

7.1 Oxygen indicators

7.1.1 Each aircraft operated at altitudes above 13000 feet AMSL, or for more than 30 minutes between 10000 feet up to and including 13000 feet AMSL, shall be equipped with a means of indicating –

(a) to the flight crew:

(i) the amount of oxygen available in each source of supply and whether the oxygen is being delivered to the dispensing units; and

(ii) of a pressurised aircraft, by visual or aural warning when the cabin pressure altitude exceeds 10000 feet AMSL;

(b) to each user of an individual dispensing unit, the amount of oxygen available and whether the oxygen is being delivered to the dispensing unit.

7.2 Supplemental oxygen for un-pressurised aeroplanes

7.2.1 An operator shall not operate a non-pressurised aeroplanes at-altitudes above 10000 ft. unless supplemental oxygen equipment, capable of storing and dispensing the oxygen supplies as mentioned below is provided for:

(a) Flight crew members:

(i) Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with Appendix 1 to this order. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply then they shall be considered as flight crewmembers on flight deck duty for the purpose of oxygen supply.

(b) Cabin crew members, additional crew members and passengers:

(i) Cabin crewmembers and passengers shall be supplied with oxygen in accordance with Appendix 1 to this order. Cabin crewmembers carried in addition to the minimum number of cabin crewmembers required, and additional crewmembers, shall be considered as passengers for the purpose of oxygen supply.

Note: (1) The amount of supplemental oxygen for sustenance required for a particular operation shall be determined on the basis of flight altitudes and flight duration, consistent with the operating procedures established for each operations in the Operations Manual and with the routes to be flown, and with the emergency procedures specified in the Operations Manual.

(2) An aeroplane intended to be operated at pressure altitudes above 10000 ft shall be provided with equipment capable of storing and dispensing the oxygen supplies required.

7.3 Supplemental oxygen equipment and supply requirements for pressurised aeroplanes

7.3.1 An operator shall not operate a pressurised aeroplane at pressure altitudes above 10000 ft unless supplemental oxygen equipment, capable of storing and dispensing the oxygen supplies required by this paragraph, is provided for:

(a) Flight crew members:

(i) Each member of the flight crew on flight deck duty shall be supplied with supplemental oxygen in accordance with Appendix 2 to this Order. If all occupants of flight deck seats are supplied from the flight crew source of oxygen supply then they shall be considered as flight crewmembers on flight deck duty for the purpose of oxygen supply. Flight deck seat occupants, not supplied by the flight crew source, are to be considered as passengers for the purpose of oxygen supply.

(ii) Flight crewmembers, not covered by sub-paragraph 7.3.1 (a) (i) above, are to be considered as passengers for the purpose of oxygen supply.

(iii) Oxygen masks shall be located so as to be within the immediate reach of flight crewmembers whilst at their assigned duty station.

(iv) Oxygen masks for use by flight crewmembers in pressurised aeroplanes operating at pressure altitudes above 25000 ft, shall be a quick donning type of mask.

(b) Cabin crew members, additional crew members and passengers:

(i) Cabin crewmembers and passengers shall be supplied with supplemental oxygen in accordance with Appendix 2 to this Order except when sub- paragraph (v) below applies. Cabin crewmembers carried in addition to the minimum number of cabin crewmembers required, and additional crewmembers, shall be considered as passengers for the purpose of oxygen supply.

(ii) Aeroplanes intended to be operated at pressure altitudes above 25000 ft shall be provided sufficient spare outlets and masks and/or sufficient portable oxygen units with masks for use by all required cabin crewmembers. The spare outlets and/or portable oxygen units are to be distributed evenly throughout the cabin to ensure immediate availability of oxygen to each required cabin crewmember regardless of his/her location at the time of cabin pressurisation failure.

(iii) Aeroplane intended to be operated at pressure altitudes above 25000 ft shall be provided and oxygen-dispensing unit connected to oxygen supply terminals immediately available to each occupant, wherever seated. The total number of dispensing units and outlets shall exceed the number of seats by at least 10%. The extra units are to be evenly distributed throughout the cabin.

(iv) Aeroplanes intended to be operated at pressure altitudes above 25000 ft or which, if operated at or below 25000 ft, cannot descend safety within 4 minutes to 13000 ft, and for which the individual certificate of airworthiness was first issued on or after 9 November 1998, shall be provided with automatically deployable oxygen equipment immediately available to each occupant, wherever seated. The total number of dispensing units and outlets shall exceed the number of seats by at least 10%. The extra units are to be evenly distributed throughout the cabin.

(v) The oxygen supply requirements, as specified in Appendix 2, to this Order for aeroplanes not certificated to fly above 25000 ft, may be reduced to the entire flight time between 10000 ft and 13000 ft cabin pressure altitudes for all required cabin crew members and for at least 10% of the passengers if, at all points along the route to be flown, the aeroplane is able to descend safely within 4 minutes to a cabin pressure altitude of 13000 ft.

8. COMMUNICATION AND RADIO NAVIGATION EQUIPMENT

8.1 Communication equipment

8.1.1 An aeroplane of MCTM of 5700 kg or less, engaged in Private operations shall be appropriately equipped to fulfill the following requirements:

(a) a VHP system to conduct two-way direct communication at any time with at least one appropriate air traffic control unit from any point on the route during flight when operating within the controlled airspace; and

(b) to be able to communicate on aeronautical emergency frequency 121.5 MHz.

8.1.2 An aeroplane of MCTM of 5700 kg or less, engaged in Aerial work or Charter (cargo only) operations shall be appropriately equipped to fulfill the following requirements:

(a) as in the paragraph 8.1.1 above of this order; and

(b) to be able to communicate at any time with at least one ground station when operating outside controlled airspace.

8.1.3 An aeroplane of MCTM of 5700 kg or less engaged in Charter (passenger only) or Scheduled public transport operations shall be appropriately equipped to fulfill the following requirements:

(a) as in the paragraph 8.1.2 of this order;

(b) able to receive meteorological information; and

(c) an additional independent VHP system of similar capability as of the paragraph 8.1.1 (a).

8.1.4 An aeroplane of MCTM of more than 5700 kg, engaged in any type of operations shall be appropriately equipped to fulfill the following requirements:

(a) as in the paragraph 8.1.3 of this order;

(b) able to reply to SSR transponder interrogation as required for the route being flown; and

(c) a HF communication system capable of operating on SSB mode to conduct two-way communication with appropriate aeronautical station when operating out side VHP coverage of ATC units.

8.2 Radio navigation equipment

8.2.1 A single-engine aeroplane when flying for the purpose of Private or Aerial work or Charter (cargo only) operation under VFR over a route on which navigation is not solely effected by visual reference to landmarks, the aeroplanes shall be adequately equipped with including the following enabling the aeroplane to be navigated on the intended route:

(a) An Automatic Direction Finding (ADF) equipment; or

(b) A Distance Measuring Equipment (DME); or

(c) A VHF omni-range (VOR) equipment or other equipment of equivalent navigation performance acceptable to Chairman.

Note: For Charter (passenger) operation under the above mentioned conditions, the destination aerodrome must have and appropriate approach procedures for the installed navigation aid(s) and the aeroplane shall be fitted with two (2) independent and separate radio navigation system capable of using the navigation aid(s).

8.2.2 For operation under VFR by multi-engine aeroplanes when flying for the purpose of Charter (passenger) or Scheduled public transport, the aeroplanes shall be equipped with:

(a) an ADF equipment;
(b) a DME;
(c) dual VOR equipment; and

(d) one Marker Beacon receiving system where a Marker Beacon is required for approach navigation purposes;

8.2.3 For operation under IFR by all aeroplanes in any type of operations (rule 106 of the CARs, 1984) the aeroplanes shall be equipped with at least:

(a) a VOR receiving system;

(b) an ADF system;

(c) a DME;

(d) one Marker Beacon receiving system where a Marker Beacon is required for approach navigation purposes;

(e) one ILS or MLS where ILS or MLS is required for approach navigation purposes; (f) area Navigation System when area navigation is required for the route being flown;

(g) an additional DME system of any route, or part therefore, where navigation is based only on DME signals;

(h) an additional VOR receiving system on any route, or part thereof, where navigation is based only on VOR signals; and

(i) an additional ADF system on any route, or part thereof, where navigation is based only on NDB signals, or

(j) complies with the Required Navigation Performance (RNP) Type for operation in the specific airspace concerned.

Note: The requirement for RNP operations is based on Regional Air Navigation Agreements as Covered in the following documents: -

(a) MNPS - ICAO Doc. 7030

(b) RNP information associated procedures - ICAO DOC, 9613

(c) RNP/RNAV - EUROCONTROL standards on area navigation

(d) Advisory Material for the - JAA TGL # 2 Airworthiness Approval of Navigation System for use in European Airspace for Basic RNAV Operation.

9. ELECTRIC LIGHTING EQUIPMENT

9.1 Aircraft operating lights

9.1.1 Each aircraft for Day Flight shall be equipped with:

(a) anti-Collision Light system;

(b) lighting supplied from the aircraft electrical system to provide adequate illumination for all instruments and equipment essential to the safe operation of the aeroplane;

(c) means of controlling the intensity of the illumination of instrument lights, unless it can be demonstrated that non-dimmed instrument lights are satisfactory under all conditions of flight likely to be encountered.

(d) lighting supplied from the aircraft electrical system to provide illumination in all passenger compartments, and

(e) an Electric Torch for each required crewmember readily accessible to crewmember when seated at their designated station.

9.1.2 Each aircraft for Night Flight shall be equipped with:

(a) as stated in the paragraph 9.1.1;

(b) navigation/position lights;

(c) two landing lights or a single light having two separately energised filaments; and

(d) lights to conform to the International regulations for preventing collisions at sea if the aeroplane is a seaplane or an amphibian.

9.2 Emergency lighting

9.2.1 An aeroplane, which has a MAPSC of more than 9 (nine) but MAPSC of 19 (nineteen) or less, shall be equipped with an Emergency Lighting system having an independent power supply to facilitate the evacuation of the aeroplane. The emergency lighting system must include:

(a) sources of general cabin illumination;

(b) internal lighting in floor level emergency exit areas; and

(c) illuminated emergency exit marking and locating signs.

9.2.2 For aeroplane, which have a MAPSC of more than 19 (nineteen), the Emergency Lighting system must include:

(a) sources of general cabin illumination;

(b) internal lighting in floor level emergency exit areas; and

(c) illuminated emergency exit marking and locating signs.

(d) for aeroplanes for which the application for the certificate of airworthiness was issued before 1 May 1972, and when flying by night, exterior emergency lighting at all over wing exits, and at exits where descent assist means are required.

(e) for aeroplanes for which the application for the certificate of airworthiness was issued after 1 May 1972, and when flying by night, exterior emergency lighting at all passenger emergency exits.

(f) for aeroplanes for which certificate or airworthiness was issued on or after 1 January 1958, floor proximity emergency escape path marking system in the passenger compartment (s).

9.2.3 An aeroplane which have a MAPSC of 19 (nineteen) or less and not certificated to FAR/JAR 23 or FAR/JAR 25, and is already on Bangladesh register of aircraft, shall have:

(a) a sources of general cabin illumination.

Note: After 1 April 1998 an operator shall not, by night, operate a passenger carrying aeroplane which has a maximum approved passenger seating configuration of 9 (nine) or less unless it is provided with a source of general cabin illumination to facilitate the evacuation of the aeroplane. The system may use dome lights or other sources of illumination already fitted on the aeroplane and which are capable of remaining operative after the aeroplane's battery has been switched off.

10. ENGINE INSTRUMENTS

10.1 The engine instrument as required by the under mentioned paragraph shall be installed on:

10.1.1 Reciprocating engine-powered aeroplanes certified in Normal, Utility, Acrobatic and Commuter category:

(a) instruments as per the Design Standard FAR/JAR 23.1305 (b)

10.1.2 Turbojet/turbofan engine-powered aeroplanes certified in Normal, Utility, Acrobatic and Commuter category:

(a) instruments as per the Design Standard FAR/JAR 23.1305 (d)

10.1.3 Turbo propeller-powered aeroplanes certified in Normal, Utility, Acrobatic and Commuter category:

(a) instruments as per the Design Standard FAR/JAR 23.1305 (e)

10.1.4 Reciprocating engine-powered aeroplanes certified in Transport (large) category:

(a) instruments as per the Design Standard FAR/JAR 25.1305 (b)

10.1.5 Turbojet/turbo fan engine-powered aeroplanes certified in Transport (large) category:

(a) instruments as per the Design Standard FAR/JAR 25.1305 (d)

10.1.6 Turbo propeller engine-powered aeroplanes certified in Transport (large) category:

(a) instruments as per the Design Standard FAR/JAR 25.1305 (e)

11. FLIGHT AND NAVIGATIONAL INSTRUMENTS FOR OPERATIONS OF AEROPLANE UNDER VFR

11.1 An aeroplane of MCTM of 5700 kg or less engaged in Private operations under VFR, shall be equipped with:

(a) an airspeed indicating system calibrated in knots;

(b) a sensitive pressure altimeter calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) a direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass; and

(d) an accurate timepiece indicating the time in hours, minutes and seconds;

11.2 An aeroplane of MCTM of 5700 kg or less engaged in (i) Aerial work or (ii) Charter operations under VFR, shall be equipped with:

(a) the Instruments as mentioned in the paragraph 11.1 of this Order;

(b) a turn and slip indicator (agricultural aeroplanes may be equipped with a slip indicator only); and

(c) an outside temperature indicator calibrated in degrees Celsius.

11.3 An aeroplane engaged in (i) Scheduled public transport operations and (ii) an aeroplane having a MCTM of more than 5700 kg engaged in Charter operations under VFR shall be equipped with:

(a) an airspeed indicating system calibrated in knots with means of preventing malfunctioning due to either condensation or icing including a warning indication of pitot heater failure;

(b) two sensitive pressure altimeters (with counter drum-pointer or equivalent presentation recommended) calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) a direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass;

(d) an accurate timepiece indicating the time in hours, minutes and seconds;

(e) a rate of climb and descent indicator (vertical speed indicator);

(f) an outside air temperature indicator calibrated in degrees Celsius.

(g) two attitude indicators (artificial horizons);

(h) a heading indicator (directional gyroscope or equivalent approved by CAAB);

(i) a turn and slip indicator except that only a slip indicator is required when a third attitude indicator usable through flight attitudes of 360 degrees of pitch and roll is installed in accordance with subparagraph (k) of this paragraph.

(j) a means of indicating whether the power supply to those instruments requiring power is working satisfactorily:

(k) in turbo-jet aeroplanes having a MCTM of more than 5700 kg and in turboprop aeroplanes having a MCTM of more than 18000 kg a third attitude indicator which :

(i) is powered from a source independent of the normal electrical generating system;

(ii) continues to provide reliable indication for a minimum 30 (thirty) minutes after total failure of the normal electrical generating system, taking into account other loads on the emergency power supply and operational procedures;

(iii) is operative automatically after total failure of the normal electrical generating system;

(iv) is located on the instrument panel in a position which will make it plainly visible to and usable by any pilot at his station; and

(v) is appropriately illuminated during all phases of operation; and

(l) in turbo-jet aeroplanes with operating limitations expressed in terms of Mach number, a Mach number indicator (Machmeter), at each pilot's station.

Note: (1) For aeroplanes having MCTM of more than 5700 kg, the instruments used by the pilot in command and which are specified in the paragraphs 11.3 (a), (b), (e) and (1) of this Order shall be capable of being connected either to a normal or an alternate static source but not both sources simultaneously. Alternatively, the aeroplane may be fitted with two independent static sources each consisting of a balanced pair of flush static ports of which one is used for the instruments specified above. Instruments and equipment other than flight instruments provided for use by the pilot in command shall not be connected to the normal static system that operates the instruments of the pilot in command;

(2) For aeroplanes having MCTM of 5700 kg or less, the instruments specified in the paragraph 11.3 (a), (b), (e) and (1) of this Order shall be capable of being connected to either a normal or alternate static source but not both sources simultaneously. Alternatively, the aeroplane may be fitted with a balanced pair of flush static ports.

(3) The instruments specified in the paragraph 11.3 (g), (h) and (i) of this Order shall have duplicated sources of power supply.

(4) CAAB may, having regard to the type of aeroplane, approve an attitude indicator incorporated in an automatic pilot system being one of the two attitude indicators required by paragraph 11.3 (g) of this Order.

(5) A gyro-magnetic type of remote indicating compass installed to meet the requirements of paragraph 11.3 (c) (ii) of this Order may also be considered to meet the requirement for a heading indicator specified in paragraph 10.3 (h) of this Order provided that it has a duplicated power supply.

(6) For Visual Flight Rules flight, the following instruments may be unserviceable:

(a) the attitude indicator required by paragraph 1 1 .3 (k) of this Order;

(b) one of the attitude indicators required by paragraph 11.3 (g) provided that the attitude indicator required by paragraph 11.3 (k) is serviceable or an attitude indicator has been provided to meet the requirements of paragraph 11.3 (i) of this Order and is serviceable ; and

(c) the turn and slip indicator or slip indicator and attitude indicator required by paragraph 11.3 (i) of this Order.

11.4 An aeroplane of MCTM of 5700 kg or less operated under VFR by night shall be equipped with:

(a) the instrument as mentioned in the paragraph 4.1;

(b) a means of indicating rate of turn and sleep;

(c) position lights;

(d) an anticollision light system; and

(e) illumination for each required instrument or indicator.

12. FLIGHT AND NAVIGATIONAL INSTRUMENTS FOR OPERATIONS OF AEROPLANE UNDER IFR

12.1 An aeroplane shall not be operated under the Instrument Flight Rules (IFR) unless it is equipped with:

(a) the flight and navigation instruments specified in the paragraphs 12.3,12.4 and 12.5 of this Order as applicable for the type of operations involved;

(b) the electric lighting equipment specified in the section 9 of this Order;

(c) flight crew microphones and interphones system specified in the paragraph 5.16 of this Order; and

(d) any other instruments or indicators specified in the aeroplane flight manual;

12.2 An aeroplane engaged in (i) Charter (passengers), (ii) Aerial work (ambulance function) and (iii) Scheduled public transport operations, must not be operated under the IFR unless it is equipped with:

(a) the instruments 12.1 of this order as applicable for the type operations; and

(b) a serviceable automatic pilot that has the following capabilities:

(i) a capability of operating the flight controls to maintain flight and manoeuvre the aeroplane about the roll and pitch axis;

(ii) an automatic heading capability; and

(iii) an altitude hold capability, or

(c) In accordance with the conditions of the paragraph 1.7 of this order.

12.3 An aeroplane having a MCTM of 5700 kg or less, engaged in Charter (Passengers) operations under IFR (except night VMC) shall be equipped with:

(a) an airspeed indicating system calibrated in knots with means of preventing malfunctioning due to either condensation or icing including a warning indication of pitot heater failure. (The pitot heater failure warning indication does not apply to those aeroplanes with a MAPSC of 9 (nine) or less or a MCTM of 5700 kg or less and issued with an individual Certificate of airworthiness prior to 1 April 1998);

(b) two sensitive pressure altimeters with counter drum-pointer or equivalent presentation (neither three-pointer nor drum-pointer altimeter are acceptable), calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) a direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass;

(d) an accurate timepiece indicating the time in hours, minutes and seconds;

(e) a rate of climb and descent indicator (vertical speed indicator);

(f) an outside air temperature indicator calibrated in degrees Celsius;

(g) two attitude indicator (artificial horizons);

(h) a heading indicator (directional gyroscope or equivalent approved by CAAB);

(i) a turn and slip indicator except that only a slip indicator is required when a third attitude indicator usable through flight attitudes of 360 degrees of pitch and roll is installed;

(j) a means of indicating whether the power supply to the gyroscopic instruments is working satisfactorily;

(k) in turbo-jet aeroplanes with operating limitations expressed in terms of Mach number, a Mach number indicator (Machmeter).

Note: (1) The instruments specified in the paragraph 12.3 (a), (b), (e) and (1) of this Order shall be capable of being connected either to a normal or an alternate static source but not both sources simultaneously. Alternatively the aeroplane may be connected to a balanced pair of flush static ports.

(2) The instruments specified in paragraph 12.3 (g), (h) and (i) of this Order shall have duplicated sources of power supply.

(3) CAAB may, having regard to the type of aeroplane, approve an attitude indicator incorporated in an automatic pilot system being one of the two attitude indicators required by paragraph 12.3 (g) of this Order.

(4) A gyro-magnetic type of remote indicating compass installed to meet the requirements of paragraph 12.3 (c) (ii) of this Order may also be considered to meet the requirement for a heading indicator specified in subparagraph 12.3 (h) of this Order provided that it has a duplicated power supply.

12.4 An aeroplane having a MCTM of 5700 kg or less engaged in (i) Aerial work and Private operations under IFR (including night VMC), (ii) Charter operations under IFR (including night VMC) and (iii) Charter operations (Cargo only) under IFR, shall be equipped with:

(a) an airspeed indicating system calibrated in knots with means of preventing malfunctioning due to either condensation or icing including a warning indication of pitot heater failure. (The pitot heater failure warning indication does not apply to those aeroplanes with a MAPSC of 9 (nine) or less or a MCTM of 5700 kg or less and issued with an individual Certificate of airworthiness prior to 1 April 1998);

(b) a sensitive pressure altimeters with counter drum-pointer or equivalent presentation (neither three-pointer nor drum-pointer altimeter are acceptable), calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass;

(d) an accurate timepiece indicating the time in hours minutes and seconds;

(e) a rate of climb and descent indicator (vertical speed indicator) for other than night VMC flights;

(f) an outside air temperature indicator calibrated in degrees Celsius;

(g) an attitude indicator (artificial horizons);

(h) a heading indicator (directional gyroscope);

(i) a turn and slip indicator except that only a slip indicator is required when a second attitude indicator usable through flight attitudes of 360 degrees of pitch and roll is

installed;

(j) means of indicating whether the power supply to the gyroscopic instruments is working satisfactorily; and

(k) except for aeroplanes engaged in night VMC flights, means of preventing malfunctioning due to either condensation or icing of at least one airspeed indicating system.

Note: (1) This instruments specified in the paragraph 12.4 (a), (b), (e) and (k) of this Order shall be capable of being connected either to a normal or an alternate static source but not both sources simultaneously. Alternatively, they may be connected to a balanced pair of flush static ports.

(2) Except for aeroplanes engaged in night VMC private and aerial work operations the instruments specified in paragraph 12.4 (g), (h) and (i) of this Order shall have duplicated sources of power supply unless the turn and slip indicator or the second attitude indicator specified in paragraph 12.4

(3) has a source of power independent of the power operating other gyroscopic instruments.

(4) A gyro-magnetic type of remote indicating compass installed to meet the requirements of paragraph 12.4 (c) (ii) of this Order may be considered also to meet the requirement for a heading indicator specified in paragraph 12.4 (h) of this Order, provided that such installation complies with the power supply requirements of the note (2) of this Order.

12.5 An aeroplane engaged in (i) Scheduled public transport operations and (ii) an aeroplane having a MCTM greater than 5700 kg engaged in Charter operations under IFR shall be equipped with:

(a) an airspeed indicating system calibrated in knots with means of preventing malfunctioning due to either condensation or icing including a warning indication of pitot heater failure;

(b) two sensitive pressure altimeters with counter drum-pointer or equivalent presentation (neither three-pointer nor drum-pointer altimeter are acceptable), calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) a direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass;

(d) an accurate timepiece indicating the time in hours, minutes and seconds:

(e) a rate of climb and descent indicator (vertical speed indicator);

(f) an outside air temperature indicator calibrated in degrees Celsius.

(g) two attitude indicator (artificial horizons);

(h) a heading indicator (directional gyroscope or equivalent approved by CAAB);

(i) a turn and slip indicator except that only a slip indicator is required when a third attitude indicator usable through flight attitudes of 360 degrees of pitch and roll is installed in accordance with subparagraph (k) of this paragraph.

(j) Q a means of indicating whether the power supply to those instruments requiring power is working satisfactorily:

(k) in turbo-jet aeroplanes having a MCTM more than 5700 kg and in turbo-prop aeroplanes having a MCTM more than 18000 kg a third attitude indicator which:

(i) is powered from a source independent of the normal electrical generating system;

(ii) continues to provide reliable indication for a minimum 30 (thirty) minutes after total failure of the normal electrical generating system, taking into account other loads on the emergency power supply and operational procedures;

(iii) is operative automatically after total failure of the normal electrical generating system;

(iv) is located on the instrument panel in a position which will make it plainly visible to and usable by any pilot at his station; and

(v) is appropriately illuminated during all phases of operation; and

(l) in turbo-jet aeroplanes with operating limitations expressed in terms of Mach number, a Mach number indicator (Machmeter), at each pilot's station.

Note: (1) For aeroplanes having a MCTM more than 5700 kg , the instruments used by the pilot in command and which are specified in the paragraph 12.5 (a), (b), (e) and (1) of this Order shall be capable of being connected either to a normal or an alternate static source but not both sources simultaneously. Alternatively the aeroplane may be fitted with two independent static sources each consisting of a balanced pair of flush static ports of which one is used for the instruments specified above. Instruments and equipment other than flight instruments provided for use by the pilot in command shall not be connected to the normal static system that operates the instruments of the pilot in command.

(2) For aeroplanes having a MCTM of 5700 kg or less, the instruments specified in the paragraph 12.5 (a), (b), (e) and (1) of this Order shall be capable of being connected to either a normal or alternate static source but not both sources simultaneously. Alternatively, the aeroplane may be fitted with a balanced pair of flush static ports.

(3) The instruments specified in paragraph 12.5 (g), (h) and (i) of this Order shall have duplicated sources of power supply.

(4) CAAB may, having regard to the type of aeroplane, approve an attitude indicator incorporated in an automatic pilot system being one of the two attitude indicators required by paragraph 12.5 (g) of this Order.

(5) A gyro-magnetic type of remote indicating compass installed to meet the requirements of paragraph 12.5 (c) (ii) of this Order may also be considered to meet the requirement for a heading indicator specified in paragraph 12.5 (h) of this Order provided that it has a duplicated power supply.

12.6 ADDITIONAL REQUIREMENTS FOR APPROVED OPERATIONS BY SINGLE-ENGINE TURBINE-POWERED AEROPLANES AT NIGHT AND/OR IN INSTRUMENT METEOROLOGICAL CONDITIONS (IMC)

12.6.1. Single-engine turbine-powered aeroplanes approved to operate at night and/or in IMC shall be equipped with the following systems and equipment intended to ensure continued safe flight and to assist in achieving a safe forced landing after an engine failure, under all allowable operating conditions:

a) two separate electrical generating systems, each one capable of supplying all probable combinations of continuous in-flight electrical loads for instruments, equipment and systems required at night and/or in IMC;

b) a radio altimeter;

c) an emergency electrical supply system of sufficient capacity and endurance, following loss of all generated power,to as a minimum:

1) maintain the operation of all essential flight instruments, communication and navigation systems during a descent from the maximum certificated altitude in a glide configuration to the completion of a landing;

2) lower the flaps and landing gear, if applicable;

3) provide power to one pitot heater, which must serve an air speed indicator clearly visible to the pilot;

4) provide for operation of the landing light specified in 2 j);

5) provide for one engine restart, if applicable; and

6) provide for the operation of the radio altimeter;

d) two attitude indicators, powered from independent sources;

e) a means to provide for at least one attempt at engine re-start;

f) airborne weather radar;

g) a certified area navigation system capable of being programmed with the positions of aerodromes and safe forced landing areas, and providing instantly available track and distance information to those locations;

h) for passenger operations, passenger seats and mounts which meet dynamically-tested performance standards and which are fitted with a shoulder harness or a safety belt with a diagonal shoulder strap for each passenger seat;

i) in pressurized aeroplanes, sufficient supplemental oxygen for all occupants for descent following engine failure at the maximum glide performance from the maximum certificated altitude to an altitude at which supplemental oxygen is no longer required;

j) a landing light that is independent of the landing gear and is capable of adequately illuminating the touchdown area in a night forced landing; and

k) an engine fire warning system.

13. EQUIPMENT, SYSTEMS AND INSTRUMENTS FOR HELICOPTERS

In addition to the applicable equipment, systems and instruments as mentioned in the section 4 of this order, an Operator shall not operate a helicopter unless it is equipped with the following additional applicable equipment, systems and instruments as mentioned below. The equipment, systems and instruments installed according to the type certificate of the helicopter shall not be removed or their quantity shall not be altered without approval of the Chairman.

13.1 Permanent or rapidly deployable floatation device

(a) Performance class 1 or 2 helicopters when flying over water at a distance from land corresponding to more than 10 (ten) minutes at normal cruise speed; or

(b) Performance class 3 helicopters when flying over water beyond auto rotational or safe forced landing distance, shall be fitted with a Permanent or Deployable means of Floatation.

13.2 Flight recorders (FDR/CVR)

13.2.1 Each applicable helicopter as mentioned in the ANO (airworthiness) Chapter E.2 and E.3, shall be equipped with:

(a) Flight Data Recorder (FDR) or Digital Flight Data Recorder (DFDR) in accordance with the ANO (Airworthiness) Chapter E.2; and

(b) Cockpit Voice Recorder (CVR) in accordance with the ANO (Airworthiness) Chapter E.3.

13.3 Life jackets

13.3.1 Each performance class 1, 2 and 3 helicopters when operating over water and beyond auto-rotational gliding distance from land ; or

13.3.2 On all flights on which in the event of any emergency occurring during take-off or during the landing at the intended destination it is reasonably possible that the helicopter would be forced to land on water; or

13.3.3 On all flights which involve manoeuvres on water, shall carry Life Jackets or Equivalent Floatation Device for each person on board.

Note: (1) Life jackets be equipped with a survivor locator light.

(2) Life jackets be stowed in a position easily accessible from the seat or berth of the person for whose use it is provided.

(3) Other approved floatation device may substitute Life Jackets for infants.

13.4 Life rafts

13.4.1 Each performance class 1 and 2 helicopters when operating over water at a distance from land corresponding to more than 10 (ten) minutes flight at normal cruise speed; or

13.4.2 Each performance class 3 helicopter when operating over water and beyond auto rotational gliding distance from land; or

13.4.3 A helicopters on all flights which involve manoeuvres on water, shall carry sufficient number of Life Rafts to carry all persons on board, stowed so as to facilitate their ready use in emergency, provided with such life-saving equipment including Means of Sustaining Life as appropriate to the flight undertaken. (For detailed requirements relating to life-saving equipment refer to the paragraph 6.7(a) of this order.)

13.5 Emergency locator transmitters (ELT)

13.5.1 Except as provided for in the paragraph 13.5.2, until 1 January 2005, each Performance Class 1 and 2 helicopters operating on flights over water as described in the paragraph 13.1 (a) and Performance Class 3 helicopters as described in the paragraph 13.1(b) shall be equipped with one ELT (S) per raft carried but not more than a total of two ELTs are required.

13.5.2 Performance Class 1 and 2 helicopters for which the individual certificate of airworthiness is first issued after 1 January 2002, operating on flights over water as described in the paragraph 13.1 (a) and Performance Class 3 helicopters for which the individual certificate of airworthiness is first issued after 1 January 2002, operating as described in the paragraph 13.1(b) shall be equipped with one automatic ELT and at least one ELT (S) in a raft.

13.5.3 From 1 January 2005, all Performance Class 1 and 2 helicopters operating on flights over water as described in the paragraph 1214 (a) and Performance Class 3 helicopters operating as described in the paragraph 13.1(b) shall be equipped with at least one ELT (S) in a raft.

Note: ELT equipment carried to satisfied the requirements in the paragraphs 12.5.1, 12.5.2 and 12.5.3 shall operate in accordance with the relevant provisions of Annex 10, Volume III.

13.6 Flight and navigational instruments for operations under VFR

13.6.1 A helicopter engaged in Private operations under VFR, shall be equipped with:

(a) an airspeed indicating system calibrated in knots.

(b) a sensitive pressure altimeter calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) a direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass; and

(d) an accurate timepiece indicating the time in hours, minutes and seconds; and

(e) any other instruments and indicators specified in the helicopter flight manual.

13.6.2 A helicopter engaged in Aerial work, Charter or Scheduled Public Transport operations under VFR shall be equipped with:

(a) All the instruments as mentioned in the paragraph 13.6.1 (a) through (d) of this order;

(b) a slip indicator;

(c) an outside air temperature indicator calibrated in degrees Celsius; and

(d) any other instruments and indicators specified in the helicopter flight manual.

13.7 Flight and navigational instruments for operations under IFR

13.7.1 A helicopter to be operated under the Instrument Flight Rules (IFR) shall be equipped with:

(a) the flight and navigation instruments specified in the paragraphs 13.7.2, 13.7.3 and 13.7.4 of this Order as applicable;

(b) any other instruments, or indicators or equipment specified in the helicopter flight manual;

(c) the electric lighting equipment specified in the section 9 of this Order; and

(d) an approved automatic pilot, or automatic stabilisation system, for other than night VFR flights except that in the case of such flight which will involve more than 30 (thirty) minutes flight over water or over land areas where aircraft altitude cannot be maintained by reference to ground lighting, an approved auto-stabilisation system or a two pilot crew shall be carried in accordance with the conditions of the paragraph 1.7 of this order.

Note: Because of considerable variation in the individual stability characteristics of different helicopter types and in the associated automatic pilot and automatic stabilisation system approved by the certification authority in the country of certification, it is not possible to detail precise specifications for this equipment. This consideration also applies to the flight crew complement. Accordingly, each application for approval to conduct IFR category operations will be individually assessed on the basis of the specific helicopter type and its associated automatic pilot or autostabilisation equipment and the proposed operating environment.

13.7.2 A helicopter engaged in Private operations under IFR (including night VMC) shall be equipped with:

(a) an airspeed indicating system calibrated in knots with means of preventing malfunction due to either condensation or icing;

(b) a sensitive pressure altimeter (with counter drum-pointer or equivalent presentation recommended) calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass;

(d) an accurate timepiece indicating the time in hours minutes and seconds;

(e) an outside air temperature indicator calibrated in degrees Celsius;

(f) an attitude indicator (artificial horizons); and

(i) a standby attitude indicator:

(ii) a turn indicator;

(g) a heading indicator (directional gyroscope);

(h) a slip indicator;

(i) a vertical speed indicator;

(j) means of indicating whether the power supply to the gyroscopic instruments is working satisfactorily; and

(k) any other instruments and indicator specified in the helicopter flight manual.

Note: (1) For operations onto vessels or platforms at sea by night an instantaneous vertical speed indicator is required in place of the vertical speed indicator specified at paragraph 13.7.2 (i) of this Order.

(2) The attitude indicator and standby attitude indicator or turn indicator as specified in paragraph 13.7.2 (f) of this Order, shall have separate and independent power sources.

(3) A gyro-magnetic type remote indicating compass installed to meet the requirements of paragraph 13.7.2 (c) (ii) of this Order may be considered also to meet the requirement for a heading indicator specified in paragraph 13.7.2 (g) of this Order, provided that such installation complies with the power supply requirements of the note (2) of this Order.

13.7.3 A helicopter engaged in Charter (cargo) operations under IFR (except night VMC) shall be equipped with:

(a) an airspeed indicating system calibrated in knots with means of preventing malfunction due to either condensation or icing;

(b) two sensitive pressure altimeters with counter drum-pointer or equivalent presentation (neither three-pointer nor drum-pointer altimeters are acceptable), calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass;

(d) an accurate timepiece indicating the time in hours minutes and seconds;

(e) an instantaneous vertical speed indicator;

(f) an outside air temperature indicator calibrated in degree Celsius;

(g) an attitude indicator (artificial horizons); and

(i) a standby attitude indicator; or

(ii) a turn indicator;

(h) a heading indicator (directional gyroscope);

(i) a slip indicator;

(j) means of indicating whether the power supply to the gyroscopic instruments is working satisfactorily; and

(k) any other instruments and indicator specified in the helicopter flight manual.

Note: (1) The instruments specified in the paragraphs 13.7.3 (a), (b) and (e) of this Order shall be capable of being connected to more than one static source or shall be connected to a balanced pair of flush static ports. Instruments and equipment other than mandatory flight instruments shall not be connected to the static system that operates the instruments used by the pilot in command;

(2) The instruments specified in paragraph 13.7.3 (h) of this Order shall have duplicated sources of power supply.

(3) The attitude indicators specified in the paragraph 13.7.3 (g) of this Order shall have duplicate sources of power supply. The standby attitude indicator shall have a power sources independent of the electrical generating system and shall operate independent of any other attitude indicating system installed.

(4) The standby attitude indicator installation specified in paragraph 13.7.3 (g) shall be one in which:

(a) the indicator complies with the FAA (US) TSO- C4c or equivalent specification acceptable to CAAB

(b) the indicator and its lighting will continue to operate for 30 (thirty) minutes following the failure of the electrical power generating system without any action by the flight crew;

(c) the position, size and lighting of the instrument display allows its use from the pilot in command's operating station by day and by night; and

(d) the operation is independent of other attitude indicator installations.

(5) A gyro-magnetic type of remote indicating compass installed to meet the requirements of paragraph 13.7.3 (c) (ii) of this Order may be considered to meet the requirement for a heading indicator specified in paragraph 13.7.3 (h) of this Order provided that such installation complies with the power supply requirements of the Note (2) of this Order.

13.7.4 A helicopter engaged in Scheduled public transport operations or Charter (passenger) operations under IFR (except night VMC) shall be equipped with:

(a) an airspeed indicating system calibrated in knots with means of preventing malfunction due to either condensation or icing;

(b) two sensitive pressure altimeters with counter drum-pointer or equivalent presentation (neither three-pointer nor drum-pointer altimeters are acceptable), calibrated in feet with a sub-scale setting, calibrated in hectopascals/millibars, adjustable for any barometric pressure likely to be set during flight;

(c) (i) direct reading magnetic compass; or

(ii) a remote indicating compass and a standby direct reading magnetic compass;

(d) an accurate timepiece indicating the time in hours minutes and seconds;

(e) two instantaneous vertical speed indicator;

(f) an outside air temperature indicator calibrated in degrees Celsius;

(g) three attitude indicators (artificial horizons);, one of which may be replaced by a turn indicator;

(h) a heading indicator (directional gyroscope);

(i) a slip indicator;

(j) means of indicating whether the power supply to the gyroscopic instruments is working satisfactorily; and

(k) any other instruments and indicator specified in the helicopter flight manual.

Note: (1) The instruments specified in the paragraph 13.7.4 (a), (b) and (e) of this Order shall be capable of being connected to more than one static source or shall be connected to a balanced pair of flush static ports. Instruments and equipment other than mandatory flight instruments shall not be connected to the static system that operates the instruments used by the pilot in command;

(2) The instruments specified in paragraph 13.7.4 (h) of this Order shall have duplicated sources of power supply.

(3) The attitude indicators specified in the paragraph 13.7.4 (g) of this Order shall have duplicate sources of power supply. The standby attitude indicator shall have a power sources independent of the electrical generating system and shall operate independent of any other attitude indicating system installed.

(4) All performance Class 1 and Class 2 helicopters when operated under IFR shall be fitted with an emergency power supply, independent of the main electrical generating system, for the purpose operating and illuminating an attitude indicator specified in the paragraph 13.7.4 (g), in which:

(a) the indicator complies with US Technical Standard Order C4c or equivalent specification acceptable to CAAB;

(b) the indicator and its lighting will continue to operate for at least 30 minutes following the failure of the electrical power generating system without any action by the flight crew;

(c) the position, size and lighting of the instrument display allows its use from the pilot in command's operating station by day and by night; and

(d) the operation is independent of other attitude indicator installations;

(e) clear indication shall be given on the instrument panel that the attitude indicator(s) is being operated by emergency power.

(5) CAAB may, having regard to the type of helicopter, approve an attitude indicator incorporated in an automatic pilot system as being one of the two attitude indicators required by paragraph 13.7.4 (g) of this Order.

(6) A gyro-magnetic type of remote indicating compass installed to meet the requirements of paragraph 13.7.4 (c) (ii) of this Order may be considered to meet the requirement for a heading indicator specified in paragraph 13.7.4 (h) of this Order provided that such installation complies with the power supply requirements of the Note (2) of this Order.

13.8 Communication (radio) equipment

13.8.1 A helicopter of MCTM of 6000 pounds or less (certified under FAR/JAR part 27) engaged in Private operations, shall be equipped with:

(a) as mentioned the paragraph 8.1 (a).

13.8.2 A helicopter of MCTM of 6000 pounds or less (certified under FAR/JAR part 27) engaged in Aerial work or Charter (cargo only) operations, shall be equipped with:

(a) as mentioned in the paragraph 8.1 (b) of this order.

13.8.3 A helicopter of MCTM of 6000 pounds or less (certified under FAR/JAR part 27) engaged in Charter (passenger) or Scheduled public transport operations, shall be equipped with:

(a) as mentioned in the paragraph 8.1 (c) of this order.

13.8.4 A helicopter certified in transport category (FAR/JAR part 29), and engaged in any type of operations, shall be equipped with:

(a) as mentioned in the paragraph 8.1 (d) of this order.

13.9 Radio navigation equipment

13.9.1 A helicopter engaged in Private or Aerial work or Charter (cargo only) operations under VFR over a route on which navigation is not solely effected by visual reference landmarks only, shall be equipped with:

(a) as stated in the paragraph 8.2(a) of this order. Issue 1 28 February 2002

13.9.2 A helicopter engaged in Charter (passenger) operations under VFR, shall be equipped with:

(a) an ADF equipment;

(b) a DME; and

(c) a VOR equipment.

13.9.3 A helicopter engaged in any type of operations under IFR, shall be equipped with:

(a) as stated in the paragraph 8.2(c) of this order.

13.10 Engine instruments

13.10.1 A helicopter certified in Normal (small) category shall be equipped with:

(a) instruments as per the Design Standard FAR/JAR 27.1305

13.10.2 A helicopter certified in Transport (large) category shall be equipped with:

(a) instruments as per the Design Standard FAR/JAR 29.1305

13.11 Altitude reporting SSR transponder

13.11.1 From 1 January 2003, unless exempted by the Chairman, each helicopter operating in designated transponder mandatory airspace, shall be equipped with a pressure- altitude reporting transponder having:

(a) mode 3/A 4096 code capability replying to Mode 3/A interrogations with the code specified by ATC; and

(b) mode C capability that automatically replies to Mode C interrogations by transmitting pressure altitude information in 100 (one hundred) foot increments.

14. EQUIPMENT AND INSTRUMENTS FOR SAILPLANE AND TOW GLIDERS

14.1 Gliders to be operated under VFR shall be equipped with at least: -

(a) an approved first aid kit;

(b) a seat and safety harness for each occupant;

(c) an airspeed indicator calibrated in knots;

(d) an altimeter, with a readily adjustable pressure datum setting scale graduated in hectopascals;

(e) a magnetic compass; and

(f) a turn and bank indicator or artificial horizon.

14.2 Each glider intended to be operated under IMC (including cloud flying) shall be equipped with at least:

(a) as mentioned in the paragraph 14.1 of this order;

(b) a variometer;

(c) a radio capable of two-way communications with appropriate ATS unit; and

(d) a parachute for each occupant;

Note: (1) Parachutes shall be inspected and packed before carriage on board by persons specifically approved for the purpose by the Chairman.

(2) No passenger will be carried on board a glider during planned/international cloud flying.

(3) All pilots and trainees when undertaking "Cloud flying" shall be made familiar with the use of parachute, before the flight is undertaken.

(4) In addition, the glider shall be fitted with a magnetic compass and a timepiece when engaged in cross-country flight.

(5) Sufficient oxygen for each occupant as specified in the paragraph 7.2 of this order shall be provided when the glider is flown at altitude of 10000 ft. and above.

15. EQUIPMENT AND INSTRUMENTS FOR POWERED (MOTOR) GLIDER.

15.1 Each powered glider shall be equipped with: -

(a) instruments and equipment as mentioned in the paragraphs 14.1 and 14.2 of this order;

(b) a tachometer or RPM indicator;

(c) a fuel quantity indicator for each fuel tank;

(d) an oil pressure indicator;

(e) an oil quantity indicator for each oil tank;

(f) a cylinder head temperature indicator; and

(g) an outside air temperature indicator, unless a separate carburettor air temperature gauge is installed.

16. OPERATIONS IN RNP DESIGNATED AIRSPACE

16.1 No person or operator shall operate an aircraft in the required navigation performance (RNP) designated airspace unless:

(a) the aircraft is appropriately equipped as required; and

(b) the operator has been specifically approved or authorised by the Chairman for the operation.

Note: For detailed guidance the ICAO Doc. 9613 should be referred.

17. OPERATIONS IN MNPS AIRSPACE WITH RVSM

17.1 No person or operator shall operate an aircraft in defined portions of airspace where based on regional air navigation agreement, minimum navigation performance specification (MNPS) are prescribed, unless the aircraft is provided with navigation equipment which:

(a) continuously provides indications to the flight crew of adherence to or departure from track to the required degree of accuracy at any point along that track; and

(b) the operator has been specifically approved or authorised for operations in defined airspace by the Chairman.

Note: For detailed guidance the ICAO Doc. 7030 should be referred.

17.2 No person or operator shall operate an aircraft in defined portions of airspace where, based on regional air navigation agreement, a reduced vertical separation minima (RVSM) of 300 m (1000 ft.)

is applied above FL 290 unless the aircraft is equipped with the following equipment:

(a) two independent altitude measurement systems;

(b) two calibrated static sources,

(c) an altitude alerting system (the threshold for the alert shall not exceed + 90 m (300 ft.);

(d) an automatic altitude control system;

(e) a secondary surveillance radar (SSR) transponder with altitude reporting system that can be connected to the altitude measurement system in use for altitude keeping; and

(f) the operator has been specifically approved or authorised by the Chairman for the operation.

Note: (1) Each aircraft must be covered by the RVSM approval data package issued by the country responsible for issue of type certificate for the aircraft type.

(2) For detailed guidance the following documents/manuals should be referred:-

(i) ICAO Doc. 9574

(ii) FAA's interim AC 91-RVSM

(iii) JAA's administrative & guidance material (section one, part 3) Temporary Guidance Leaflet No. 6

18. CATEGORY II PRECISION APPROACH EQUIPMENT

18.1.1 Each aeroplane performing a Category II precision approach procedure shall be equipped in accordance with:

(a) the minimum instruments and equipment as mentioned in the paragraph 4.1 of this order and have or have the means of indicating (as appropriate);

(b) position lights;

(c) an anti collision lights systems;

(d) illumination for each required instrument or indicator;

(e) aircraft attitude, by gyroscopic or inertial means;

(f) magnetic heading, by gyroscopic or inertial means;

(g) that the power supply to any gyroscopic instruments is adequate;

(h) sensitive pressure altitude, in feet, adjustable for barometric pressure in hectopascals or millibars;

(i) outside air temperature;

(j) an accurate timepiece indicating the time in hours, minutes and seconds;

(k) airspeed in knots, with a means of preventing malfunctioning;

(l) rate of climb and descent;

(m) rate of turn and slip:

(n) two localiser and glide slope receiving systems that:

(i) each provide a basic ILS display at each pilot station;

(ii) have at least one localiser antenna and one glide slope antenna;

(o) at least one ILS system required under in the paragraph 18.1.1 (n) of this order, is not affected by the use of the aircraft communication equipment;

(p) a marker beacon receiver that provides distinctive aural and visual indications of the outer and middle markers;

(q) two gyroscopic or inertial aircraft attitude indicators;

(r) two gyroscopic or inertial magnetic heading indicators;

(s) two airspeed indicators calibrated in knots with a means of preventing malfunctioning due to either condensation or icing;

(t) two sensitive altimeters, calibrated in feet, each having a placard correction for altimeter scale error and for the wheel height of the aircraft;

(u) two rate of climb and descent indicators;

(v) a flight control guidance system that consists of:

(i) an automatic approach coupler, with, at least, automatic steering in relation to an ILS localiser at one pilot station;

(ii) a flight director system that shall display computed information as steering commands in relation to an ILS localiser, and on the same instrument, either computed information as pitch commands in relation to an ILS glide slope or basic ILS glide slope information;

(w) for operation with a decision height below 150 feet but not lower than 100 feet:

(i) a marker beacon receiver providing aural and visual indications of the inner marker;

(ii) a radio altimeter;

(x) warning systems, for immediate detection by the pilot of system faults in

(i) items required by paragraph 18.1.1 (n), (r), (s), and (w);

(ii) if installed for use in Category II precision approach procedure, the radio altimeter and autothrottle system;

(y) fully functioning dual controls;

(i) an externally vented static pressure system with an alternate static pressure source; and

(ii) a windshield wiper, or equivalent means of providing adequate cockpit visibility for a safe transition, by either pilot, to touchdown and rollout.

This order is issued in pursuance of the Rules 4, 9, 89, 107 and 156 of the Civil Aviation Rules, 1984. The ANO is a complete re-issue and supersedes the issue 2, dated 10 November, 2009.

AIR VICE MARSHAL M MAFIDUR RAHMAN
BBP, BSP, BUP, ndu, afwc, psc
Chairman
Civil Aviation Authority of Bangladesh

SUPPLEMENTAL OXYGEN FOR UN-PRESSURISED AEROPLANES

(a)	(b)
SUPPLY FOR:	**DURATION AND PRESSURE ALTITUDE**
1. All occupants of flight deck seats on flight deck duty	Entire flight time at pressure altitude above 10000 ft.
2. All required cabin crew members	Entire flight time at pressure altitudes above 13000 ft and for any period exceeding 30 (thirty) minutes at pressure altitudes above 10000 ft but not exceeding 13000 ft.
3. 100% of passengers (See Note below)	Entire flight time at pressure altitudes above 13000 ft.
4. 10% of passengers (See Note below)	Entire flight time after 30 (thirty) minutes at pressure altitudes greater than 10000 ft but not exceeding 13000 ft.

Note: For the purpose of this table 'passengers' means passengers actually carried and include infants under the age of 2.

SUPPLEMENTAL OXYGEN FOR PRESSURISED AEROPLANES

(a)	(b)
SUPPLY FOR:	DURATION AND CABIN PRESSURE ALTITUDE
1. All occupants of flight deck seats on flight deck duty	Entire flight time when the cabin pressure altitude exceeds 13000 ft and entire flight time when the cabin pressure altitude exceeds 10000 ft but does not exceed 13000 ft after the first 30 (thirty) minutes at those altitudes, but in no case less than: (i) 30 (thirty) minutes for aeroplanes certificated to fly at altitudes not exceeding 25000 ft (Note 2) (ii) 2 (two) hours for aeroplanes certificated to fly at altitudes more than 25000 ft (Note 3).
2. All required cabin crew members	Entire flight time when cabin pressure altitudes exceeds 1 3000 ft but not less than 30 (thirty) minutes (Note 2), and entire flight time 'when cabin pressure altitude is greater than 10000 ft but does not exceed 13000 ft after the first 30 (thirty) minutes at these altitudes.
3. 1 00% of passengers (Note 5)	Entire flight time when the cabin pressure altitude exceeds 15000 ft but in no case less than 10 (ten) minutes (Note 4)
4. 30% of passengers (Note 5)	Entire flight time when the cabin pressure altitude exceeds 14000 ft but does not exceed 1 5000 ft.
5. 10% of passenger (Note 5)	Entire flight time when the cabin pressure altitude exceeds 14000 ft after the first 30 (thirty) minutes at

Note: (l) The supply provided must take account of the cabin pressure altitude and descent profile for the routes concerned.

Note: (2) The required minimum supply is that quantity of oxygen necessary for a constant rate of descent from the aeroplane's maximum certificated operating altitude to 10000 ft in 10 (ten) minutes and followed by 20 (twenty) minutes at 10000 ft.

Note: (3) The required minimum supply is that quantity of oxygen necessary for a constant rate of descent from the aeroplane's maximum certificated operating altitude to 10000 ft in 10 (ten) minutes and followed by 110 (one hundred ten) minutes at 10000 ft. The oxygen required as per the paragraph 7.3.1 (a) of this order, [same as JAR-OPS 1.780 (a) (1)] may be included in determining the supply required.

Note: (4) The required minimum supply is that quantity of oxygen necessary for a constant rate of descent from ~ the aeroplane's [maximum certificated operating altitude to 15000 ft in 10 (ten) minutes.

Note: (5) For the purpose of this table 'passengers' means passengers actually carried and includes infant.

CIVIL AVIATION AUTHORITY OF BANGLADESH
AIR NAVIGATION ORDERS

AIRWORTHINESS REQUIREMENTS

PART E - OPERATIONAL AND AIRWORTHINESS REQUIREMENTS

CHAPTER E. 8 - PREPARATION, APPROVAL AND USE OF FLIGHT CREW CHECK LISTS

SECTIONS

1.	GENERAL	4.	NORMAL PROCEDURES
2.	DEFINITIONS	5.	ABNORMAL AND EMERGENCY PROCEDURES
3.	SCOPE AND PROCEDURES		

1. GENERAL

1.1 ICAO Standards and recommended practices for the operation of aircraft requires that the Operator shall provide flight crew checklists and the flight crew shall use the checklists prior to, during and after all phases of operations, and in emergency, to ensure compliance with the operating procedures contained in the aircraft operating manual or other documents associated with the Certificate of Airworthiness and otherwise in the operations manual.

1.2 The Rule 140 of the Civil Aviation Rules, 1984 mandates that all holders of ATOL issued by the Chairman, shall establish a flight check system for each type of Aircraft, setting out the procedures to be followed by the pilot- in-command and other flight crew members prior to and on take-off, in flight, landing and in Emergency Situations. This Order specifies the procedures to be followed for preparation and use of checklists for flight check system.

2. DEFINITIONS

2.1 For the purpose of this Order, the definitions as mentioned under the Rules 2 and 183 of the Civil Aviation Rules, 1984 shall apply. Where no definitions are given under the rule, the under mentioned definitions shall apply:

(a) **"Abnormal Procedures Check Lists"** means, a list which is part of the flight crew checklist containing item of action to be performed by the flight crew in the order as listed, for handling malfunctions of equipment, or other abnormalities, which are not of an emergency nature or which involve potential emergency that may be deferred.

(b) **"Emergency Check List"** means, a list which is part of the flight crew checklist containing item of action to be performed by the flight crew in the order as listed, whenever emergent situations develop in flight on account of failure / malfunction of aircraft systems/components and requiring immediate attention extra alertness on the part of flight crew for ensuring safe operation of aircraft.

(c) **"Flight Crew Checklist"** means the list(s) containing items of inspection / action to be performed by the flight crew in the order as listed and in the circumstances as indicated for ensuring safe operation of aircraft.

(d) **"Normal (Standard) Procedures Check Lists"** means, a list which is part of the flight crew checklist containing item of action to be performed by the flight crew in the order as listed, for the conduct of normal operations.

3. SCOPE AND PROCEDURES

3.1 Each operator of an aircraft including private aircraft operators shall establish a flight check system for each type of aircraft operated by him for visual inspection of the aircraft externally and internally before flight and for safe manipulation of control of aircraft systems during every flight by the members of the flight crew. The system shall entail listing of procedures in brief to be followed by the flight crew during the various phases of operation of aircraft like before during and after take off as well as before and after landing and during emergent situations.

3.2 Such check lists have the date of issue and/or revision number printed on each page and shall be in the laminated. The checklist shall be carried in the cockpit and shall be readily accessible to the flight crew in flight. The pilot-in-command shall ensure that the flight check system is carried out in detail.

3.3 Check lists displayed on Electronic Centralized Aircraft Monitoring (ECAM) system of aircraft is supplementary and does not replace the printed checklist. In case of any discrepancy or difference between the procedures displayed on the ECAM and those stated in the Aeroplane Flight Manual (AFM), the AFM shall always have precedence.

3.4 Normally the cockpit check system and the emergency procedures to be followed are given by the aircraft manufacturers in their Operations Manual /Crew Operating Manual/Flight Manual/Pilots Hand book. Operators shall use the check lists provided by the manufacturers. A set of the checklist shall be provided to the Chairman. Any deviations from the manufacturer's procedures shall be followed only after obtaining concurrence of the Chairman and such deviations with proper justification shall be forwarded to the Chairman, through the Airworthiness and Engineering Licensing Division for acceptance before adoption.

3.5 Operators who do not have such information in respect of their aircraft should contact the aircraft manufacturers for -the purpose. However, pending receipts of such a list from the manufacturers they should prepare their own list which shall be submitted to the Airworthiness and Engineering Licensing Division who will intimate to the operator the acceptance of the same.

3.6 The Checklist must be arranged by "challenge" and "response" heading for two or more pilot/flight crew aeroplanes or by "item" and "condition" headings for single-pilot aeroplanes. Under the either method, the item to be checked shall be listed with the desired condition stated. Key words or switch and lever positions shall be written in capital letters in the condition column. The checklist shall also indicate the function of each flight crew member vis-à-vis each item of the list to avoid confusion.

3.7 Alterations to the Check List on the basis of operator's own experience must be carried out only after obtaining concurrence of the Chairman.

3.8 The Chairman may require alterations to check lists based on operational experience, which shall be carried out by concerned operators.

4. NORMAL PROCEDURES

4.1 The normal procedures and duties assigned to the crew, the appropriate checklists, the system for use of the checklist and a statement covering the necessary coordination procedures between flight and cabin crew. The following normal procedures and duties must be included:

(a) Pre-flight;

(b) Pre-departure;

(c) Altimeter setting and checking;

(d) Taxi, Take-Off and Climb;

(e) Noise abatement;

(f) Cruise and descent;

(g) Approach, Landing preparation and briefing;

(h) VFR Approach;

(i) Instrument approach;

(j) Visual Approach and circling;

(k) Missed Approach;

(l) Normal Landing;

(m) Post Landing; and

(n) Operation on wet and contaminated runways.

5. ABNORMAL AND EMERGENCY PROCEDURES

5.1 The abnormal and emergency procedures and duties assigned to the crew, the appropriate checklist, the system for use of the checklist and a statement covering the necessary co-ordination procedures between flight and cabin crew. The following abnormal and emergency procedures and duties must be included:

(a) Crew Incapacitation;

(b) Fire and Smoke Drills;

(c) Unpressurised and partially pressurized flight;

(d) Exceeding structural limits such as overweight landing;

(e) Exceeding cosmic radiation limits; (where applicable)

(f) Lightning Strikes;

(g) Distress Communications and alerting ATC to Emergencies;

(h) Engine failure;

(0 System failures;

(j) Guidance for Diversion incase of Serious Technical Failure.

(k) Ground Proximity Warning;

(1) TCAS Warning;

(m) Wind shear; and

(n) Emergency Landing/Ditching.

This Order is issued in pursuance of the Rules 4 and 140 of the Civil Aviation Rules, 1984.

Air Cdre Lutfur Rahman ndu, psc
Chairman
Civil Aviation Authority of Bangladesh

AIRWORTHINESS REQUIREMENTS

PART E - AIRCRAFT EQUIPMENT

CHAPTER E. 9 APPROVALS FOR SPECIAL FLIGHTS

Section No.	Title
1.	GENERAL
2.	DEFINITIONS
3.	PURPOSE
4.	SCOPE AND PROCEDURES
APPENDIX-1	FORM AWS-20 (APPLICATION FOR SPECIAL FLIGHT)
APPENDIX-2	FORM AWS-14 (APPROVAL FOR SPECIAL FLIGHT)

1. GENERAL

1.1 The Standards and Recommended Practices (SARP) for airworthiness of aircraft as laid down in the ICAO Annex 8 requires that when an aircraft has sustained damage or has defect(s), the State of Registry shall judge whether the damage or the defect is of a nature such that the aircraft is no longer airworthy as defined by the appropriate airworthiness requirements and shall prohibit the aircraft from resuming flight until it is restored to an airworthy condition.

1.2 If the damage or the defect is sustained or ascertained when the aircraft is in the territory of another Contracting State, the authorities of the other Contracting State shall be entitled to prevent the aircraft from resuming its flight on the condition that they shall advise the State of Registry immediately, communicating to it all details necessary to formulate the judgment referred to in the paragraph 1.1 of this order.

1.3 The State of Registry may, however, in exceptional circumstances, prescribe particular limiting conditions to permit operation of a non-commercial air transport flight by an aircraft to an aerodrome at which the aircraft will be restored to an airworthy condition, considering all limitations (if any) proposed by the other Contracting State. In such cases, the Contracting State that had originally prevented the aircraft to resume flight, shall permit the aircraft to resume flight or flights within the prescribed limitation (if any) imposed by the State of registry.

1.4 The Rule 115 of the CARs, 1984 authorises the Chairman to give permission to fly an aircraft in Bangladesh for the specific purposes mentioned in the sub-rule 1 of the said rule.

2. DEFINITIONS

2.1 For the purpose of this Order, the definitions as mentioned under the Rule 2, 183 and 234 of the Civil Aviation Rules, 1984 shall apply. Where a particular definition is not given under the rules, the under mentioned definitions shall apply:

(a) **"Base station"** means the station where the aircraft is based and which is equipped to under take its maintenance including repair, modification and overhaul.

(b) **"En-route stations"** means any transit/line station other than the base station through which the aircraft operates and which normally is equipped to undertake transit checks and rectification of minor defects.

(c) **"Approvals for special flights"** means an approval accorded by the Chairman of Civil Aviation for conducting a non-commercial air transport operation involving an aircraft, that may not meet current applicable airworthiness requirements and /or other requirements of the Civil Aviation Rules, 1984 but the aircraft is still airworthy and capable of safe flight to an aerodrome at which it will be restored for airworthy condition for commercial air transport operation.

3. PURPOSE

3.1 Purpose of a special flight is to cover operation of an aircraft which may not meet airworthiness standards established by the Chairman. Therefore, appropriate limitations are prescribed for Special Flights to minimize hazards to persons or property if the aircraft is otherwise safe to conduct the intended flight.

4. SCOPE AND PROCEDURES

4.1 Permission for special flight may be given by the Chairman only for the under mentioned specific purposes as provided in the rule 115(1) of the CARs, 1984:

(a) To bring the aircraft to a place at which maintenance on the aircraft may be carried out;

(b) To deliver the aircraft to a person under contract of sale or with a view to sale;

(c) To bring the aircraft to a place where demonstration, experiment or test with respect to the aircraft is to take place;

(d) To carry out search and rescue including evacuating the aircraft from an area of impending danger, or in cases of ***force majure*****;** or

(e) To assist in dealing with a state of emergency.

4.2 **Application:** The application for Special Flight shall be submitted to the Chairman on the Form AWS- 20 (refer Appendix - 1 of this Order) and enclosing any other information considered necessary for the purpose of prescribing operating limitations.

4.3 **General Operating Conditions for Special Flight:** Since a special flight authorization is issued to cover operation of an aircraft which may not meet airworthiness standards established by Bangladesh and other Contracting State(s) over whose territory the aircraft may fly, appropriate limitations must be prescribed to minimize hazard to persons or property. To enable determination of these limitations, the AELD may make or require the applicant to make appropriate inspections or tests. Because of the different kinds of operations involved, there may be differences in the detailed limitations. However, the following limitations are considered to be essential in all special flight authorizations:

(a) A copy of the authorization should be displayed in the aircraft at all times when operating under the terms of the authorization;

(b) The registration marks assigned to the aircraft by the CAAB or the State of Registry should be displayed on the aircraft;

(c) Persons or property should not be carried for compensation or hire;

(d) No person should be carried in the aircraft unless that person is essential to the purpose of the flight and has been advised of the contents of the authorization and the airworthiness status of the aircraft;

(e) The aircraft should be operated only by crew holding appropriate certificates or licenses issued or validated by the Chairman;

(f) All flights should be conducted in accordance with the applicable general operating rules as per the CARs 1984, Air Navigation Order and the regulations of the State(s) in or over which the operations are conducted;

(g) All flights should be conducted so as to avoid areas having heavy traffic or any other areas where flights might create hazardous exposure to persons or property;

(h) All flights should be conducted within the performance operating limitations prescribed in the aircraft flight manual and those additional limitations specified by the Chairman for the particular flight; and

(i) All flights should be conducted prior to the expiry date of the authorization. If the flight involves operations over State(s) other than Bangladesh, the operator of the aircraft must obtain authorizations from the appropriate authorities of those State(s) prior to undertaking the flight.

4.4 **Granting of Permission:** Upon receipt of application from the owner/operator of the aircraft for special flight permit, the report on the condition of the aircraft will be analyzed. Based on the assessment of the situation and with regard to safety of the aircraft and also persons on board, the Chairman may approve operation of Special Flight (ferry flight) through AWS-14 (refer Appendix-2 of this Order) subject to the following condition / limitations:

(a) Inspection or tests by the operator for determining the safety of aircraft for the intended flight and certificate to that effect by appropriately licensed AME or authorised person(s).

(b) A limitation that the operating weight on any ferry flight must be the minimum necessary with the necessary reserve fuel load and that the centre of gravity is within limits.

(c) Any other operational limitation(s) as considered necessary for the particular flight.

5. SUBMISSION OF POST FLIGHT REPORT

5.1 In case the flight requires the use of airspace of States other than Bangladesh, permission to carry out ferry flight over those States should be obtained by the operator before commencing the flight. All such written permission(s) obtained from the States for the ferry flight must be filed with CAAB (AELD) on completion of flight along with the flight plan.

5.2 Within 24 hours of completion of the special flight, the operator shall submit a report to the AELD which shall include:

(a) Any abnormality encountered during the flight;

(b) Action taken at the base to render the aircraft airworthy;

(c) Result of experimental test or production test flight, if conducted; and

(d) Any other information regarding the flight deemed necessary.

5.3 Notwithstanding the above, the Chairman may refuse to grant approval to operate Special Flight if there is reasonable doubt that such flight may jeopardize safety of the aircraft and/or persons on board.

This order is issued in pursuance of the Rules 4 and 115 of the Civil Aviation Rules, 1984, is a complete re-issue and supersedes the issue 1, dated 28 February 2002.

Air Cdre Sakeb Iqbal Khan Majlis, ndu, psc
Chairman
Civil Aviation Authority, Bangladesh

CIVIL AVIATION AUTHORITY OF BANGLADESH
Airworthiness & Engineering Licensing Division

APPLICATION FOR ISSUE OF SPECIAL/FERRY FLIGHT PERMIT

(In case of limited space, the required information may be provided on additional pages as appendix.)

1. Name of the Owner /Operator:

2. Address of the Owner /Operator:

3. Aircraft Details:

Make and Model	Registration Marks	Serial No.

4. Purpose of the Flight:

5. Flight Plan:

6. Information on the Flight Crews:

	Pilot-in Command	Co-Pilot	Flight Engineer
Name			
Lic. No.			
Ratings			
Licence validity:			

7. Detailed assessment of defect/damage sustained:

8. Any limitation/restriction the applicant considers necessary for safe operation of the aircraft:

Engineering:

Operation:

9. Proposed action to make the aircraft fit for ferry flight:

10. Any other information relevant to the flight for the purpose of prescribing Operating limitations:

11. Certified that the aircraft is capable of safe flight to the intended destination

Sign:_____ Authorised engineering executive Name and designation	Sign:_____ Authorised operation executive Name and designation

CIVIL AVIATION AUTHORITY, BANGLADESH
Airworthiness & Engineering Licensing Division

APPROVAL FOR SPECIAL FLIGHTS

CAAB Reference: **Date:**

1. Permission is hereby granted to the Operator: _____ holder of the AOC No._____for operating Non-commercial air transport operation with the aircraft Nationality and Regn. Marks _____to operate flight from _____to _____ for the purpose of SPECIAL FLIGHTS under the rule 115 of Bangladesh Civil Aviation Rule, 1984 provided following conditions are met before / while undertaking the flight:

(a) All the conditions as stated in the paragraph 4.3 of the ANO (AW) E.9 titled Approvals for Special Flights; and

(b)

2. During above flight(s), the following provisions of rule-114 and rule-120 do not apply:

(a)

(b)

3. The Special Flight permit is valid up to _____or completion of the flight whichever is earlier, and **a copy of this permit shall be carried on board the aircraft.**

4. If the flight involves operation over airspace of countries other than Bangladesh, the Operator of the aircraft must obtain special/ferry flight permit from the appropriate authorities of such countries prior to operation of such flight. All such permissions obtained form the concerned countries must be filed with CAAB on completion of flight along with flight plan.

Place: Signature:
(Authorised CAAB Officer)

CIVIL AVIATION AUTHORITY, BANGLADESH

AIR NAVIGATION ORDERS AIRWORTHINESS REQUIREMENTS

PART E – AIRCRAFT EQUIPMENTS

CHAPTER E.10	AIRWORTHINESS REQUIREMENTS FOR OPERATION OF AIRCRAFT IN MNPS AIRSPACE

SECTIONS

1.	GENERAL	5.	OPERATIONAL REQUIREMENT AND APPROVAL
2.	DEFINITIONS	6.	MAINTENANCE REQUIREMENTS
3.	GENERAL REQUIREMENTS	7.	MINIMUM EQUIPMENT LIST (MEL)
4.	AIRCRAFT SYSTEM / EQUIPMENT REQUIREMENTS		

1. GENERAL

1.1 The ANO lays down the requirements concerning mainly airworthiness approval of navigation equipment in Minimum Navigation Performance Specification (MNPS) activities and further amplifies the requirements of the ANO (AW) E.6, Section 17. The requirements stipulated in this ANO must be complied with by the operators intending to operate their airplanes in MNPS airspace.

1.2 The concept of MNPS was introduced on a world wide basis in 1977 after establishing criteria for MNPS in the North Atlantic Air Navigation Meeting. The objective of MNPS Airspace is to enable operators to derive maximum economic benefit from the improvement in the capabilities of latest navigation equipment while ensuring safety of operations.

1.3 The Sub rule 2 of the Rule 107 of the Civil Aviation Rules, 1984 stipulates that an aircraft shall not be used in any class of operations unless it is fitted with or carries such equipment, including emergency equipment, as the Chairman approves or directs. Similarly the Sub rule 3 of the Rule 107 of the Civil Aviation Rules, 1984 stipulates that an instrument or item of equipment be shall be fitted or carried or used in accordance with the direction issued by the Chairman.

1.4 The contents of this ANO are consistent with the provisions of ICAO Annex 6 and the ICAO Doc 7030/4, which may be referred by the prospective operators.

2. DEFINITIONS

2.1 For the purpose of this Order the following definitions shall apply:

(a) **Long-range navigation system (LRNS)** means an electronic navigation unit that is approved for use under instrument flight rules as a primary means of navigation, and has at least one source of navigational input, such as inertial navigation system, global positioning system, Omega/very low frequency, or Loran C.

(b) **North Atlantic Minimum Navigation Performance Specification Airspace (NAT MNPSA)** means that volume of airspace between FL 285 and FL 420 extending between latitude 27 degrees north and the North Pole, bounded in the east by the eastern boundaries of control areas Santa Maria Oceanic, Shanwick Oceanic, and Reykjavik Oceanic and in the west by the western boundary of Reykjavik Oceanic Control Area, the western boundary of Gander Oceanic Control Area, and the western boundary of New York Oceanic Control Area, excluding the areas west of 60 degrees west and south of 38 degrees 30 minutes north.

3. GENERAL REQUIREMENTS

3.1 The navigation performance capability required for aircraft to be operated in the NAT MNPS airspace defined in section 2.1(b) is as follows:

(a) The standard deviation of lateral track errors shall be less than 6.3 NM (11.7 Km). Standard deviation is a statistical measure of data about a mean value. The mean is zero nautical miles. The overall form of data is such that the plus and minus 1 standard deviation about the mean encompasses approximately 68 percent of the data and plus or minus 2 deviations encompasses approximately 95 percent.

(b) The proportion of the total flight time spent by aircraft 30 NM (55.6 Km) or more off the cleared track shall be less than 5.3×10^{-4} (less than 1 hour in 1,887 flight hours).

(c) The proportion of the total flight time spent by aircraft between 50 NM and 70 NM (92.6 Km and 129.6 Km) off the cleared track shall be less than 13×10^{-5} (less than 1 hour in 7,693 flight hours.)

3.2 Presently MNPS requirements have been laid down and are applicable in the North Atlantic Airspace (NAT) only. However, MNPS requirements may be imposed in any other regional airspace (i.e. AFI, CAR, EUR, MID/ASIA, NAM, PAC and SAM) by the ATS providers. In this respect the ICAO doc. 7030/4 titled ***Index to application of supplementary procedures,*** Page (ix) may be referred. Specifications may not be exactly similar to that of NAT-MNPS. To meet, the accuracy requirements for navigation in the particular MNPS Airspace, appropriate equipment

shall be installed for such operations. Individual approval is required for each aircraft and the operator to operate in each MNPS airspace as and when such areas are notified and operator wishes to operate in such airspace.

3.3 No person shall operate Bangladeshi registered aircraft in airspace designated as Minimum Navigation Performance Specifications (MNPS) airspace unless it is equipped with navigation equipment that complies with minimum navigation performance specifications prescribed in ICAO document 7030/4 in the form of Regional Supplementary Procedures or in the current edition of NAT Doc 001/T13/5N and the ICAO doc NAT MNPS titled North Atlantic Air Space Operations Manual (2005 Edition or current edition as applicable).

4. AIRCRAFT SYSTEM/EQUIPMENT REQUIREMENTS

4.1 In order to consider each aircraft for approval of the Chairman for unrestricted operation in the MNPSA, an aircraft shall be equipped with:

(a) Long Range Navigation Systems (LRNSs) as mentioned below; **and**

(b) An accurate time keeping device e.g **the Master Clock**, which can be reset only on ground.

4.1.1 Two Long Range Navigation Systems (LRNSs) consisting of:

(a) One Inertial Navigation System INS); **and**
(b) One Global Navigation Satellite System (GNSS); **or**
(c) One navigation system using the inputs from one or more Inertial Reference Systems (IRS) or any sensor system complying with MNPS requirement.

NOTE 1: Currently the only GNSS system fully operational and for which approval material is available, is GPS.

NOTE 2: A GPS installation must be approved as follows:

(a) If the two required LRNSs are both GPS, they must be approved in accordance with the FAA Advisory Circular AC- 20-138A, Appendix 1 and their operation approved in accordance with FAA HBAT 95-09.

(b) If, however, GPS serves as only one of the two required LRNSs, then it must be approved in accordance with FAA TSO-C129 or later standard or with equivalent JAA documentation JTSO-C129a.

4.2 Each LRNS must be capable of providing to the flight crew a continuous indication of the aircraft position relative to track

4.3 It is essential that the navigation system employed for the provision of steering guidance is capable of being coupled to the auto-pilot.

NOTE: Current Inertial Navigation Systems have demonstrated the capability of meeting NAT MNPS. Dual Navigation Systems which have been installed, operated and maintained in accordance with Appendix C of FAR 121 or JAR specifications or any other specifications acceptable to the Chairman can be approved for operation in NAT MNPS airspace.

4.4 In case RVSM operations are required to be conducted in MNPS airspace, the additional equipment as per the ANO (AW) E.11 shall also be installed:

4.5 Carriage of standby navigation equipment shall be in accordance with the section 8 of the ANO (AW) E.6 and as governed by ICAO Annex 6 Part I and Part II - Chapter 7.

4.6 Any other equipment which meets MNPSA accuracy criteria and is acceptable to the Chairman may be installed.

5. OPERATIONAL REQUIREMENT AND APPROVAL

5.1 Each operator shall develop MNPSA operational procedures and submit the Operational Procedures for approval of the Chairman. The crew training guidance information may be taken from the ICAO doc NAT MNPS titled North Atlantic Air Space Operations Manual (2005 Edition or current edition as applicable).

5.2 The operating crew shall be adequately trained and kept proficient for operation of aircraft in MNPS airspace and shall be fully aware of the procedures to be followed. During operations in MNPS airspace if there is any failure, the pilot shall inform the concerned ATC immediately and comply with their instructions.

5.3 Each operator shall have a system of evaluation and recording Inertial Navigation System radial errors and ensure that such defects when reported are duly rectified.

6. MAINTENANCE REQUIREMENTS

6.1 All the required installed equipment and systems shall be maintained in accordance with the manufacturers approved maintenance program.

6.2 Aircraft Maintenance Engineers(AME) shall scrutinize the Flight Reports for pilot reported Inertial Navigation System radial errors or failures and ensure that such defects are promptly rectified.

7. MINIMUM EQUIPMENT LIST (MEL)

7.1 Each operator shall reflect requirements of minimum navigation systems for operation in the MNPSA in their customized MEL for approval of the Chairman.

Issued in pursuance of the Rules 4 and 107 of the Civil Aviation Rules 1984.

Air Cdre Sakeb Iqbal Khan Majlis, ndu, psc

Chairman

Civil Aviation Authority, Bangladesh

CIVIL AVIATION AUTHORITY, BANGLADESH

AIR NAVIGATION ORDERS

AIRWORTHINESS REQUIREMENTS

PART E – AIRCRAFT EQUIPMENTS

CHAPTER E.11	REQUIREMENTS FOR IMPLEMENTATION OF REDUCED VERTICAL SEPARATION MINIMUM (RVSM).

Section No	Title	Section No	Title
1.	GENERAL	8.	PROCEDURES FOR GRANT OF AIRWORTHINESS APPROVAL
2.	APPLICABILITY	9.	CONTINUED AIRWORTHINESS – MAINTENANCE PROCEDURES
3.	DEFINITIONS	10.	OPERATIONAL APPROVAL
4.	BASIC REQUIREMENTS	11.	PROVISION FOR MONITORING OF OPERATORS AIRCRAFT
5.	APPROVAL REQUIREMENTS	12.	REPORTING ALTITUDE KEEPING ERRORS
6.	AIRWORTHINESS APPROVAL OF AIRCRAFT	13.	REMOVAL OR AMENDMENT OF AUTHORITY
7.	AIRCRAFT SYSTEMS	APPNDX. 1	RVSM PERFORMANCE

1. GENERAL

1.1 This order prescribes the requirements for obtaining approval of the Civil Aviation Authority of Bangladesh for operating in RVSM airspace with vertical separation of 300 m (1000 ft) above Flight Level (FL) 290 and further amplifies the requirements of the ANO (AW) E.6, Section 17.

1.2 Reduced vertical separation minimum (RVSM) was implemented in the North Atlantic (NAT) Region on 27 March 1997. Airspace of Bangladesh has become RVSM airspace on 27 November 2003 between FL 290 and FL 410, inclusive of FL 290 and FL 410 and all aircraft operating in the RVSM airspace are required comply with the requirements of this order.

1.3 The Sub rule 2 of the Rule 107 of the Civil Aviation Rules, 1984 stipulates that an aircraft shall not be used in any class of operations unless it is fitted with or carries such equipment, including emergency equipment, as the Chairman approves or directs. Similarly, the Sub rule 3 of the Rule 107 of the Civil Aviation Rules, 1984 stipulates that an instrument or item of equipment be shall be fitted or carried or used in accordance with the direction issued by the Chairman.

2. APPLICABILITY

2.1 This ANO is intended to provide a minimum aircraft system performance specification (MASPS) for altimetry to conduct flight in RVSM airspace. It establishes an acceptable means, but not the only means, that can be used in the approval of aircraft and operators to conduct flight in airspace or on routes where RVSM is applied. It lays down guidance and requirements on airworthiness, continuing airworthiness, and operations programs for RVSM operations.

2.2 Non RVSM approved aircraft intending to climb/descend through RVSM airspace and other operations such as humanitarian, maintenance, ferry flights and State/military aircraft shall be dealt with by the Chairman in co-ordination with the Air Traffic Management on case to case basis with limitations/ restrictions as may be considered necessary for relevant ATC airspace.

2.3 This contents of this ANO are consistent with the provisions of ICAO Annex 6 and ICAO Doc 9574 on the above subject.

3. DEFINITIONS

3.1 **Aircraft Group:** A group of aircraft that are of nominally identical design and build with respect to all details that could influence the accuracy of height keeping performance.

3.2 **Altimetry System Error (ASE):** The difference between the pressure altitude displayed to the flight crew when referenced to the International Standard Atmosphere ground pressure setting (1013.25 hPa /29.92 in. Hg) and free stream pressure altitude.

3.3 **Assigned Altitude Deviation (AAD):** the difference between the transponded Mode C altitude and the assigned altitude/ flight level.

3.4 **Automatic Altitude Control System:** Any system that is designed to automatically control the aircraft to a referenced pressure altitude.

3.5 **Avionics Error (AVE):** The error in the processes of converting the sensed pressure into an electrical output, of applying any static source error correction (SSEC) as appropriate, and of displaying the corresponding altitude.

3.6 **Basic RVSM Envelope:** The range of Mach numbers and gross weights within the altitude ranges FL 290 to FL 410 (or maximum attainable) where an aircraft can reasonably be expected to operate most frequently.

3.7 **Flight Technical Error (FTE):** Difference between the altitude indicated by the altimeter display being used to control the aircraft and the assigned altitude/flight level.

3.8 **Full RVSM Envelope:** The entire range of operational Mach numbers, W/d, and altitude values over which the aircraft can be operated within RVSM airspace.

3.9 **Height keeping Capability:** Aircraft height keeping performance that can be expected under nominal environmental operating conditions, with proper aircraft operating practices and maintenance.

3.10 **Height keeping Performance:** the observed performance of an aircraft with respect to adherence to a flight level.

3.11 **Non-Group Aircraft:** An aircraft for which the operator applies for approval on the characteristics of the unique airframe rather than on a group basis.

3.12 **Residual Static Source Error:** The amount by which static source error (SSE) remains under-corrected or overcorrected after the application of SSEC.

3.13 **RVSM Airspace:** RVSM airspace is any designated airspace/route between FL 290 and FL 410 inclusive where aircraft are separated vertically by 1000 ft (300 m)

3.14 **Static Source Error (SSE):** The difference between the pressure sensed by the static system at the static port and the undisturbed ambient pressure.

3.15 **Static Source Error Correction (SSEC):** A correction for static source error.

3.16 **Total Vertical Error (TVE):** Vertical geometric difference between the actual pressure altitude flown by an aircraft and its assigned pressure altitude (flight level).

3.17 **W/d:** Aircraft weight, W, divided by the atmospheric pressure ratio, d

4. BASIC REQUIREMENTS

4.1 No person shall operate Bangladesh registered aircraft in airspace designated as Reduced Vertical Separation Minimum (RVSM) airspace unless;

(a) The operator and the operator's aircraft comply with the requirements of this ANO.

(b) The operator is authorised by the Chairman to perform RVSM operations; and

(c) The Operations Specifications of the Air Operator Certificate (AOC) are endorsed by the Chairman, which authorizes the operator to conduct RVSM operations.

5. APPROVAL REQUIREMENTS

5.1 Airspace where RVSM is applied should be considered special qualification airspace. Both the individual aircraft and the specific aircraft type or types that the operator intends to use will need to be approved by the Chairman before the operator conducts flights in RVSM airspace. Requirements of this ANO shall be complied with for the approval of specific aircraft type or types and for airworthiness and operational approval.

5.2 Approval will encompass the following elements: -

(a) RVSM Airworthiness Approval (including continued airworthiness);

(b) RVSM Operational Approval; and

(c) Provision for height monitoring of operator's aircraft.

5.3 **RVSM (Airworthiness) Approval:** The approval that is issued by the CAA to indicate that an aircraft has been modified in accordance with the relevant approval documentation e.g. service bulletin, supplemental type certificate etc. and is therefore, eligible for monitoring. The date of issue of such an approval should coincide with the date when the modification was certified by the operator as being complete. Moreover, an operator intending to operate an aircraft in the proposed RVSM envelop shall apply to the CAAB with a statement regarding navigational and communication equipment fitted in the aircraft for inspection of the airworthiness official before approval is accorded. The operator shall also give an undertaken that the proposed aircraft has been inspected in accordance with applicable SB or any other RVSM data pack for approval. The operator shall also give an undertaken specifying that the required equipment fitted in the aircraft prior approval shall not be altered without prior approval of the CAAB.

5.4 **RVSM (Operational) Approval:** The approval that is issued by the CAA once an operator has achieved the following:

(a) RVSM Airworthiness approval; and

(b) State approval of operations manual (where applicable) and on-going maintenance procedures

5.5 The Operator shall apply for RVSM Airworthiness and Operational approval to the Chairman.

5.6 On satisfactory compliance with the requirements given in this ANO, the operator shall be given provisional approval for the specific aircraft. Approval may be regularized after the aircraft meets the Height Monitoring Performance using HMU/ GMU.

NOTE: Only once RVSM (operational) approval has been issued should "W" be used in item 10 of the ATC flight plan to indicate RVSM approval.

6. AIRWORTHINESS APPROVAL OF AIRCRAFT

6.1 Each aircraft type that the operator intends to use in RVSM airspace should have received RVSM airworthiness approval from the regulatory authority of country of manufacture / design including the approval of continued airworthiness program. The Chairman shall accept such RVSM approval and grant airworthiness approval to each aircraft on the compliance with the RVSM Data Packages.

6.2 RVSM Data Packages for each aircraft type/ group of aircraft shall be approved by the regulatory authority of country of manufacture/ design and may take the following form:

6.1.1 In-service Aircraft

(a) Manufacturer's Service Bulletin (SB)

(b) Aircraft Service Change

(c) Supplemental Type Certificates (STC)

(d) Airplane Flight manual (AFM)

6.1.2 Aircraft manufactured as RVSM Complaint - AFM Statement of Compliance

6.3 The Operator shall obtain approval from the State of Registry for each individual aircraft group and each individual aircraft to be used by the operator for RVSM operations.

6.4 Each aircraft of Bangladeshi operators shall have the airworthiness and the operational approval from the Chairman prior to it being approved for use by the operator in RVSM environment.

6.5 Each aircraft shall receive approval for continued airworthiness program prior to it being reviewed for operational approval.

7. AIRCRAFT SYSTEMS

7.1 The aircraft shall be equipped to meet the following minimum equipment for RVSM operations:

7.1.1 Two independent altitude measurement systems shall be installed. Each system shall be composed of the following elements:

(a) Cross-coupled static source/system, with ice protection if located in areas subject to ice accretion, cross-coupled static source pitot/static shall be incorporated in the altimeter circuit with provision of heating as a preventive measures against ice formation;

(b) Equipment for measuring static pressure sensed by the static source, converting it to pressure altitude and displaying the pressure altitude to the flight crew, centralized air data computer (CADC) shall be fitted in the aircraft for conversion pressure altitude to displaying altitude. At least two CADC shall be fitted in the aircraft;

(c) Equipment for providing a digitally encoded signal corresponding to the displayed pressure altitude, for automatic altitude reporting purposes, Mode S transponder with CAAB allocated 24 bit Mode S code shall be installed in the aircraft to perform this function;

(d) Static source error correction (SSEC)/Position Error Correction (PEC), if needed to meet the performance criteria of paragraphs 3.3, 3.4 or 3.6 of Appendix - 1 attached, as appropriate, CADC installed in the aircraft to perform this function; and

(e) Signals referenced to a pilot selected altitude for automatic control and alerting. These signals will need to be derived from altitude measurement system meeting the criteria of this ANO, and in all cases, enabling the criteria of paragraphs 7.1.3 and 7.2.6 to be met. Altimeters with adjustment nob along with CADC perform this function.

7.1.2 One secondary surveillance radar transponder (meeting TSO C112 standards) with an altitude reporting system that can be connected to the altitude measurement system in use for altitude keeping. Transponder with Mode S capability perform this function.

7.1.3 Airborne Collision Avoidance System (ACAS II) (meeting TSO C119b standards) to improve the safety level of flights operating within RVSM airspace.

7.1.4 An altitude alerting system that alerts the crew aurally and visually if displayed altitude deviates from the selected altitude by more than ± 300 feet (for aircraft for which application for type certification was made on or before April 9, 1997) or ± 200 feet (for aircraft for which application for type certification is made after April 9, 1997). Altimeters itself does this perform this function.

7.1.5 An automatic altitude control system shall be required which shall be capable of controlling altitude within tolerance band of ± 15 meters (± 50 feet) about commanded altitude, when operated in the altitude hold mode in straight and level flight under non turbulent, non gust conditions. Digital flight guidance computer perform this function.

7.1.6 All the equipment described in paragraphs 7.1.1 to 7.1.5 form the RVSM minimum aircraft systems performance specification (MASPS), including altimeter system error in specified in Appendix-1 of this chapter in the paragraph 2, 3.2, 3.3 and 3.4. Among the equipment mentioned, an automatic altitude keeping device shall be operative during flight in the RVSM envelop.

7.2 **Altimetry System Composition:**

7.2.1 The altimetry system of an aircraft comprises all those elements involved in the process of sampling free stream static pressure and converting it to a pressure altitude output. The elements of the altimetry system fall into two main groups:

(a) Airframe plus static sources.

(b) Avionics equipment and/or instruments.

7.3 **Altimetry System Outputs:**

7.3.1 The following altimetry system outputs are significant for RVSM operations:

(a) Pressure altitude (Baro-corrected) for display.

(b) Pressure altitude reporting data.

(c) Pressure altitude or pressure altitude deviation for an automatic altitude control device.

7.4 **Altimetry System Accuracy**

7.4.1 The total system accuracy shall satisfy the criteria of paragraphs 3.3, 3.4 or 3.6 of the Apendix-1, RVSM performance attached.

7.5 **Static Source Error Correction:**

7.5.1 If the design and characteristics of the aircraft and its altimetry system are such that the criteria of paragraphs 3.3, 3.4 or 3.6 of Appendix-1 are not satisfied by the location and geometry of the static sources alone, then suitable SSEC shall be applied automatically within the avionics equipment of the altimetry system.

7.6 **Altitude Reporting Capability:**

7.6.1 The aircraft altimetry system shall provide an output to the aircraft transponder as required by applicable operating regulations.

7.7 **Altitude Control Output:**

7.7.1 The altimetry system shall provide a signal that can be used by an automatic altitude control system to control the aircraft to a selected altitude. The signal may be used either directly or combined with other sensor signals. If SSEC is necessary to satisfy the criteria of paragraphs 3.3, 3.4 or 3.6 of Appendix-1, then an equivalent SSEC may be applied to the altitude control signal. The signal may be an altitude deviation signal, relative to the selected altitude or a suitable absolute altitude signal.

7.7.2 Whatever the system architecture and SSEC system, the difference between the signal output to the altitude control system and the altitude displayed to the flight crew shall be kept to the minimum.

7.8 **Altimetry System Integrity:**

7.8.1 The RVSM approval process shall verify that the predicted rate of occurrence of undetected failure of the altimetry system does not exceed 1 x 10 -5 per flight per hour. All failures and failure combinations whose occurrence would not be evident from cross cockpit checks and which would lead to altitude measurement/display errors outside the specified limits need to be assessed against this value. Other failures or failure combinations need not be considered.

8. PROCEDURE FOR GRANT OF RVSM AIRWORTHINESS APPROVAL AND CONTINUATION OF APPROVAL.

8.1 **Grant of RVSM airworthiness approval and continuation.**

8.1.1 In the case of a **newly built aircraft,** the aircraft manufacturers obtain approval from the regulatory authority of the country of manufacture/design by submitting performance and analytical data supporting RVSM airworthiness approval. Compliance with the RVSM criteria shall be stated in the Aircraft Flight Manual including reference to the applicable build standard, related conditions, and limitations. The maintenance and repair manuals will give the associated airworthiness instructions.

8.1.2 In case of an aircraft **already in service,** the manufacturer shall submit the performance and analytical data to the regulatory authority of the country of manufacture/design. The data shall be supplemented with the service bulletin or its equivalent, which identifies the work to be done to achieve the build standard, continued airworthiness instructions, and an amendment to the aircraft flight manual stating related conditions and limitations. Approval by the regulatory authority indicates acceptance of that aircraft type and build standard as complying with the RVSM airworthiness criteria.

8.1.3 The combination of performance and analytical data, service bulletin(s) or equivalent, continued airworthiness instructions, and the approved amendment or supplement to the Aircraft Flight Manual is known as the RVSM approval data package.

8.1.4 For airworthiness approval of specific aircraft, an aircraft operator is required to apply to the Chairman. The application shall be supported by evidence that the aircraft has been inspected, and where necessary, modified in accordance with applicable Service Bulletins, and is of a type and build standard that meets the RVSM airworthiness criteria. The operator shall also confirm that the continued airworthiness instructions are available and that the approved Flight Manual amendment or supplement has been incorporated.

NOTE: For RVSM airspace where an operational approval is prescribed, airworthiness approval alone does not authorize flight in that airspace.

8.1.5 The operator shall ensure that a minimum of two aircraft of each type grouping of the operator shall be accomplished their height-keeping performance monitored, at least once every two years or within intervals of 1000 flight hours per aircraft, whichever period is longer. If the operator aircraft type grouping consist of a single aircraft, monitoring of that aircraft shall be accomplished within the specified period.

8.1.6 The operator shall communicate with the Regional Monitoring Agency (RMA) for accomplishment of the task mentioned in paragraph 8.1.5. The operator shall submit the report of height-keeping performance monitored by the regional monitoring agency to CAAB at the instant and also submit the total fleet report at an interval of three months. System performance monitoring is necessary to ensure that the implantation and continued operation of RVSM meet the safety objective. If an operator does not comply this objective by not monitoring the height-keeping performance, RVSM approval shall be suspended without any prior notification. In this case Air traffic control will be notified accordingly.

8.2 Contents of the RVSM approval data package

8.2.1 As a minimum, the data package will need to consist of the following items:

(a) A statement of the aircraft group or non-group aircraft and applicable build standard to which the data package applies.

(b) Definition of the applicable flight envelope(s).

(c) Data showing compliance with the performance criteria of Appendix-1 and the paragraphs 7 of this ANO.

(d) The procedures to be used to ensure that all aircraft submitted for airworthiness approvals comply with RVSM criteria. These procedures will include the references of applicable service bulletin and the applicable approved aircraft flight manual amendment or supplement.

(e) The maintenance instructions that ensure continued airworthiness for RVSM approval.

8.3 **Aircraft Groupings**

8.3.1 For aircraft to be considered as members of a group for purposes of RVSM approval, the following conditions shall be satisfied:

(a) Aircraft shall have been manufactured to a nominally identical design and be approved by the same Type Certificate (TC), TC amendment or Supplemental Type Certificate (STC), as applicable;

(b) The static system of each aircraft shall be installed in a nominally identical manner and position. The same SSE corrections shall be incorporated in all aircraft of the group; and

(c) The avionics units installed on each aircraft to meet the minimum RVSM equipment requirements of this ANO shall be manufactured to the manufacturer's same specification and have the same part number.

(d) The RVSM data package shall have been produced or provided by the airframe manufacturer or an approved design organisation.

NOTE (1): For derivative aircraft it may be possible to utilise the data from the parent configuration to minimise the amount of additional data required to show compliance. The extent of additional data required will depend on the nature of the changes between the parent aircraft and the derivative aircraft.

NOTE (2): Aircraft that have avionic units that are of a different manufacturer or part number may be considered part of the group, if it is demonstrated that this standard of avionic equipment provides equivalent system performance.

8.3.2 Non-group Aircraft:

(a) If an airframe does not meet the conditions of paragraphs 8.3.1(a) to (d) to qualify as a member of a group, or is presented as an individual airframe for approval, then it must be considered as a non-group aircraft for the purposes of RVSM approval.

8.5 **Avionics Equipment:** Avionics equipment shall be identified by function and part number. A demonstration shall show that the avionic equipment can meet the design criteria established when the equipment is operated in the environmental conditions expected to be met during RVSM operations.

8.6 **Compliance Procedure**: The data package furnished by the manufacturer shall define the procedures, inspections and tests and the limits that will be used to ensure that all aircraft approved against the data package "conform to type"; that is all future approvals, whether of new build or in service aircraft meet the allowances developed.

8.7 **Continued Airworthiness**:

8.7.1 The following items shall be reviewed and updated as applicable to RVSM:

(a) The structural repair manual with special attention to the areas around each static source, angle of attack sensors, and doors if their rigging can affect air flow around the previously mentioned sensors.

(b) Amendment of the customized MEL of the Operator as per the current the Master Minimum Equipment List (MMEL)

8.7.2 The data package shall include details of any procedures that are not covered in above said paragraphs, but may be needed to ensure continued compliance with RVSM approval criteria as per the under mentioned example:

(a) For non-group aircraft where airworthiness approval has been based on flight test, the continuing integrity and accuracy of the altimetry system shall be demonstrated by ground and flight test of the aircraft and its altimetry system at intervals to be agreed with the Chairman. However, exemption from the flight test requirement may be granted if it can be demonstrated that the relationship between any subsequent airframe/system degradation and its effects on altimetry system accuracy is understood and that it can be compensated or corrected.

(b) In-flight defect reporting procedures shall be defined for identification of altimetry system error sources. Such procedure shall cover acceptable differences between primary and alternate static sources, and others as appropriate.

(c) For groups of aircraft, where approval is based on geometric inspection, periodic re-inspection shall be necessary and the intervals required should be specified in the specified program.

8.7.3 **Post Approval Modification**: Any variation/modification from the initial installation that affects RVSM approval should be referred to aircraft manufacturer and accepted by the Chairman.

9. CONTINUED AIRWORTHINESS - MAINTENANCE PROCEDURES

9.1 General

9.1.1 The integrity of the design features necessary to ensure that altimetry systems continue to meet RVSM approval criteria shall be verified by scheduled tests and inspections in conjunction with an approved maintenance program. The operator shall review its maintenance procedures and address all aspects of continued airworthiness that may be relevant.

9.1.2 Adequate maintenance facilities shall be available to enable compliance with the RVSM maintenance procedures.

9.2 Maintenance Programs

9.2.1 Each operator requesting RVSM operational approval shall establish RVSM maintenance and inspection practices acceptable to the Chairman that shall include any required maintenance specified in the data package. These practices shall be included in the operator's approved maintenance programme.

9.3 Maintenance Documents:

9.3.1 The following manuals/documents shall be reviewed, as appropriate

(a) Maintenance Manuals.
(b) Structural Repair manual
(c) Standard Practices Manuals.
(d) Illustrated Parts Catalogues
(e) Maintenance Schedule
(f) MMEL/MEL

9.4 **Maintenance Practices**:

9.4.1 The aircraft altimetry and height keeping equipment shall be maintained in accordance with the manufacturer's approved procedures and servicing schedules.

9.4.2 The operator's maintenance program shall include, for each aircraft type, the maintenance practices stated in the applicable aircraft and component manufacturers' maintenance manuals. In addition, attention shall be given to the following items:

(a) All RVSM equipment shall be maintained in accordance with the aircraft and component manufacturers' maintenance instructions and the performance criteria of the RVSM approval data package.

(b) Any modification or design change which in any way affects the initial RVSM approval shall be subject to a design review acceptable to the Chairman.

(c) Any repairs, not covered by approved maintenance documents, which may affect the integrity of the continuing RVSM approval, e.g. those affecting the alignment of pitot/static probes, repairs to dents or deformation around static plates shall be subject to a design review acceptable to the Chairman.

(d) Built-in Test Equipment (BITE) testing shall not be used for system calibration unless it is shown to be acceptable by the aircraft manufacturer/design organization, and with the agreement of the Chairman.

(e) An appropriate system leak check (or visual inspection where permitted) shall be accomplished following reconnection of a quick-disconnect static line.

(f) Airframe and static systems shall be maintained in accordance with the aircraft manufacturer's inspection standards and procedures.

(g) To ensure the proper maintenance of airframe geometry for proper surface contours and the mitigation of altimetry system error, surface measurements or skin waviness checks will need to be made, as specified by the aircraft manufacturer, to ensure adherence to RVSM tolerances. These checks should be performed following repairs, or alterations having an effect on airframe surface and airflow.

(h) The maintenance and inspection program for the autopilot will need to ensure continued accuracy and integrity of the automatic altitude control system to meet the height keeping standards for RVSM operations. This requirement will typically be satisfied with equipment inspections and serviceability checks.

(i) Whenever the performance of the installed equipment has been demonstrated to be satisfactory for RVSM approval, the associated maintenance practices shall be consistent with continued RVSM approval. Examples of equipment to be considered are:

(i) Altitude Alerting
(ii) Automatic Altitude Control
(iii) Secondary Surveillance Radar altitude reporting equipment
(iv) Altimetry system.

9.5 **Action for non-compliance aircraft**

9.5.1 Those aircraft positively identified as exhibiting height keeping performance errors that require investigation, shall not be operated in RVSM airspace until the following actions have been taken –

(a) The failure or malfunction is confirmed and isolated; and
(b) Corrective action is taken to comply with requirements for RVSM approval.

9.6 **Maintenance Training**

9.6.1 Additional training may be necessary to support RVSM approval. Areas needed to be highlighted for initial and recurrent training of relevant personnel are:

(a) Aircraft geometric inspection technique.
(b) Test equipment calibration and use of that equipment.
(c) Any special instruction or procedures introduced for RVSM approval.

9.7 **Test Equipment**

9.7.1 Test equipment should have the capability to demonstrate continuing compliance with all the paragraphs meters established in the data package for RVSM approval.

9.7.2 Test equipment should be calibrated using reference standards at periodic intervals acceptable to the Chairman. The approved maintenance program shall include an effective quality control program with the attention to the following:

9.7.3 Required test equipment accuracy must ensure:

(a) Regular calibrations of test equipment traceable to a master standard. Determination of the calibration interval should be a function of the stability of the test equipment. The calibration interval should be established using historical data so that the degradation is small in relation to the required accuracy.

(b) Regular audits of calibration facilities both in-house and outside.

(c) Adherence to approved maintenance practices.

(d) Procedures for controlling operator errors and unusual environmental conditions which may affect calibration accuracy.

10. OPERATIONAL APPROVAL

10.1 The Operator is required to obtain the Chairman approval to operate in airspace designated as RVSM airspace and maintain high levels of height keeping performance.

10.2 The Operator shall submit operational programs including the flight crew training as well as operations manuals and check list for approval;

10.3 Each aircraft type group utilised by an operator shall be capable of height keeping performance which does not exceed a mean Total Vertical Error of 25m (80ft). The Chairman may verify this by evaluating the Altimetry System Error (ASE) and Flight Technical Error (FTE) components of Total Vertical Error (TVE) separately;

10.4 The standard deviation about the mean TVE shall not exceed the following.

(a) Standard Deviation (ft): $82 - 0.004z^2$ where z equals mean TVE for the aircraft type in fleet;

(b) Standard Deviation (m): $25 - 0.016z^2$ where z equals mean TVE for the aircraft type in meters.

10.5 The Chairman while granting operational approval shall evaluate airworthiness documents for each aircraft type group. It is necessary for the operator to demonstrate height keeping performance for the aircraft type.

10.6 If in-service experience shows that the height keeping performance of a particular aircraft type utilized by the operator does not meet the requirements of paragraphs 6.3 and 6.4, the operator shall take steps to improve performance to the required level. If the performance is not improved, operational approval for the aircraft type may be withdrawn.

10.7 The operator shall ensure that a customized MEL adopted from the Master Minimum Equipment List (MMEL) and relevant operational regulations pertaining to the RVSM operations is submitted to AELD for approval of the Chairman.

10.8 The requirements for the Flight Crew Training as detailed in the ANO (Flight Ops) shall be complied with.

10.9 On satisfactory compliance of all Airworthiness and Operational requirements for RVSM operation by the operator, the Chairman shall issue / amend AOC with endorsement for RVSM operation.

NOTE: Only once RVSM (operational) approval has been issued should "W" be used in item 10 of the ATC flight plan to indicate RVSM approval.

11. PROVISION FOR MONITORING OF OPERATORS AIRCRAFT

11.1 The operator shall provide a plan for participation in the monitoring program. This program should normally entail a check of at least a portion of the operator's aircraft by an independent height monitoring system.

11.2 Monitoring of aircraft height-keeping performance may be done by either a ground based Height Monitoring Unit (HMU) or a portable GPS Height Monitoring Unit (GMU), which is carried on board the aircraft. In regions with HMUs, aircraft operators may meet the monitoring requirements without any specific action on their part, other than ensuring that the aircraft undertakes a flight with the area of coverage of an HMU within the time period within which monitoring should take place. For monitoring with the portable GMUs, operators need to arrange for a monitoring flight. Regional Monitoring Agency (RMAs) will notify operators sufficiently in advance regarding the time scales when specific aircraft require monitoring.

NOTE: (1) **For the Asia region:** Monitoring Agency for Asia Region (MAAR)
Aeronautical Radio of AEROTHAI
102 Ngamduplee Tungmahamek
Sathorn, Bangkok 10120
Thailand.
E-mail: maar@aerothai.co.th, Fax: +66-2-287-8155

NOTE: (2) **For the NAT region:** National Air Traffic Services Ltd
Central Monitoring Agency
CAA House, Room T805
45-59 Kingsway
London WC2B 6TE
United Kingdom
Phone: 0044 0171-832-5732, Fax: 0044 0171-832-5562

NOTE: (3) **For the PAC region:**
Asia-Pacific Approvals Registry and Monitoring Organization (APARMO)
William J Hughes Technical Centre (WJHTC)
NAS & International Airspace Analysis Branch (ACT-520)
Atlantic City International Airport
Atlantic City NJ 08405
USA
Phone: 001 (609) 485-5475 , Fax: 001 (609) 485-5117,
E-Mail: APARMO@tc.faa.gov

11.3 A program to establish a requirement which ensures that a minimum of 2 (two) aeroplanes of each aircraft type grouping of the operator have their height-keeping performance monitored, at least once every 2(two) years or within intervals of 1000 (one thousand) flight hours per aeroplane, whichever period is longer. If an operator aircraft type grouping consists of a single aeroplane, monitoring of that aeroplane shall be accomplished within the specified period.

12. REPORTING ALTITUDE KEEPING ERRORS

12.1 Each operator shall develop a system of reporting each event in which the operator's aircraft has exhibited the height deviations which are in magnitude equal to or, greater than, the following criteria:

(a) Total Vertical Error – 300 feet;
(b) Altimetry System Error – 245 feet; and
(c) Assigned Altitude Deviation – 300 feet.

13. REMOVAL OR AMENDMENT OF AUTHORITY

13.1 The Chairman may amend Operations Specifications of the operator to revoke or restrict an RVSM authorisation if it is found that the operator is not complying, or is unable to comply with the requirements of this ANO.

Issued in pursuance of the Rules 4 and 107 of the Civil Aviation Rules 1984 and comes into effect immediately. The ANO is a complete re-issue and supersedes the issue 2, dated 17 April, 2014.

AIR VICE MARSHAL M MAFIDUR RAHMAN
BBP, BSP, BUP, ndu, afwc, psc
Chairman
Civil Aviation Authority of Bangladesh

RVSM PERFORMANCE

1 **General:** The objectives set out by the ICAO Review of the General Concept of Separation Panel (RGCSP) have been translated into airworthiness standards by assessment of the characteristics of altimetry system error (ASE) and automatic altitude control.

2 **RVSM Flight Envelopes:** For the purposes of RVSM approval, the aircraft flight envelope may be considered as two parts; the Basic RVSM flight planning envelope and the Full RVSM flight envelope (referred to as the Basic envelope and the Full envelope respectively), as defined and explained in paragraphs 10.4 of this ANO. For the Full envelope, a larger ASE is allowed.

3 **Altimetry System Error**

3.1 To evaluate a system against the ASE performance statements established by RGCSP, it is necessary to quantify the mean and three standard deviation values for ASE, expressed as ASE_{mean} and $_{ASE3SD.}$ To do this, it is necessary to take into account the different ways in which variations in ASE can arise. The factors that affect ASE are:

(a) Unit to unit variability of avionics equipment.

(b) Effect of environmental operating conditions on avionics equipment.

(c) Airframe to airframe variability of static source error.

(d) Effect of flight operating conditions on static source error.

3.2 Assessment of ASE, whether based on measured or predicted data will need to consider sub-paragraphs (a) to (d) of 3.1. The effect of item (d) as a variable can be eliminated by evaluating ASE at the most adverse flight condition in an RVSM flight envelope.

3.3 The criteria to be met for the Basic envelope are:

(a) At the point in the envelope where the mean ASE reaches its largest absolute value that value should not exceed 25 m (80 ft);

(b) At the point in the envelope where absolute mean ASE plus three standard deviations of ASE reaches its largest absolute value, the absolute value should not exceed 60 m (200 ft).

3.4 The criteria to be met for the Full envelope are:

(a) At the worst point in the Full envelope where the mean ASE reaches its largest absolute value, the absolute value should not exceed 37 m (120 ft).

(b) At the point in the Full envelope where the mean ASE plus three standard deviations of ASE reaches its largest absolute value, the absolute value should not exceed 75 m (245 ft).

(c) If necessary, for the purpose of achieving RVSM approval for a group of aircraft (see paragraphs 10 of the ANO), an operating limitation may be established to restrict aircraft from conducting RVSM operations in parts of the Full envelope where the absolute value of mean ASE exceeds 37 m (120 ft) and/or the absolute value of mean ASE plus three standard deviations of ASE exceed 75 m (245 ft). When such a limitation is established, it should be identified in the data submitted to support the approval application, and documented in appropriate aircraft operating manuals. However, visual or aural warning/indication associated with such a limitation need not be provided in the aircraft.

3.5 Aircraft types for which an application for type certification is made after 1 January 1997, should meet the criteria established for the Basic envelope in the Full RVSM envelope.

3.6 The standard for aircraft submitted for approval as non-group aircraft, as defined in paragraphs 10.7.2 of the ANO, is as follows:

(a) For all conditions in the Basic envelope:
- Ù Residual static source error + worst case avionics Ù < 50 m
(160 ft)

(b) For all conditions in the Full envelope:
- Ù Residual static source error + worst case avionics Ù< 60 m
(200 ft)

NOTE: **Worst case avionics means that a combination of tolerance values, specified by the aircraft constructor for the altimetry fit into the aircraft, which gives the largest combined absolute value for residual SSE plus avionics errors.**

4. **Altitude Keeping:** An automatic altitude control system is required capable of controlling altitude within ±20 m (±65 ft) about the selected altitude, when the aircraft is operated in straight and level flight under non turbulent non-gust conditions.

NOTE: **Automatic altitude control systems with flight management system/ performance (Management system inputs allowing variations up to ±40 m (±130 ft) under non-turbulent, non-gust conditions, installed in aircraft types for which an application for type certification was made prior to January 1, 1997 need not be replaced or modified**.

CIVIL AVIATION AUTHORITY, BANGLADESH

AIR NAVIGATION ORDERS AIRWORTHINESS REQUIREMENTS

PART E – AIRCRAFT EQUIPMENTS

CHAPTER E.12 AIRWORTHINESS APPROVAL FOR RNAV/ RNP OPERATION

SECTIONS

1.	**GENERAL**	**6.**	**RNAV SYSTEMS FOR RNA V-X OPERATIONS**
2.	**DEFINITIONS**	**7.**	**FLIGHT CREW TRAINING REQUIREMENTS**
3.	**DESIGNATION OF RNP AND RNAV SPECIFICATIONS**	**8.**	**OPERATIONAL APPROVAL**
4.	**BASIC REQUIREMENTS**	**9.**	**OVERSIGHT OF OPERATORS**
5.	**AIRWORTHINESS APPROVAL PROCESS**		

1. GENERAL

1.1 This order prescribes the requirements for obtaining approval of the Civil Aviation Authority of Bangladesh for operating in Required Navigation Performance (RNP) designated airspace and further amplifies the requirements of the ANO (AW) E.6, Section 17.

1.2 The Sub rule 2 of the Rule 107 of the Civil Aviation Rules, 1984 stipulates that an aircraft shall not be used in any class of operations unless it is fitted with or carries such equipment, including emergency equipment, as the Chairman approves or directs. Similarly the Sub rule 3 of the Rule 107 of the Civil Aviation Rules, 1984 stipulates that an instrument or item of equipment be shall be fitted or carried or used in accordance with the direction issued by the Chairman.

1.3 RNP as a concept applies to navigation performance within airspace and therefore affects both the airspace and the aircraft. RNP is intended to characterize airspace through a statement of the navigation performance accuracy (RNP type) to be achieved within the airspace. The RNP type is based on a navigation performance accuracy value that is expected to be achieved at least 95 percent of the time by the population of aircraft operating within airspace.

1.4 This ANO lays down the necessary guidance for obtaining airworthiness and operational approvals for the use of navigation system in the airspace designated for RNAV operations. It establishes an acceptable means, but not the only means that can be used in the approval process to conduct flight in airspace or on routes where RNAV operation is applicable. The operator is also required to meet the RNAV airspace requirements of the State on which aircraft is flying.

1.5 The contents of the ANO are consistent with the provisions of ICAO Annex 6 and Doc 9613 on the subject. Guidelines for implementing and obtaining approval for RNP 1, RNP 2, RNP 5 and RNP 10 have been specified in the ICAO Doc 9613.

2. DEFINITIONS

2.1. For the purpose of this Order, the definitions as mentioned under the Rules 2 and 183 of the Civil Aviation Rules, 1984 shall apply. Where a particular definition is not given under the Rule, the under mentioned definitions shall apply:

(a) **Area Navigation (RNAV)** means a method of navigation which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these. For example:

- ***RNAV 1*** requires a total system error of not more than 1 NM for 95% of the total time
- ***RNAV 2*** requires a total system error of not more than 2 NM for 95% of the total flight time.
- ***RNAV 5*** requires a total system error of not more than 5 NM for 95% of the total flight time
- ***RNAV10*** requires a total system error of not more than 10 NM for 95% of the total flight time

Note: Area navigation includes Performance Based Navigation as well as other RNAV operations that do not meet the definition of Performance Based Navigation.

(b) **Area Navigation Route** means an ATS route established for the use of aircraft capable of employing area navigation.

(c) **Basic Area Navigation (B-RNAV)** means that RNAV which meets a track keeping accuracy equal to or better than +/-5 NM for 95 percent of the flight time. This value includes signal source error, airborne receiver error, display system error, and flight technical error. This navigation performance assumes the necessary coverage provided by satellite or ground-based navigation aids is available for the intended operation.

(d) **Global Positioning System (GPS)** means the U.S. Global Navigation Satellite System (GNSS) core satellite constellation that provides space-based positioning, velocity, and time.

(e) **Global Navigation Satellite System (GNSS)** means the worldwide position and time determination system, which includes one or more satellite constellations, aircraft receivers, and system integrity monitoring. GNSS is augmented as necessary to support the required navigation performance for the actual phase of operation.

(f) **Performance Based Navigation** means Area navigation based on performance requirements for aircraft operating along an ATS route, on an instrument approach procedure or in a designated airspace.

(g) **Precision Area Navigation (P-RNAV).** P-RNAV is defined as RNAV that meets a track keeping accuracy equal to or better than +/- 1 NM for 95 percent of the flight time. This value includes signal source error, airborne receiver error, display system error, and flight technical error. This navigation performance assumes the necessary coverage provided by satellite or ground-based navigation aids is available for the intended operation.

(h) **RNAV Equipment means** any combination of navigation equipment used to provide RNAV guidance. (RNP GM)

(i) **RNAV Operations** means aircraft operations using area navigation for RNAV applications. RNAV operations include the use of area navigation for operations which are not developed in accordance with the PBN Manual ICAO Document 9613-AN/937.

(j) **RNAV System** means a navigation system which permits aircraft operation on any desired flight path within the coverage of station-referenced navigation aids or within the limits of the capability of self-contained aids, or a combination of these. An RNAV system may be included as part of a Flight Management System (FMS).

(k) **Required Navigation Performance (RNP)** means a statement of the navigation performance accuracy necessary for operation within a defined airspace. Navigation performance and requirements are defined for a particular RNP type and/or application.

(l) **RNP Route** means an ATS Route established for the use of aircraft adhering to a prescribed RNP Specification

(m) **RNP System** means an area navigation system which supports on-board performance monitoring and alerting.

(n) **RNP Operations** means an aircraft operations using a RNP System for RNP applications.

3. DESIGNATION OF RNP AND RNAV SPECIFICATIONS

3.1 Oceanic, remote continental, en-route and terminal operations

3.1.1 For oceanic, remote, en-route and terminal operations, an RNP specification is designated as RNP X, e.g. RNP 4. An RNAV specification is designated as RNAV X, e.g. RNAV 1. If two navigation specifications share the same value for X, they may be distinguished by use of a prefix, e.g. Advanced-RNP 1 and Basic-RNP 1.

3.1.2 For both RNP and RNAV designations, the expression "X" (where stated) refers to the lateral navigation accuracy in nautical miles, which is expected to be achieved at least 95 per cent of the flight time by the population of aircraft operating within the airspace, route or procedure.

NOTE: A detailed discussion of navigation error components and alerting can be found in the ICAO document 9613-AN/937, Volume II, Part A, 2.2.

					Navigation specifications					
	RNP specifications include a requirement for on-board performance monitoring and alerting						RNAV specifications do include a requirement for **not** on-board performance monitoring and alerting			
		Designation **RNP X**						Designation **RNAV X**		

Figure 1. Description of the RNP and BRNV

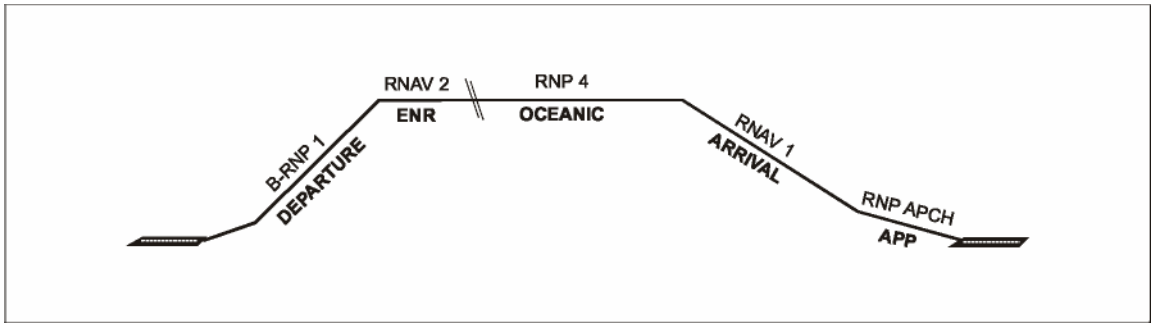


Figure 2. Example of an application of RNAV and RNP specifications to ATS routes and instrument procedures are shown above

4. BASIC REQUIREMENTS

4.1 No person shall operate Bangladesh registered aircraft in airspace designated for RNAV operations unless:

(a) Aircraft is equipped with a RNAV system able to support the desired navigation.

(b) RNAV system and aircraft operations are compliant with the requirements contained in this CAR for the particular navigation application and authorized by the Chairman for the operation.

(c) The Operations Specifications contained in the Operating Permit of this operator are endorsed by the Chairman to conduct RNAV operations.

Note: The navigation specification details the flight crew and aircraft requirements needed to support the navigation application. This specification includes the level of navigation performance, functional capabilities, and operational considerations required for the RNAV system.

4.2 Aircraft requirements for RNP 10 Operations

4.2.1 RNP 10 requires that aircraft operating in oceanic and remote areas be equipped with at least two independent and serviceable LRNSs comprising an INS, an IRS FMS or a GNSS, with an integrity such that the navigation system does not provide an unacceptable probability of misleading information.

4.3 Aircraft requirements for RNP 5 Operations

4.3.1 RNAV 5 operations are based on the use of RNAV equipment which automatically determines the aircraft position using input from one or a combination of the following types of position sensors, together with the means to establish and follow a desired path:

(a) VOR/DME;

(b) ***DME/DME***;

(c) INS or IRS; and

(d) GNSS.

4.4 Aircraft requirements for RNP 1 and RNP 2 operations

4.4.1 RNAV 1 and RNAV 2 operations are based upon the use of RNAV equipment that automatically determines the aircraft position in the horizontal plane using input from the following types of position sensors (no specific priority):

(a) Global navigation satellite system (GNSS) in accordance with FAA TSO-C145 (), TSO-C146 (), or TSO-C129 (). Positioning data from other types of navigation sensors may be integrated with the GNSS data provided other position data do not cause position errors exceeding the total system accuracy requirements. The use of GNSS equipment approved to TSO-C129 () is limited to those systems which include the minimum functions specified in 3.3.3.3 of the ICAO document 9613-AN/937. As a minimum, integrity should be provided by an aircraft-based augmentation system. In addition, TSO-C129 equipment should include the following additional functions:

(i) pseudo-range step detection;
(ii) health word checking;

(b) DME/DME RNAV equipment complying with the criteria listed in 3.3.3.2.2 of the ICAO document 9613-AN/937; and

(c) DME/DME/IRU RNAV equipment complying with the criteria listed in 3.3.3.2.3 of the ICAO document 9613-AN/937.

5. AIRWORTHINESS APPROVAL PROCESS

5.1 Currently the CAAB neither approves Design organizations nor do issues aircraft type certificates. Therefore, the Airworthiness approval process assures that each item of the RNAV equipment installed on Bangladesh registered aircraft is of approved design appropriate to its intended function and that the installation functions properly under foreseeable operating conditions. Additionally, the airworthiness approval process identifies any installation limitations that need to be considered for operational approval.

5.2 The basis for certification, limitation (if any) and other information shall be stated in the Aircraft Flight Manual (AFM) or AFM Supplement as applicable. Information may also be repeated and expanded upon in other documents such as Pilot Operating Handbooks (POHs) or Flight Crew Operating Manuals (FCOMs).

5.3 The AFM may also provide appropriate RNAV system operating and abnormal procedures applicable to the equipment installed, including, where applicable, reference to required modes and systems configuration necessary to support an RNP capability.

5.4 The MMEL and the customized MEL should identify the minimum equipment necessary to satisfy the criteria for operating in the particular RNAV types.

5.2 In general terms, RNAV equipment operates by automatically determining aircraft position from one, or a combination, of the following together with the means to establish and follow a desired path;

(a) VOR/DME;

(b) DME/DME;

(c) INS or IRS;

(d) LORAN C; and

(e) GPS/GNSS

5.3 For airworthiness approval, the following information shall be submitted along with the application:

(a) A Sufficient data for assessment of the equipment/system regarding its acceptability for intended use.

(b) Evidence of testing carried out to demonstrate the navigation performance accuracy appropriate to the RNP type.

(c) Where the system is intended for use in designated areas for which airworthiness approval would be required, the information must adequately reflect the relevant airworthiness considerations that would affect the aircraft's ability to comply with the operational requirements for flight within such designated airspace.

5.4 Appropriate RNAV equipment certified for use in all required phases of flight shall be installed.

5.5 **Acceptable Means of Compliance**

5.5.1 Where reference is made in the AFM/ manufacturer regarding installation of RNAV system or specific level of required navigation performance (RNP), it is acceptable for issuance of airworthiness approval for RNAV-X operation provided the aircraft eligibility was determined through demonstration of compliance against the relevant airworthiness criteria **(e.g.** TGL No. 10 or FAA AC 90-100A for RNAV1 and RNAV 2).

6. RNAV SYSTEMS FOR RNA V-X OPERATIONS

6.1 The RNAV system installed should be compliant with a set of basic performance requirements as described in the navigation specification, which defines accuracy, integrity and continuity criteria. It should also be compliant with a set of specific functional requirements, have a navigation database, and support each specific path terminator as required by the navigation specification.

NOTE: For certain navigation applications, a navigation database may be optional.

6.2 For a multi-sensor RNAV system, an assessment should be conducted to establish which sensors are compliant with the performance requirement described in the navigation specification.

6.3 The navigation specification generally indicates if a single or a dual installation is necessary to fulfill availability and/or continuity requirements. The airspace concept and navaid infrastructure are key elements in deciding if a single or a dual installation is necessary.

6.4 Approval of RNP systems for RNP-X operations

6.4.1 The RNP system installed should be compliant with a set of basic RNP performance requirements, as described in the navigation specification, which should include an on-board performance monitoring and alerting function. It should also be compliant with a set of specific functional requirements, have a navigation database, and should support each specific path terminator as required by the navigation specification.

6.4.2 For a multi-sensor RNP system, an assessment should be conducted to establish sensors which are compliant with the RNP performance requirement described in the RNP specification.

7. FLIGHT CREW TRAINING REQUIREMENTS

7.1 The pilot training programme shall be submitted to the Chairman for approval.

8. OPERATIONAL APPROVAL

8.1 General

8.1.1 The operational approval process assumes first that the corresponding installation/airworthiness approval has been granted. During operation, the crew should respect AFM and AFM supplements limitations. Normal procedures are provided in the navigation specification and detailed necessary crew action to be conducted during pre-flight planning, prior to commencing the procedure and during the procedure. Abnormal procedures are provided in the navigation specification. These procedures should detail crew action in case of on-board RNAV system failure and in case of system inability to maintain the prescribed performance of the on board monitoring and alerting function.

8.2 Granting of operational approval

8.2.1 The Chairman shall assess a particular operator for granting operational approval taking into account:

(a) Evidence of aircraft eligibility (Airworthiness Approval has been granted);

(b) Assessment of the operating procedures for the navigation systems to be used;

(c) Control of those procedures through acceptable entries in the Operations Manual;

(d) Identification of flight crew training requirements; and

(e) Where required, control of navigation database process.

8.3 The operational approval should be documented in the Air Operators Certificate (AOC) and amendment to the operations manual.

8.4 The following minimum requirements shall be considered while approving the specific RNAV approval for each operator:

(a) Approval is required to be obtained by each individual operator, as well as for each individual aircraft type group/ equipment (manufacturer/ model) utilized by an operator;

(b) Each aircraft type/ group utilized by an operator shall be shown to be capable of maintaining navigation performance accuracy relevant to the level of RNAV approval being sought;

(c) Each aircraft carrying RNAV/ flight management systems shall receive airworthiness approval prior to being reviewed for operational approval. The Chairman shall evaluate the airworthiness documents for each aircraft type/group equipment (manufacturer/ model).

8.5 If in-service experience shows that the navigation performance of a particular aircraft type utilized by an operator does not meet the requirements, the operator shall take steps to improve navigation performance to the required level. If performance is not improved, operational approval for the aircraft type may be withdrawn from that operator. In case where navigation performance is observed to be grossly in error, approval shall be withdrawn immediately.

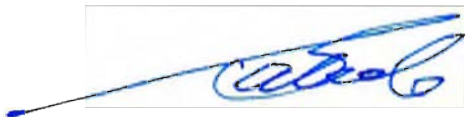
8.6 For the detailed guidance the FAA AC 90-96 and 90-101A may be referred.

9. OVERSIGHT OF OPERATORS

9.1 The Chairman shall consider any navigation error reports in determining remedial action. Repeated navigation error occurrences attributed to a specific piece of navigation equipment may result in cancellation of the approval for use of that equipment. Information that indicates the potential for repeated errors may require modification of an operator's training program. Information that attributes multiple errors to a particular pilot crew may necessitate remedial training or license review.

9.2 Procedure for reporting of incidents shall be established by the operator.

Issued in pursuance of the Rules 4 and 107 of the Civil Aviation Rules 1984.



Air Cdre Sakeb Iqbal Khan Majlis, ndu, psc

Chairman

Civil Aviation Authority, Bangladesh