



Master Minimum Equipment List (MMEL)

**Delegates Conference
14 November 2018**

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Objectives

- 1. To describe the policies and procedures associated with the development and approval of:**
 - **M MEL;**
 - **Transport Canada MMEL Supplement (TC Supplement);**
 - **Transport Canada MMEL Addendum (TC Addendum)**

- 2. To improve awareness on MMEL considerations for aircraft modifications (STCs).**

Summary of Presentation

- **Definitions**
- **Purpose of MMEL/MEL**
- **Legal Basis**
- **Policy and Guidance Material**
- **MMEL Relief Considerations**
- **Categorization**
- **Approval Process**
- **MMEL Relief for STCs**

Master Minimum Equipment List (MMEL)

A document approved by the Minister that establishes the aircraft equipment allowed to be inoperative under specified conditions for a specific type of aircraft.

- *Developed by **manufacturer***
- *Approved by **State of Design***
- *Aircraft type specific*
- *Applicable to various models (e.g. B737-100 to -900)*
- *Addresses various aircraft configurations*

Minimum Equipment List (MEL)

An approved document issued to an air operator that authorizes dispatch of an aircraft with equipment inoperative under specified conditions.

- *Developed by **air operator***
- *Based on:*
 - *MMEL*
 - *TC Supplement (foreign aircraft) or TC Addendum (domestic aircraft)*
- *Approved by **State of Registry***
- *Operator fleet specific*
 - *Specific models*
 - *Custom configuration (specific STCs)*



U.S. Department of Transportation
Federal Aviation Administration
Washington, D.C.

Master Minimum Equipment List

Revision: 57
Date: 09/29/2014

Boeing 737 **B-737-100/200/300/400/500/600/700/800/900/900ER**

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U.S. DEPARTMENT OF TRANSPORTATION		FEDERAL AVIATION ADMINISTRATION		MASTER MINIMUM EQUIPMENT LIST	
AIRCRAFT: B-737		REVISION NO : 55		PAGE: 78-1	
		DATE: 04/12/2011			
SYSTEM & SEQUENCE NUMBER	ITEM	1.	2.	NUMBER INSTALLED	
				3. NUMBER REQUIRED FOR DISPATCH	
				4. REMARKS OR EXCEPTIONS	
78 - ENGINE EXHAUST					
1.	Thrust Reverser Systems				
	1) (-100/-200)	C	2	1	(M)(O) One may be inoperative provided thrust reverser is deactivated and secured closed.
		C	2	1	(M)(O) One may be inoperative provided: a) Thrust reverser guide carriage is verified to be in over-center (forward thrust) position, and b) Override System is armed only after landing. NOTE: Relief also applies to airplanes modified by STC SA5730NM or ST00131SE.
	2) (-300/-400/-500)	C	2	1	(M)(O) One may be inoperative provided thrust reverser is locked in forward thrust position.
	3) (-600/-700/-800/-900)	C	2	1	(M)(O) One may be inoperative provided: a) Thrust reverser is locked in forward thrust position, and b) Appropriate performance adjustments are applied.



AIR XXXXX		MINIMUM EQUIPMENT LIST		
B737-600/-700/-800		REVISION XX		PAGE:
		DATE: dd mmm yy		78-1
SYSTEM & SEQUENCE NUMBER	ITEM	1.	2.	NUMBER INSTALLED
				3. NUMBER REQUIRED FOR DISPATCH
				4. REMARKS OR EXCEPTIONS
78 - ENGINE EXHAUST				
1.	Thrust Reverser Systems	C	2	1
				(M)(O) One may be inoperative provided: a) Thrust reverser is locked in forward thrust position, and b) Appropriate performance adjustments are applied.

PLACARDING:

OTHER INSTRUCTIONS:

OPERATIONS (O):

Description of appropriate operational procedures necessary for dispatch with inoperative equipment. In this example, this section would contain performance adjustments as required by proviso b).

MAINTENANCE (M):

Description of appropriate maintenance procedures necessary for dispatch with inoperative equipment. In this example, this section would contain procedures to lock inoperative thrust reverser in forward thrust position as required by proviso a).

TC Supplement

- **Issued against foreign aircraft type MMEL to address:**
 - **Canadian Aviation Regulations (CARs)**
 - **Unique/specific Canadian interpretation (MMEL Guidance Book)**
 - **TCCA (Flight Test/Engineering) Technical Assessment**
 - **STCs**

- **Relief based on Guidance Book suggested wording**

TC Supplement (Cont'd)

- **Only includes items for which there is a difference to the aircraft manufacturer's MMEL**
- **TC Supplement always takes precedence over MMEL relief (including any revision or temporary revision) - TP 9155 - Paragraph 3.7.3 b)**

Note: This rule applies even if relief specified in the TC Supplement is less restrictive than the one indicated in the MMEL

TC Addendum

- **Issued against domestic aircraft type MMEL to address equipment/system installed through STCs**
- **Relief based on Guidance Book suggested wording and STC holder proposal**



U.S. DEPARTMENT OF TRANSPORTATION FEDERAL AVIATION ADMINISTRATION				MASTER MINIMUM EQUIPMENT LIST	
AIRCRAFT: B-737			REVISION NO : DATE:	57 09/29/2014	PAGE: 22-1
SYSTEM & SEQUENCE NUMBER	ITEM	1.	2.	NUMBER INSTALLED	
				3. NUMBER REQUIRED FOR DISPATCH	
				4. REMARKS OR EXCEPTIONS	
22 - AUTO FLIGHT					
1.	Autopilot Systems	C	-	1	Maybe inoperative provided approach minimums do not require its use.
		B	-	0	Except for ER operations, may be inoperative provided: a) Approach minimums do not require their use, b) Enroute operations do not require autopilot use, and c) Number of flight segments and segment duration is acceptable to flight crew. NOTE1: Operators should make every effort to repair autopilot early in repair interval, as provided by this relief statement, in consideration of such factors as weather, traffic density, and effect of other inoperative systems. NOTE2: Any mode which functions normally may be used. If CWS is inoperative, do not use other modes (pitch or roll).
	1) Control Wheel Autopilot Disconnect Switches	C	2	1	One may be inoperative provided: a) Autopilot is not used below 1500 feet AGL, and, b) Approach minimums do not require use of autopilot.
		B	2	0	May be inoperative provided autopilot is not used.
***	2) Autopilot Disengage Bar	C	1	0	



**Transport Canada
Civil Aviation**

**MMEL
Guidance Book**

Revision 07

Approved by

R. W. Walker
Acting Chief, Flight Test
National Aircraft Certification

Date: 27 April 2009

Canada

MMEL GUIDANCE BOOK ATA 22 AUTO FLIGHT

ITEM: 22-10-2 AUTOPILOT DISCONNECTS

Autopilot Disconnect Functions (Quick Release Controls)	C	-	1	One may be inoperative provided:
	B	-	0	May be inoperative provided the autopilot is not used.
				<ul style="list-style-type: none"> a) The autopilot is not used below 1,500 ft AGL, b) Approach minimums do not require the use of the autopilot, and c) The pilot flying has the operative disconnect.



TRANSPORT CANADA
MMEL SUPPLEMENT
TO
BOEING 737
MASTER MINIMUM EQUIPMENT LIST

Walter Istchenko
Chief, Flight Test
National Aircraft Certification
for Minister of Transport

November 11, 2014
Revision: 22

Canada

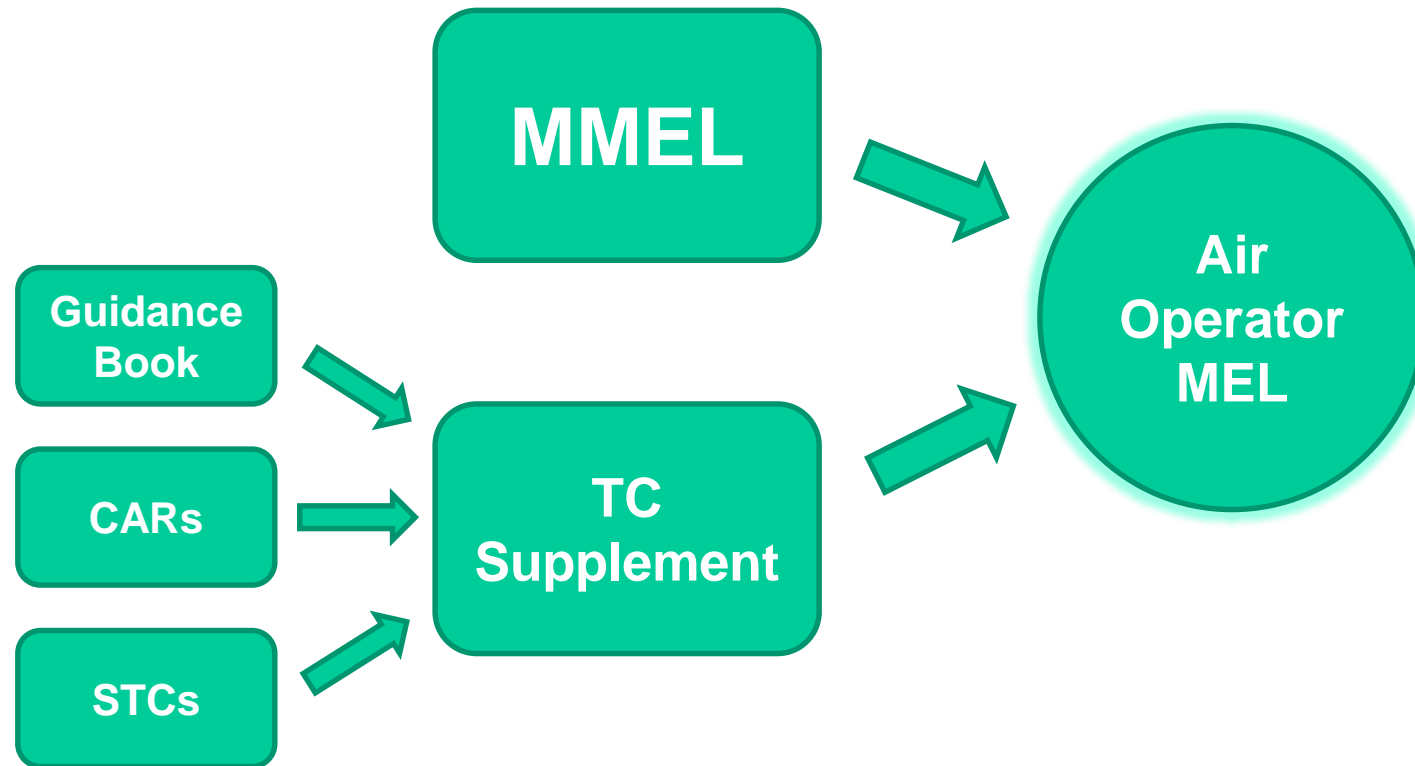
TRANSPORT CANADA
Master Minimum Equipment List
Supplement

Aircraft:		Revision No. 22		Page:	
BOEING 737		Date: Nov. 11, 2014		22-1	
System & Sequence Numbers	1.	2. Number Installed		3. Number Required for Dispatch	
				4. Remarks or Exceptions	
22	AUTO FLIGHT				
1. Autopilot Systems	C	-	1	No change from FAA MMEL	
	B	-	0	No change from FAA MMEL	
				NOTES: No change from FAA MMEL	
1) Control Wheel Autopilot Disconnect Switches	C	2	1	One may be inoperative provided: a) Autopilot is not used below 1500 feet AGL, b) Approach minimums do not require use of autopilot, and c) The pilot flying has the operative disconnect.	
	B	2	0	No change from FAA MMEL	
*** 2) Autopilot Disengage Bar	C	1	0		

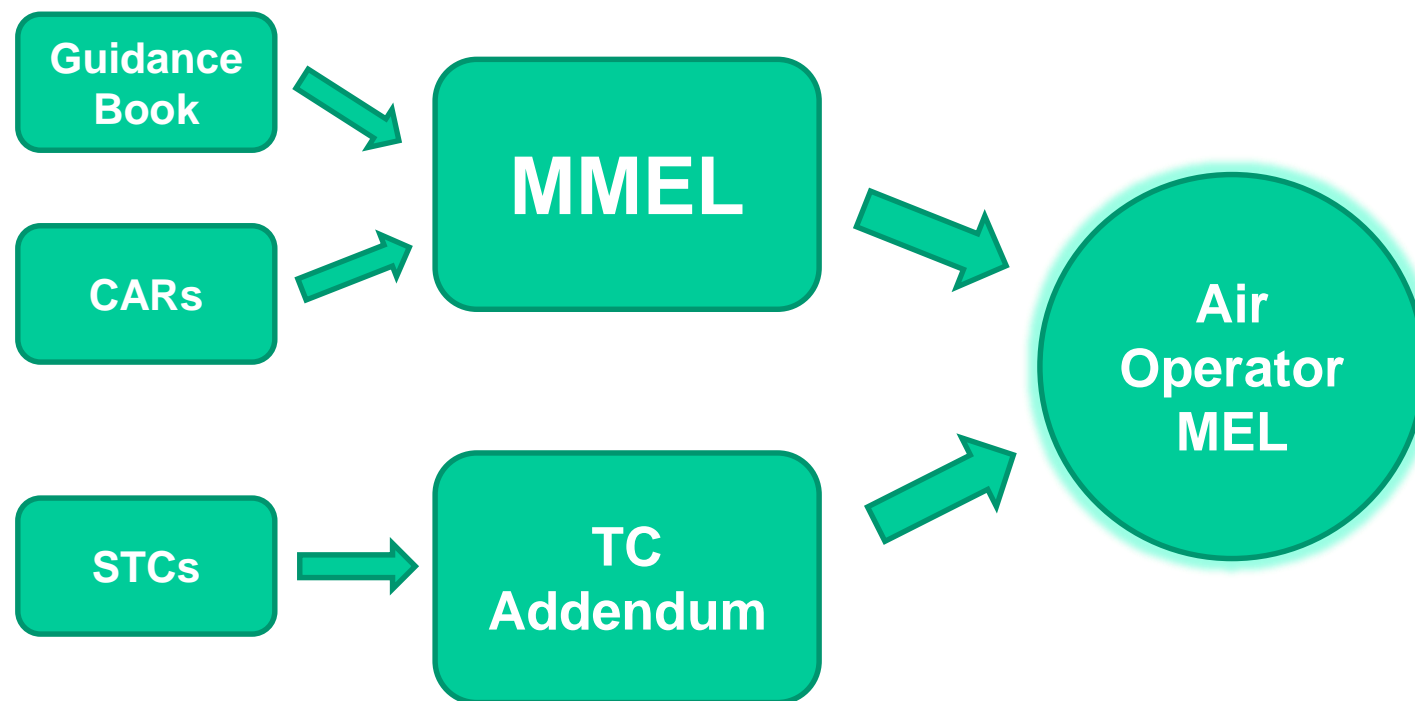
Purpose of MMEL/MEL

To allow dispatch (continued operation) of an aircraft on a conditional or limited basis with certain equipment inoperative.

MEL Development *(Foreign Aircraft Types)*



MEL Development *(Domestic Aircraft Types)*



MMEL Legal Basis

Canadian Basis

**CAR 605.07 General
CAR 704.07 Commuter
CAR 705.07 Airline**

FAA Basis

FAR 91.213

EASA Basis

CS-MMEL

Legal Basis - CAR VI

General Operating and Flight Rules

Subpart 5. Aircraft Requirements

Paragraph 605.07

The Minister may...

- **Establish a MMEL for each type of aircraft.**
- **Supplement a MMEL.**
- **Approve a MEL for each operator of that type.**

Legal Basis - CAR VII

Commercial Air Services

Subpart 4. *Commuter Operations*

Division II - Certification - Paragraph 704.07

- (1) The Minister shall... issue or amend an air operator certificate.**

- (2)(d) For the purposes of (1) an applicant shall have, after 1 Jan 1997, where a MMEL has been established for an aircraft type, a MEL for each aircraft of that type.**

Legal Basis - CAR VII

Commercial Air Services

Subpart 5. Airline Operations

Division II - Certification - Paragraph 705.07

- (1) The Minister shall ... issue or amend an air operator certificate...**

- (2)(e) for the purposes of (1) an applicant shall have, after 1 Jan 97, where a MMEL has been established for an aircraft type, a MEL for each aircraft of that type.**

MEL Legal Basis - Summary

Type of Operation	MEL Required	CAR Reference
Airline	Yes	CAR 705.07
Commuter	Yes	CAR 704.07
Others	No	CAR 605.10

Inoperative Equipment

Dispatch must be in accordance with either:

➤ **CAR 605.09 – Operations with MEL**

- MEL conditions and limitations

Commuter and Airline Operations require MEL

Others (including Private) are not required to have MEL, but some elect to operate with one

or

➤ **CAR 605.10 – Operations without MEL**

- No MEL
- Equipment not required by applicable design standards and operating rules may be inoperative
- Deactivation and placarding

- **MMEL/MEL Policy and Procedures Manual (TP 9155)
Second Edition - January 2006**

www.tc.gc.ca/eng/civilaviation/publications/tp9155-menu-5179.htm

- **TC MMEL Guidance Book
Rev. 07 - 27 April 2009**

(Source of standardized/suggested MMEL relief)

www.tc.gc.ca/eng/civilaviation/certification/projects-mm-el-guide-menu-1394.htm

Basis for Allowing Relief

- **System redundancy**
- **Equipment may not be required under all operating conditions**
- **Optional equipment**
- **Passenger convenience / Non-essential equipment and furnishings (NEF)**

MMEL Exceptions

- **Obvious items**
- **Missing secondary airframe or engine items
(Configuration Deviation List)**
- **No conflict with an AD**
- **No conflict with AFM limitations and emergency
procedures**

Level of Safety Principle

Ensure that the level of safety required by design requirements and operating rules is maintained.

"525.1447 Equipment Standards for Oxygen Dispensing Units

If oxygen dispensing units are installed, the following apply:

(a) There must be an individual dispensing unit for each occupant for whom supplemental oxygen is to be supplied. Units must be designed to cover the nose and mouth and must be equipped with a suitable means to retain the unit in position on the face. Flight crew masks for supplemental oxygen must have provisions for the use of communication equipment.

(b) If certification for operation up to and including 25,000 feet is requested, an oxygen supply terminal and unit of oxygen dispensing equipment for the immediate use of oxygen by each crew member must be within easy reach of that crew member. For any other occupants, the supply terminals and dispensing equipment must be located to allow the use of oxygen as required by the applicable operating rules.

(c) If certification for operation above 25,000 feet is requested, there must be oxygen dispensing equipment meeting the following requirements:

(1) There must be an oxygen dispensing unit connected to oxygen supply terminals immediately available to each occupant, wherever seated, and at least two oxygen dispensing units connected to oxygen terminals in each lavatory. The total number of dispensing units and outlets in the cabin must exceed the number of seats by at least 10 percent. The extra units must be as uniformly distributed throughout the cabin as practicable. If certification for operation above 30,000 feet is requested, the dispensing units providing the required oxygen flow must be automatically presented to the occupants before the cabin pressure altitude exceeds 15,000 feet. The crew must be provided with a manual means of making the dispensing units immediately available in the event of failure of the automatic system.

... "

"Oxygen Equipment and Supply

605.31 ...

(2) No person shall operate a pressurized aircraft unless it is equipped with sufficient oxygen dispensing units and oxygen supply to provide, in the event of cabin pressurization failure at the most critical point during the flight, sufficient oxygen to continue the flight to an aerodrome suitable for landing while complying with the requirements of the table to this subsection.

Table - Minimum Oxygen Requirements for Pressurized Aircraft Following Emergency Descent (Note 1)

	Column I	Column II
Item	Persons for Whom Oxygen Supply Must Be Available	Period of Flight and Cabin-Pressure-Altitude
1.	All crew members and 10 per cent of passengers and, in any case, no less than one passenger	(a) Entire period of flight exceeding 30 minutes at cabin-pressure-altitudes above 10,000 feet ASL but not exceeding 13,000 feet ASL (b) Entire period of flight at cabin-pressure-altitudes above 13,000 feet ASL (c) For aircraft operated in an air transport service under the conditions referred to in paragraph (a) or (b), a period of flight of not less than (i) 30 minutes (Note 2), and (ii) for flight crew members, two hours for aircraft the type certificate of which authorizes flight at altitudes exceeding FL 250 (Note 3)
2.	All passengers	(a) Entire period of flight at cabin-pressure-altitudes exceeding 13,000 feet ASL (b) For aircraft operated in an air transport service under the conditions referred to in paragraph (a), a period of flight of not less than 10 minutes

..."



DEPARTMENT OF TRANSPORT MINISTÈRE DES TRANSPORTS
MASTER MINIMUM EQUIPMENT LIST LISTE PRINCIPALE D'ÉQUIPEMENT MINIMAL

Aircraft – Aéronef	Revision No - NO de révision: 20	Page
Canadair CL-600-2B19/-2C10/-2D15/-2D24/-2E25	Date: November 10/10	35-2

1. System & Sequence No Item No de système/série article	2.	3. Number Installed Nombre d'articles installés	4. Number Required For Dispatch Nombre d'articles à expédier
35 – <u>OXYGEN</u>			
...			
20-01 Passenger Oxygen System	B	1	0
<p>Operating Rule CAR 605.31</p>			<p>(O) May be inoperative provided:</p> <ul style="list-style-type: none"> a) All components of cabin pressurization warning and indicating systems are operative, b) Operations are conducted so that minimum enroute altitude is at or below 13,000 ft MSL, c) Operations are conducted at or below FL 250, d) Portable oxygen units are provided for all crew members and for 10 percent of the passengers for half an hour (supplemental oxygen), e) Operational procedures are established to ensure that passengers are appropriately briefed to accommodate revised equipment, and f) Both Air Conditioning Packs are verified operative. <p>Design Requirement AWM 525.1447</p>
...			

Safety Considerations

- **Effect of subsequent failures**
- **Change in flight crew workload**
- **Degradation in efficiency and/or capability to cope with adverse environmental conditions**

Compensating Methods

- **Adjustment of operating limitations**
- **Transfer of function to an operating component**
- **Reference to other instruments or components**
- **Change in operating procedures**
- **Change in maintenance procedures**



U.S. DEPARTMENT OF TRANSPORTATION		FEDERAL AVIATION ADMINISTRATION		MASTER MINIMUM EQUIPMENT LIST	
AIRCRAFT: B-767		REVISION NO : DATE:		33c 08/20/2010	PAGE: 21-X
SYSTEM & SEQUENCE NUMBER	ITEM	1.	2.	3.	4.
<u>21 - AIR CONDITIONING</u>				NUMBER INSTALLED	NUMBER REQUIRED FOR DISPATCH
33-2	CABIN DIFF Pressure Indicator	C	1	0	(O) May be inoperative provided: a) CABIN ALT indicator operates normally, and b) A chart is provided to convert cabin altitude to cabin differential pressure.
Transfer of Function / Reference to Another Operating Component					
33-3	CABIN ALT Indicator	C	1	0	(O) May be inoperative provided: a) CABIN DIFF pressure indicator operates normally, and b) A chart is provided to convert cabin differential pressure to cabin altitude.

Justification

- **Demonstrate that equipment is optional or redundant**
- **Provide a quantitative and/or qualitative safety analysis**

Repair Times “Categorization”

A method of classifying inoperative items to define the maximum time between the deferral of an inoperative item and its repair.

Repair Interval Categories

CATEGORY A - Items repaired within time interval specified in Remarks column of MMEL.

CATEGORY B - Items repaired within three calendar days (72 hours) excluding the day of discovery.

CATEGORY C - Items repaired within ten calendar days.

Repair Interval Categories (Cont'd)

CATEGORY D - 120 day repair interval.

Items of an optional nature which operator may, at his discretion, deactivate or remove from an aircraft.

Criteria:

- a) does not affect crew workload,**
- b) pilots do not rely on the function of the item on a routine or continuous basis, and**
- c) pilots' training, subsequent habit pattern and procedures do not rely on the use of item.**



U.S. DEPARTMENT OF TRANSPORTATION		FEDERAL AVIATION ADMINISTRATION		MASTER MINIMUM EQUIPMENT LIST	
AIRCRAFT: B-767		REVISION NO : 33c		PAGE: 25-X	
		DATE: 08/20/2010			
SYSTEM & SEQUENCE NUMBER	ITEM	1.	2.	3. NUMBER INSTALLED	4. REMARKS OR EXCEPTIONS
25 - EQUIPMENT AND FURNISHINGS		3. NUMBER REQUIRED FOR DISPATCH			
11-1	Flight Crew Seat				
***	1) Power Adjustment System	D	2	0	May be inoperative provided fwd/aft and vertical manual adjustment modes operate normally.
	2) Manual Adjustment System				
	a) Recline	A	2	0	(M) May be inoperative provided: a) Seat is secured in upright position and is acceptable to affected crewmember, b) Fwd/aft and vertical manual adjustment modes operate normally, and c) Repairs are made within <u>two flight days</u> .
	b) Armrest	B	4	0	May be inoperative provided: a) Affected armrest is in up position or removed, and b) Seat is acceptable to affected crewmember.
	c) Lumbar, Thigh Supports and Headrest	C	2	0	May be inoperative provided seat is acceptable to affected crewmember.

120 calendar days

3 calendar days

10 calendar days

Approval Authority (MMEL)

CANADA: National Aircraft Certification Branch
(Flight Test Division)

USA: Aircraft Evaluation Groups (AEGs)

EUROPE: Certification

MMEL is one of the elements of Operational Suitability Data (OSD) approved as part of Aircraft Type Design

M MEL Approval Process Domestic Aircraft

- **Produced by manufacturer**
- **Reviewed by Transport Canada M MEL Review Group**
- **Approved by National Aircraft Certification Branch (Chief, Flight Test)**

MMEL Approval Process Foreign Aircraft

- **TC will accept foreign MMELs approved by foreign aviation authority.**
- **A TC Supplement is produced to modify the basic MMEL to address specific Canadian requirements (Flight Test/Engineering assessment) and rules (CARs), and add relief for STCs.**

MMEL Approval Process

Third Country MMELs

- **Not normally acceptable (e.g. FAA MMEL for an European type design)**
- **Exceptions are permitted, particularly for older aircraft, when deemed appropriate (e.g. FAA MMEL for the Dassault Falcon 20)**
(Ref. TP 9155 Paragraph 2.5.8)



A few examples...



U.S. DEPARTMENT OF TRANSPORTATION					
FEDERAL AVIATION ADMINISTRATION			MASTER MINIMUM EQUIPMENT LIST		
AIRCRAFT: B-767			REVISION NO : DATE:		33b 05/01/2010
			PAGE:		34-10
SYSTEM & SEQUENCE NUMBER	ITEM	1.	2.	NUMBER INSTALLED	
				3.	NUMBER REQUIRED FOR DISPATCH
					4.
					REMARKS OR EXCEPTIONS
34 - NAVIGATION					
46-1	Ground Proximity Warning System (GPWS)	A	1	0	(O) May be inoperative provided: a) Alternate procedures are established and used, and b) Repairs are made within two flight days .
	1) Modes 1 thru 4	A	4	0	(O) May be inoperative provided: a) Alternate procedures are established and used, and b) Repairs are made within two flight days .
	2) Test Mode	A	1	0	May be inoperative provided: a) GPWS is considered inoperative, and b) Repairs are made within two flight days .
...					



TRANSPORT CANADA
Master Minimum Equipment List
Supplement

Aircraft:		Revision No. 13		Page:	
BOEING 767		Date: July 14, 2009		34-6	
System & Sequence Numbers	1.	2.	Number Installed		
			3.	Number Required for Dispatch	
			4. Remarks or Exceptions		
34	NAVIGATION				
46-1	Ground Proximity Warning System (GPWS)	A	1	0	(O) May be inoperative provided: a) Alternate procedures are established and used, and b) Repairs are made within three flight days .
	1) Modes 1 - 4	A	4	0	(O) May be inoperative provided: a) Alternate procedures are established and used, and b) Repairs are made within three flight days .
	2) Test Mode	A	1	0	May be inoperative provided: a) GPWS is considered inoperative, and b) Repairs are made within three flight days .
					...



MASTER MINIMUM EQUIPMENT LIST					
Airplane		Revision 6		Page	
ERJ 170/ERJ 190				25-9	
System & Sequence Number	ITEM	1.	2. Number installed		
			3. Number required for dispatch	4. Remarks and/or exceptions	
25 EQUIPMENT/FURNISHINGS					
21-10	Passenger Seat(s)	D	-	-	May be inoperative provided: <ul style="list-style-type: none"> a) Seat does not block an Emergency Exit, b) Seat does not restrict any passenger from access to the main aircraft aisle, and c) The affected seat(s) are blocked and placarded "DO NOT OCCUPY". NOTE 1: A seat with an inoperative seat belt is considered inoperative. NOTE 2: Inoperative seats do not affect the required number of Flight Attendants. NOTE 3: Affected seat(s) may include the seat(s) behind and/or adjacent outboard seats.
	1) Recline Mechanism	D	-	-	(M) May be inoperative and seat occupied provided seat is secured in the upright position.
		D	-	-	May be inoperative and seat occupied provided seat back is immovable in full upright position.
(Continued)					



TRANSPORT CANADA Master Minimum Equipment List Supplement

Aircraft: EMBRAER 170/175/190		Revision No. 06 Date: Apr. 20, 2010		Page: 25-3
System & Sequence Numbers	1.	2.	Number Installed	
			3. Number Required for Dispatch	
			4. Remarks or Exceptions	
25 EQUIPMENT/ FURNISHINGS				
21-10 Passenger Seat(s)	D	-	-	No change from ANAC MMEL NOTES: 1. No change from ANAC MMEL 2. Deleted 3. No change from ANAC MMEL
1) Recline Mechanism	D	-	-	No change from ANAC MMEL
	C	-	-	No change from ANAC MMEL
				...

MEL Criteria When No TC Supplement Has Been Issued

- **Cannot be less restrictive than the applicable MMEL**
- **Must not contain relief not addressed in the MMEL**
- **Must not contain relief that is based solely on CARs or the MMEL Guidance Book**
- **Must not include relief not permitted by the CARs**



MMEL Website

<http://www.tc.gc.ca/eng/civilaviation/certification/projects-mmcl-menu-1379.htm>

MMEL Revisions

- **Same process as original approvals**
- **MMEL website displays revision number and date for each MMEL and TC Supplement**
- **Website posting date provided for new and revised MMELs and TC Supplements**

STC MMEL Relief – Procedures (1)

- **A proposal of relief is to be submitted either by the STC Holder (preferred) or Air Operator to the Regional Aircraft Certification Engineer (RACE) responsible for the STC**
- **Early coordination between the RACE and Flight Test may be necessary for complex or large projects (e.g. new Combi Configuration)**
- **RACE provides Flight Test with his/her concurrence (recommendation for MMEL approval)**

STC MMEL Relief – Procedures (2)

- **Flight Test revises the applicable TC Supplement (foreign aircraft) or TC Addendum (domestic aircraft) to add relief for the STC**
- **Relief can only be added to the Air Operator MEL once the TC Supplement or TC Addendum is approved and published**

MMEL Proposal – Recommendations

- **Compliance with all applicable elements of TP 9155**
 - **Level of Safety Principle (2.4.1)**
 - **MMEL Justification Methods (2.4.4)**
 - **Repair Interval Category, Number Installed, Number Required, Relief Conditions**
 - **Any necessary Operational (O) and Maintenance (M) Procedures**

- **Whenever possible, the MMEL Guidance Book should be used as source of suggested relief**



Questions





End