A Recall on the Correct Use of the MEL

The dispatch under a Minimum Equipment List (MEL) item allows to dispatch an aircraft in a safe and airworthy condition when certain system functions or equipment are temporarily unavailable or inoperative, enabling the aircraft to continue earning revenue without compromising the safety of the flight.

But, what are the MEL principles and are there good practices to think about when dispatching an aircraft with an MEL item in the tech log?

In the daily operations of an aircraft, failures that have an impact the flight dispatch can happen. A lack of spare parts or other constraints may make it unfeasible to fix the issue before the next scheduled flight. Using the MEL to dispatch an aircraft with a system function or equipment which is inoperative can avoid costly operation disruptions and ensures that the safety of the aircraft is not impaired. The operator can then schedule the necessary maintenance action at the next most suitable opportunity such as a return to a main base or a station when spares parts are available. This article recalls the principles of the Master Minimum Equipment List (MMEL) which is the baseline for the establishment of the Operator's Minimum Equipment List (MEL). It also provides an overview of the best practices for using the MEL.

THE MMEL AND THE MEL

Definitions

» **MMEL**

The Airbus MMEL is a dispatch document that is produced by the aircraft manufacturer and approved by the certification authorities.

The MMEL is used as a reference by the Operators to create their own MEL, which will permit the dispatch and operation of an aircraft with one or more inoperative equipment or unavailable system function while maintaining an acceptable level of safety.

» **MEL**

The MEL is a dispatch document developed by the Operator based on the aircraft manufacturer's MMEL. The MEL must be as restrictive as or more restrictive than the MMEL and must be approved by the Operator's national airworthiness authorities.

The MEL permits the Operator to assess the impact on their operations (flight schedule, route, environmental conditions,...) while operating an aircraft with systems, functions or components inoperative, thus to optimize aircraft dispatch reliability and profitability without impairing safety.

How is the MMEL developed?

The MMEL provides a list of items with associated conditions for dispatch. For every item, Airbus must demonstrate that the associated dispatch conditions are compliant with the certification requirements as specified by EASA. The major steps of this demonstration are the following:

Step 1: Assessment of the MMEL item to identify any operational impact or impact on other system functions, and check if there is any influence on the safety level of the aircraft.

> "The MMEL is used as a reference by the Operators to create their own MEL"

> "The MEL must be as restrictive as or more restrictive than the MMEL and must be approved by the Operator's national airworthiness authorities."

Step 2: Identification and assessment of the operational and safety impact of the next critical aircraft system failure which may occur during subsequent flights.

Step 3: Definition of any maintenance actions or operational procedures that may be necessary as a means of mitigation for the assessed impacts of the MMEL item.

Based on the above assessments, a dispatch status is defined for each MMEL item as either:

- "GO" when the dispatch is permitted for a limited period of time without specific dispatch condition, or
- "GO IF" when the dispatch is permitted for a limited period of time with specific dispatch conditions, or
- "NO GO" when the dispatch is not permitted and corrective maintenance action must be undertaken before the aircraft can continue operations.

How is the MEL developed?

The Operator's MEL is a dispatch document which should be tailored according to the Operator's routes, procedures and applicable local regulations, and within the constraints defined by the aircraft manufacturer's MMEL.

"The Operator's MEL is a dispatch document which should be tailored according to the Operator's routes, procedures and applicable local regulations, and within the constraints defined by the aircraft manufacturer's MMEL."

When does the MEL apply?

As per regulations, when there are failures or defects that cannot be rectified, and which are covered by an MEL item, the MEL must be applied prior to departure and accepted the Captain.

The "departure" corresponds to the "commencement of the flight". "The commencement of the flight" is defined as the moment when the aircraft starts to move under its own power for the purpose of takeoff (i.e. the taxi phase).

EASA and FAA require Operators to define procedures in their MEL for the management of any failure that occurs during the taxi-out phase.

EASA regulations

The EASA regulations require that Operators define an appropriate guidance for flight crew for the management of failures if they occur between the start of taxi and commencement of take-off roll.

The EASA regulations also state that the captain may decide to continue with the flight based on their "good judgment and airmanship". Additionally, their regulations allow flight crew to consult the MEL if it will help them to make a decision. Communication with dispatch, or the Operator's maintenance control centre, may assist the flight crew in their assessment of the MEL item and aid the Captain to decide if they will continue with the flight or not.

The final decision to continue with the flight is the responsibility of the Captain. This decision should be based on any operational considerations that could impair the current flight and also consider any impact on the subsequent missions of the aircraft.

FAA regulations

The FAA regulations require that Operators establish a procedure for the Pilot In Command (PIC) to communicate with the aircraft dispatch and maintenance organizations when a failure occurs after an aircraft departs the gate or ramp area, during pushback, taxi or prior to take-off.

This procedure permits the flight crew to review the situation and determine if the aircraft can be either dispatched with the failure under the MEL item, or if the failure must be rectified before take-off. If a dispatch with the failure under the relevant MEL item is advised, the return to the gate to accomplish the appropriate maintenance or operational procedure must be considered. In coordination with the Operator's dispatch and maintenance organization, certain MEL procedures may be accomplished by the flight crew without returning to the gate, provided these procedures are approved by the FAA's Principal Operations Inspector (POI).

Other Local regulations

Other National Aviation Authorities (NAA) may have regulations that differ from the regulations defined by the EASA or by the FAA. It is the responsibility of each Operator to check the applicable regulations with their relevant NAA.

MEL consultation in flight

The MEL is defined as a dispatch document and therefore the MEL is not applicable in flight. However, if a system or equipment defect is detected during flight, the MEL information may be useful to assess the likely dispatch condition for the next flight. A detailed description of the defect detected should be entered in the tech log, and Operator's dispatch or Maintenance Control Centre notified so they can consult MEL when the aircraft arrives.

What about multiple failures?

If several aircraft system functions or equipment are inoperative, operators should consult the MEL for each individual item to check if there are any incompatibilities for each of the associated dispatch conditions. If there is no MEL restriction, it is the flight crew's responsibility to assess the situation and to decide whether or not to dispatch the aircraft with multiple inoperative items.

"if a system or equipment defect is detected during flight, the MEL information may be useful to assess the likely dispatch condition for the next flight."

RULES AND RECOMMENDATIONS ON HOW TO USE THE MEL

From the moment of the failure has occurred until the dispatch of the aircraft, the following steps should be followed to ensure that the aircraft can be dispatched in an airworthy condition.

Step 1: Detection of the failure

A failure is detected:

-Through an ECAM alert or an indication on the Master Warning Panel (A300 B2/B4 only) or a failure indication on the Maintenance Panel (A300/A310 only)
- Through an observation of the flight crew by:
  - A flight deck effect (missing indication, amber indication on a System Display (SD) page, inoperative button or display, etc...)
  - A defective component detected during the external walkaround (e.g. external light not illuminating)

-Through an observation of the maintenance personnel.

> "Any aircraft system function unavailability or equipment failure has to be reported in the technical logbook by the flight crew"

Step 2: Reporting the failure

Any aircraft system function unavailability or equipment failure has to be reported in the technical logbook by the flight crew.

This technical logbook entry is the starting point for assessing any defect using the MEL. The flight crew should write any additional information associated to the defect that will help identify the cause of the defect such as the ECAM alert title, time of occurrence, SD page indication and flight phase.

Line Maintenance personnel can also make an entry in the aircraft's technical logbook to report any system function defect or inoperative equipment detected during ground operations.

NOTE

Aircraft system defects detected in the passenger cabin may be reported by the cabin crew in the cabin logbook. Should the defect have an impact on dispatch, these entries must be transferred to the aircraft's technical logbook before assessing the relevant MEL item applicability.

Step 3: Identification of the correct dispatch condition or MEL item associated to the failure

The identification of the failure is usually based on the ECAM alert's title and the dispatch assessment is provided in the MEL Entries section under the "CONDITION OF DISPATCH" header **(fig.1).**

VENT EXTRACT FAULT	
AIRCRAFT STATUS	**CONDITION OF DISPATCH**
NIL	Refer to Item 21-26-01 Avionics Extract Fan

(fig.1)
Example of a MEL entry with an associated MEL item

KEYPOINT

If a failure is classified as "NO DISPATCH" **(fig.2),** the aircraft must not be dispatched until the equipment or function is rectified.

BRAKES ANTI SKID FAULT	
AIRCRAFT STATUS	**CONDITION OF DISPATCH**
NIL	NO DISPATCH

(fig.2)
Example of a MEL entry with a "NO DISPATCH" condition

In some cases, MEL Entries section may require additional action by the flight crew or the maintenance crew in order to assess the dispatch conditions, particularly when:

- One ECAM alert refers to several MMEL items **(fig.3)**

ANTI ICE L(R) WINDSHIELD	
AIRCRAFT STATUS	**CONDITION OF DISPATCH**
If the Window Heat Computer is affected	Refer to Item 30-42-01 Window Heat Computer
NIL	Refer to Item 30-42-03 Windshield Heating

(fig.3)
Example of a MEL entry with several associated MEL items

- The dispatch condition assessment depends whether the ECAM alert is actual or false (spurious) **(fig.4)**

BRAKES BRK Y ACCU LO PR	
AIRCRAFT STATUS	**CONDITION OF DISPATCH**
Actual alert	NO DISPATCH
False alert	Refer to Item 32-44-02 ACCU PRESS Indicator
// END	

(fig.4)
Example of a MEL with dispatch condition depending whether the alert is actual of false

- The dispatch condition assessment requires additional information such as ECAM indication on the SD page **(fig.5)**

VENT SKIN VALVE FAULT	
AIRCRAFT STATUS	**CONDITION OF DISPATCH**
Outlet valve determined faulty on the CAB PRESS SD page	Refer to Item 21-26-04 Avionics Skin Air Outlet Valve
Inlet valve determined faulty on the CAB PRESS SD page	Refer to Item 21-26-05 Avionics Skin Air Inlet Valve

(fig.5)
Example of a MEL entry with the dispatch condition depending on indications on the associated SD page

On A350, the ECAM Dispatch Messages are a straight forward help for dispatch. The flight crew finds the Dispatch Message in the MEL entries section to get the condition of dispatch or identify the applicable MEL item **(fig.6)**

L/G CTL 1(2)	
AIRCRAFT STATUS	**CONDITION OF DISPATCH**
The landing gear control 1(2) is failed.	Refer to Item 32-31-01 Landing Gear Control

(fig.6)
Example of a Dispatch Message on A350

The A380 and A350 MEL also show a “Crew Observations” section in the MEL entries **(fig.7)** covering failures of monitored systems that are indicated with flight deck effects that don’t have an associated ECAM alert or Dispatch Message, for example, an amber indication on system display (SD) page or when the FAULT light of a pushbutton switch illuminates. The “Crew Observations” section also covers malfunctions that can be visually detected by the flight crew or the maintenance personnel, for example during the external walk around.

MANUAL HORIZONTAL ADJUSTMENT INOPERATIVE ON COCKPIT SEAT	
AIRCRAFT STATUS	**CONDITION OF DISPATCH**
The manual horizontal adjustment is inoperative on the CAPT seat or on the F/O seat.	NO DISPATCH
The manual horizontal adjustment is inoperative on the third occupant seat.	Refer to Item 25-12-02 Third Occupant Seat Horizontal Adjustment

(fig.7)
Example of a Crew Observation in the MEL Entries section on A380

If the failure is not linked to an ECAM alert or to a failure reflected in the Crew Observation section (A380 & A350), the correct MEL item should be identified directly into the MEL items section.

KEYPOINT

It is important to identify the MEL item correctly. The application of a MEL item that does not correspond to the inoperative equipment or unavailable system function may have unintended consequences for the safety of the flight.

Step 4: Review of the dispatch conditions

When the MEL item is correctly identified, the flight crew should carefully review the dispatch condition.

If there are several dispatch conditions, the title of the associated dispatch condition helps to identify which one is applicable **(fig.8).**

> “The application of a MEL item that is not corresponding with the inoperative equipment or unavailable system function may have unintended consequences for the safety of the flight.”

36-12-02 APU Bleed Valve

☐ 36-12-02A Inoperative in the closed position

Repair Interval	Nbr Installed	Nbr Required
C	1	0

o m May be inoperative provided that:

1) ETOPS beyond 180 min is not conducted, and
2) The APU bleed valve is deactivated in the closed position, and
3) The APU BLEED pb-sw is set to Off.

☐ 36-12-02B Inoperative in the open position

Repair Interval	Nbr Installed	Nbr Required
C	1	0

o May be inoperative in the open position provided that:

1) ETOPS beyond 180 min is not conducted, and
2) The APU is not used in flight.

(fig.8)
Example of a MEL item with two dispatch conditions: 36-12-02A and 36-12-02B

Step 5: Decision for dispatch

Maintenance personnel may propose to dispatch the aircraft under MEL item provided that all of the associated dispatch conditions are fulfilled.

It is the Captain’s responsibility to accept the aircraft dispatch under the MEL item for the flight; taking into account not only the MEL dispatch condition but also the applicable operator’s policy and the operational constraints.

> “It is the Captain’s responsibility to accept the aircraft dispatch under the MEL item for the flight”

> “Inoperative items should be repaired as soon as possible and at least within the period of time defined by the repair interval”

Step 6: Log of the MEL item

The maintenance personnel must make an entry into the logbook for the MEL item and determine the deadline for rectification based on the MEL repair interval.

Inoperative items should be repaired as soon as possible and at least within the period of time defined by the repair interval **(fig.9).**

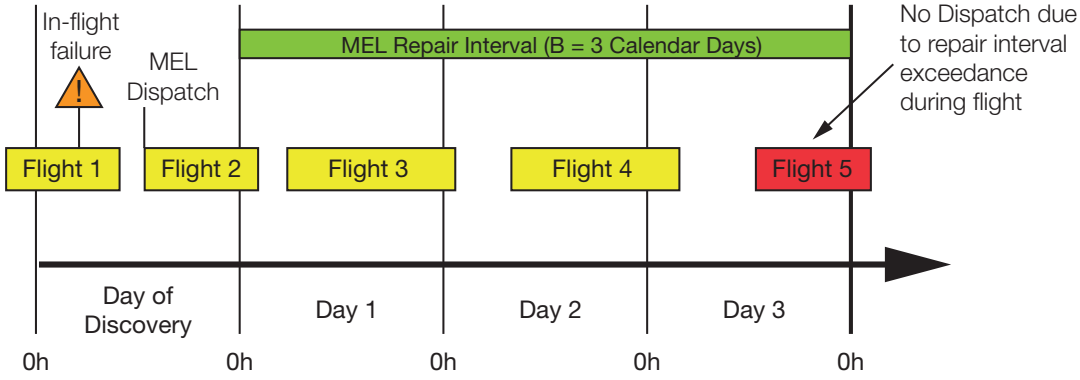
BEST PRACTICE

Plan the repair as soon as possible to avoid operational disruption should additional failure occur that may make the dispatch impossible.

» The allowable intervals for rectification are classified as the following:

Interval	A	B	C	D
Calendar Days	Refer to interval provided in MMEL item	3*	10*	120*

*Excluding the day the defect was first detected



(fig.9)
Principle of the repair interval

» Specificity of Category “A” repair intervals

MEL with category “A” repair intervals can use different references, e.g. calendar days, flight cycles…

Step 7: Initial dispatch

For the first dispatch after applying the MEL item, all dispatch conditions and associated limitations must be accounted for and any relevant maintenance (m) and operational (o) procedures must be applied to maintain an acceptable level of safety for the operation of the aircraft, even with the inoperative equipment or unavailable system function.

BEST PRACTICE

For a complete awareness of aircraft dispatch condition, maintenance personnel should also consult the operational procedure (when applicable).

KEYPOINT

An incorrect or incomplete application of the maintenance or operational procedure may impair the safety of the flight.

Step 8: Subsequent flights dispatched under MEL item

For the subsequent flights, the flight crew must check that any open MEL item in the logbook is within the window of the repair interval and that this time limit won't be exceeded during the next flight mission.

When the dispatch conditions are accepted by the captain (as described in step 5), all necessary operational procedures must also be applied.

In the case when a new MEL item is recorded in the technical logbook, the maintenance personnel must also review all of the pre-existing MEL items to ensure that all of the dispatch conditions for each item are fulfilled.

> "An incorrect or incomplete application of the maintenance or operational procedure may impair the safety of the aircraft."

KEYPOINT

In the case of a multiple MEL items logged, flight crew and maintenance personnel must check before each flight that dispatch conditions of all MEL items are fulfilled.

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The MEL is a commonly used tool allowing for the safe and continuous operation of the aircraft until rectification of certain inoperative equipment or unavailable system functions that are not adversely affecting the airworthiness of the aircraft. But incorrectly using the MEL could lead to dispatching an aircraft in a configuration that is not airworthy and with potential consequences that could impair the safety of the flight.

Understanding the principles and rules for correctly applying MEL items is crucial for both maintenance personnel and flight crews.

When dispatching under a MEL item, the conditions of dispatch and the rectification interval must be taken into account and the associated maintenance and operational procedures must be accurately applied.

It is ultimately the Captain's responsibility to decide to dispatch the aircraft for flight under the MEL conditions.

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