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***ESPN-R***

***European Safety Promotion Network – Rotorcraft***

***Team Operations and SMS***

***MAINTENANCE CHECK FLIGHT MANUAL***

*A template for the Aviation Community*

**Edition 1**

**02/07/2021**

**Purpose of the Maintenance Check Flight Manual template**

The Purpose of this template is to provide the operators a starting point for their own development of a maintenance check flight programme as required by Reg. (EU) 965/2012 - ORO.AOC.125.

This document is intended as an initial guideline and it shall be reviewed and opportunely modified by the operator to respect its own internal organisation and procedures.

This document has been initially released by Safe-IT, the Italian safety managers’ discussion group (Focal Point: [s.burigana@aeronauticalsafety.com](mailto:s.burigana@aeronauticalsafety.com)) and it has been further discussed and developed by the ESPN-R working group.

Anyone can use this document to develop their own MCF manual within their company. The material is editable and disclosable.

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**MAINTENANCE CHECK FLIGHT MANUAL**

NOTE1: The document shall be properly changed in order to reflect the operator’s organisation.

NOTE 2: Maintenance Check Flights (MCFs) are a multi-department activity that involve, at least, CAMO, Flight Operations, Maintenance, Operator (if maintenance is a contracted activity). A proper entry shall be made in each manual of the department involved. This can be done by “splitting” this manual into single specific parts or referring to the MCF manual from the department’s manual.

NOTE 3: An MCF manual is required only for LEVEL A MCFs with COMPLEX MOTOR-POWERED AIRCRAFT, while a SOP may be sufficient in other types of MCFs. Nevertheless, an operator or organisation may consider developing a dedicate MCF manual anyway, by deleting the not required parts of this manual. This manual does not provide specific guidance for MCF for other than complex motor-powered aircraft.

NOTE 4: Although the explanations and information herein are EASA-regions centred by usage of many references and terms from EASA regulations, the application of the content, methodology, information and procedures is of course as well very much recommended to be exploited and applied outside EASA regions because it will support operators to conduct MCFs with the lowest risk possible. This document is intended as an initial guideline and it shall be reviewed and modified by the operator with respect to its own internal organisation and procedures.

NOTE 5: The MCF manual may be a standalone document or integrated into the Operations Manual in relevant chapters, such as the general description and criteria in OM Part A chapters 4, 5 and 8.7 and type related issues in OM B chapter 2 and training issues in OM D.

**EDITION 0**

**REVISION 0.0** - 02/07/2021

*Operator’s name and address*

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# Introduction

A significant number of aviation accidents and serious incidents occur during non-revenue flights. Among them, a particular case is maintenance check flights (MCFs). These flights, under the control of the operator, may be required to assist in the identification of a defect, to complete certain maintenance instructions, to verify that maintenance has been properly performed, or to avoid operational disruptions after major maintenance.

During the performance of a MCF and in order to fulfil its objective, there is often the need to operate the aircraft differently from what is the normal aircraft operation (e.g., trying to reproduce in flight a fault discovered on ground for troubleshooting).

Performing this flight without additional precautions may not be safe.

## Revisions

|  |  |  |  |
| --- | --- | --- | --- |
| **Ed.** | **Rev.** | **Data** | **Remarks** |
| **0** | **0.0** | **21/05/2021** | **New Edition** |
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## Definitions

|  |  |
| --- | --- |
| **Level A maintenance check flights** | Flights where the use of abnormal or emergency procedures, as defined in the aircraft flight manual, is expected, or where a flight is required to prove the functioning of a backup system or other safety devices |
| **Level B maintenance check flights** | Any maintenance check flights other than a “Level A” maintenance check flight |
| **Maintenance check flight** | A flight of an aircraft with an airworthiness certificate or with a permit to fly which is carried out for troubleshooting purposes or to check the functioning of one or more systems, parts or appliances after maintenance, if the functioning of the systems, parts or appliances cannot be established during ground checks and which is carried out in any of the following situations:   1. as required by the aircraft maintenance manual (‘AMM’) or any other maintenance data issued by a design organisation approval (DOA) holder being responsible for the continued airworthiness of the aircraft; 2. after maintenance, as required by the operator or proposed by the organisation responsible for the continuing airworthiness of the aircraft; 3. as requested by the maintenance organisation for verification of a successful defect rectification; 4. to assist with fault isolation or troubleshooting; |
| **Test Flight** | A pre-certification flight, usually carried out by the manufacturer. Test Flights are not dealt with in this manual |
| **Continuing Airworthiness** (Operator)**:** | meaning all of the processes ensuring that, at any time in its operating life, the aircraft complies with the airworthiness requirements in force and is in a condition for safe operation |
|  |  |
| **Continued Airworthiness** (DOA Holder)**:** | all the actions associated with the upkeep of a type design and the associated approved data through life |

## Synonyms and acronyms

|  |  |
| --- | --- |
| **AGL**  **AMM** | Above Ground Level  Aircraft Maintenance Manual |
| **ATC** | Air Traffic Control |
| **ATL** | Aircraft Technical Log |
| **ATS** | Air Traffic Service |
| **CAA** | Civil Aviation Authority |
| **CFS** | Check Flight Schedule |
| **DCA**  **DOA** | Department of Civil Aviation  Design Organisation Approval |
| **FSTD** | Flight Simulator Training Device |
| **HTL** | Helicopter Technical Log |
| **MCF** | Maintenance check flight |
| **MEL**  **OEM** | Minimum Equipment List  Original Equipment Manufacturer |
| **RA** | Risk Assessment |
| **RFM** | Rotorcraft Flight Manual |
| **TS** | Task Specialist |
| **VFR** | Visual Flight Rules |

## Purpose

This manual contains the policy, procedures, and criteria for the Maintenance Check Flights operations with company helicopters of the type(s) […].

## Distribution

This manual and each subsequent update is distributed to:

* Flight Operations Post Holder
* CAMO
* Maintenance Manager
* Training Post Holder
* ATO Head of Training
* Ground Post Holder
* Maintenance Check Flight authorised pilots
* All technicians and Certifying Staff
* DCA/CAA

## Practical Use of this Manual

The Maintenance Check Flight Manual is meant to assist in the preparation and safe execution of Maintenance Check Flights (MCFs). Where there is conflict between this Manual and the equivalent documentation provided by the aircraft manufacturer, the manufacturer’s documentation has precedence.

## Rules and regulations

This MCF manual includes rules set down by the following EU Regulations and related AMCs and GMs:

* Reg. (EU) 1321/2014 - GM M.A.301(i) Continuing airworthiness tasks
* Reg. (EU) 965/2012 – Last amended by Reg. (EU) 2020/745 of 05/06/2020

In particular, the Maintenance Check Flight has been introduced by:

* Reg. (EU) 2019/1384 of 04/09/2019

Following is a summary of the relevant applicable rules. [Transcription of the regulatory text is not necessary in the operator’s MCF Manual. The following text has been inserted for operator’s MCF manual development convenience and may be deleted]

The ORO.AOC.125 requires operators to comply with the Maintenance Check Flight organisation, under the provisions in Part-SPO, on complex aircrafts or commercial maintenance operations, or Part-NCO, for non-commercial flights on other-than-complex aircrafts.

The following sections report the provisions for the execution of the Maintenance Check Flights:

MCF with **complex** motor-powered aircraft

* Reg. (EU) 965/2012 - ANNEX VIII (PART-SPO)

SUBPART E: SPECIFIC REQUIREMENTS

SECTION 5 – MAINTENANCE CHECK FLIGHTS (MCFS)

MCF with **other than complex** motor-powered aircraft

* Reg. (EU) 965/2012 - ANNEX VII (PART-NCO)

SUBPART E: SPECIFIC REQUIREMENTS

SECTION 6 – MAINTENANCE CHECK FLIGHTS (MCFS)

The aircraft involved in the MCF are divided in complex and other-than-complex motor-powered aircraft. The definition of ‘complex motor-powered aircraft’ is defined in the Art. 3 (j) of the repealed Reg. (EU) 216/2008 (former Basic Regulation). Article 140 of Reg. (EU) 2018/1139 (New Basic Regulation) indicates that the definition in Reg. (EU) 216/2008 is still relevant.

Reg. (EU) 965/2012 - ANNEX I – DEFINITIONS reports the definition of the Maintenance Check Flight:

*(76a) ‘maintenance check flight (‘MCF’)’ means a flight of an aircraft with an airworthiness certificate or with a permit to fly which is carried out for troubleshooting purposes or to check the functioning of one or more systems, parts or appliances after maintenance, if the functioning of the systems, parts or appliances cannot be established during ground checks and which is carried out in any of the following situations:*

1. *as required by the aircraft maintenance manual (‘AMM’) or any other maintenance data issued by a design approval holder being responsible for the continuing airworthiness[[1]](#footnote-1) of the aircraft;*
2. *after maintenance, as required by the operator or proposed by the organisation responsible for the continuing airworthiness of the aircraft;*
3. *as requested by the maintenance organisation for verification of a successful defect rectification;*
4. *to assist with fault isolation or troubleshooting;*

Article 9aa of Reg. (EU) 965/2012 (cover regulation) relieves from attending an MCF course to pilots-in-command that have check flights experience before 25 September 2019.

*Article 9aa - Flight crew requirements for maintenance check flights*

*A pilot having acted, before 25 September 2019, as a* *pilot-in-command on a maintenance check flight that in accordance with the definition in point SPO.SPEC.MCF.100 in Annex VIII is categorised as a Level A maintenance check flight, shall be given credit for the purpose of complying with point SPO.SPEC.MCF.115(a)(1) of that Annex. In that case, the operator shall ensure that the pilot-in-command receives a briefing on any differences identified between the operating practices established before 25 September 2019 and the obligations provided in Section 5 of Subpart E of Annex VIII to this Regulation including those derived from the related procedures established by the operator.*

## Internal documents and references

Maintenance Check Flight risk assessment.

[Report references to CAME where applicable.]

[Report references to MOE where applicable.]

# General considerations

## Conditions Requiring an MCF

A MCF may be requested in the following cases:

* **requested by maintenance data** - As required by the aircraft maintenance manual (AMM) or any other maintenance data issued by the design approval holder for the continuing airworthiness of the aircraft; or
* **requested by the operator** - After scheduled maintenance or unscheduled maintenance including repainting, as required by the operator; or hand back of it from or to a lessor for contractual reasons; or
* **requested by the maintenance organisation** - As required by the maintenance organisation for verification of a successful defect rectification; or
* **requested to regain airworthiness** - To assist with fault isolation or troubleshooting.

Maintenance check flights are categorised as MCF Level A or MCF Level B.

* **Level A** maintenance check flights - Flights where the use of abnormal or emergency procedures, as defined in the aircraft flight manual, is expected, or where a flight is required to prove the functioning of a backup system or other safety devices
* **Level B** maintenance check flights - Maintenance check flights other than level A.

NOTE from the Team: Reg. 965 indicates:

***SPO.SPEC.MCF.100 Levels of maintenance check flight***

*Before conducting a maintenance check flight, the operator shall determine the applicable level of the maintenance check flight as follows:*

1. *“Level A” maintenance check flight for a flight where the use of abnormal or emergency procedures, as defined in the aircraft flight manual, is expected, or where a flight is required to prove the functioning of a backup system or other safety devices;*
2. *a “Level B” maintenance check flight for any maintenance check flights other than a “Level A” maintenance check flight.*

***SPO.SPEC.MCF.140 Systems and equipment***

*When a maintenance check flight is intended to check the proper functioning of a system or equipment, that system or equipment shall be identified as potentially unreliable and appropriate mitigation measures shall be agreed prior to the flight in order to minimise risks to flight safety.*

The Operator shall define which of its MCF flight is to be considered as a Level A or a Level B MCF. This can be done with a specific risk assessment.

The following table may help the organisation on how to approach a documented definition of Level A or B MCFs.

| Way to approach the SPO.SPEC.MCF.100 | Example | PROs and CONs | Documentation |
| --- | --- | --- | --- |
| The phrase “*the use of abnormal or emergency procedures, as defined in the aircraft flight manual, is expected*” may be interpreted as: “whenever the MCF requires the pilot to execute some manoeuvres that are not described in the RFM under “normal procedures”, but are part of the abnormal or emergency section, that flight is a Level A MCF. | **LEVEL A MCF**  Autorotation to verify the Nr during a power-off descent.  Flight without one of the two hydraulic systems to check the correct functioning.  These procedures and the way to handle the situation are described in the abnormal or emergency section of the RFM.  **LEVEL B MCF**  Flight to the Vne.  Post-maintenance flight to verify that all systems are functioning without the exclusion of any of them during flight.  These flights may be executed by referencing only to the “normal procedure” section of the RFM. | **PROs**  Most MCF may be classified as Level B.  **CONs**  Classifying a flight as Level A or B does not clarify if a MCF is a high risk or low risk flight. For example, a post-maintenance MCF after the substitution of parts of the tail rotor (blade, pitch-change mechanism, TR hydraulic parts, etc.) is a Level “B” MCF because there are no abnormal or emergency procedures required to be executed during the MCF flight. Nevertheless, if the substituted component will not work properly, handling a tail rotor emergency could be very demanding. | When preparing the MCF Form (see Attachment A), the CAMO, with the help of the Operations department, shall define if the MCF is a Level A or B by verifying if any of the RFM abnormal or emergency procedures are planned to be executed during the MCF flight.  An analysis of the risk level of the flight shall be done for each MCF considering the possibility of failure of the checked system. Level A or B categorisation does not give due information if the flight is a high risk or low risk.  Before the flight, the pilot shall duly review the abnormal and emergency procedures related to the system to be checked and mentally prepare for using them. |
| The phrase “*the use of abnormal or emergency procedures, as defined in the aircraft flight manual, is expected*” may be interpreted as: “whenever a system shall be verified in flight for proper functioning, that system shall be considered unreliable and may fail. The pilot shall be prepared for the possible course of action to be implemented in case of checked system malfunction. The complexity and the risk level of the pre-planned or possible course of action determines the Level A or B of the MCF. | **LEVEL A MCF**  Post-maintenance flight to verify that all systems are functioning after an engine component has been replaced (starter generator, FCU, fuel nozzles, etc).  In case of system malfunction, the pilot may expect an engine failure or a commanded engine shutdown in flight (OEI, autorotation if single-engine)  Flight to verify the functionality of the AFCS.  In case of AFCS malfunction, the pilot may expect to fly with reduced stability.  In case of checked system malfunction, the pilot shall make use of abnormal or emergency procedures, or he may need a further flying skill than needed during normal flight.  **LEVEL B MCF**  Engine shutdown on ground by using the fuel valve or the throttles, to verify their functionality.  Flight to verify any electrical component in daylight VMC.  In case of checked system malfunction, the pilot will not need to execute demanding procedures. | **PROs**  Level A and B classification reflects the level of demanding requirements for a pilot in case of malfunction of the checked system.  **CONs**  Most MCF will be classified as Level A.  Possibly, MCF risk assessment may be more complex. | The risk assessment shall analyse the risk level of the handling of the flight, supposed that the checked system fails.  One way to do so, is to initially analyse the abnormal and emergency procedures described in each specific aircraft type RFM and classify them as Level A or B based on the complexity and the level of risk of the manoeuvres or course of actions required.  Subsequently, the MCF shall be analysed to see which of the abnormal or emergency procedures may apply to the requested maintenance flight and classify the MCF accordingly.  Before the flight, the pilot shall duly review the abnormal and emergency procedures related to the system to be checked and mentally prepare for using them. |

ESPN-R has published an example MCF of risk assessment.

Criteria for determining MCF Levels and the subsequent conclusions shall be described in the MCF manual and is subject for review by the NAA. MCFs should be monitored through SMS, FDM if available, pilot debriefs and reports, etc. as part of the Risk Management component of the internal SMS. Subsequently, a proper correction of the specific MCF defined as level A and B may be performed.

The following table summarises the requirements for the MCFs:

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Requirements** | **Complex**  motor-powered aircraft | **Other than complex**  motor-powered aircraft |
| **Level A** maintenance check flights  (use of abnormal or emergency procedures, as defined in the aircraft flight manual, is expected, or where a flight is required to prove the functioning of a backup system or other safety devices) |  | Ref. **SPO**.SPEC.MCF | Ref. **NCO**.SPEC.MCF |
| MCF manual | x | R |
| MCF SOP (flight procedures) | R | R |
| MCF documented flight programme | x |  |
| MCF checklist (flight and in-flight assessment procedures) |  | x |
| Pilot selection | x |  |
| Pilot MCF course | Yes. Course grandfathered for pilots acting as MCF pilot-in-command before 25/09/2019 (Art. 9aa) | Selected by the operator.  No MCF course required.  NOTE: AMC1 NCO.SPEC.MCF.120 states that “*The operator may select a flight instructor*”. |
| Pilot minimum experience | x |  |
| Pilot MCF recency | x |  |
| Co-pilot or TS on board | x |  |
| TS course | x | x |
| **Level B** maintenance check flights  (other than a Level A maintenance check flight) |  | Ref. **SPO**.SPEC.MCF | Ref. **NCO**.SPEC.MCF |
| MCF manual | R | R |
| MCF SOP (flight procedures) | R | R |
| MCF documented flight programme | R |  |
| MCF checklist (flight and in-flight assessment procedures) |  | x |
| Pilot selection | x |  |
| Pilot MCF course |  |  |
| Pilot minimum experience |  |  |
| Pilot MCF recency |  |  |
| Co-pilot or TS on board |  |  |
| TS course | x | x |

R - recommended

## Appropriate maintenance release before the MCF

The possible scenarios that call for a MCF are suggested in the Reg. (EU) No 1321/2014 - GM M.A.301(i) – and they depend on the aircraft defect and the status of the maintenance activity performed before the flight.

The following table summarises the possible MCF scenarios.

| Scenario | Required by | Req. By AMM | Maintenance | Airworthiness certificate | Doc. before flight |
| --- | --- | --- | --- | --- | --- |
| 1 | CAMO | Yes | Incomplete | Valid | Certificate of release to service after incomplete maintenance |
| 2 | Operator or CAMO.  After the aircraft has undergone certain maintenance | No | Complete | Valid | Certificate of release to service |
| 3 | Maintenance organisation.  After troubleshooting of a system on the ground | Yes | Complete | Valid | Certificate of release to service |
| 4 | Maintenance organisation.  An aircraft system has been found to fail. The satisfactory diagnosis of the cause of the fault can only be made in flight | No | Incomplete | NOT valid | Permit to fly |
| 5 | Maintenance completed, but airworthiness certificate NOT valid (e.g. ARC expires during a longer-than-planned maintenance | No | Complete | NOT valid | Permit to fly |

## Flight authorisation by the [operator]

MCFs are carried out under the control and responsibility of the aircraft operator.

The [Operator] and/or the Operation Department will coordinate in advance with the CAMO/Maintenance Organisation/Department for proper: [Report the procedure or the reference where this procedure is reported]

* Flight preparation
* Flight and post-flight activities
* Aircraft handover
* Processes requiring the involvement of the maintenance Department/organisations or their personnel

When the decision to undertake a MCF has been made, the Flight Operation [Post Holder] and the CAMO/Maintenance […] will appoint the MCF crew who will then review the relevant documentation and perform the MCF flight.

The MCF order must be signed by the CAMO/Maintenance (e.g., by issuing the related work order).

Preparation of the aircraft and necessary maintenance documentation for a MCF and maintenance related post-flight activities are the responsibility of [Maintenance organisation name].

## Process to develop a flight programme and procedures

The flight programme is agreed between the CAMO department, the maintenance organisation and the Operation department.

Each specific MCF is defined and documented in advance in a MCF form and is made available to the maintenance personnel, to the task specialist and to the MCF crew before the flight.

The CAMO department maintain the list of the available MCF forms. When a new MCF, other than those available, is needed, the following process will be initiated.

| **CAMO P.H.** | **MAINTENANCE MANAGER** | **FLIGHT OPERATIONS POST HOLDER** |
| --- | --- | --- |
| If a particular maintenance step requires a MCF, other than those available in the existing MCF form’s collection, a new form will be prepared | When a MCF is needed following a particular maintenance phase or for troubleshooting purposes, not covered by the working order and not available among the existing MCF form’s collection, he will request the specific MCF to the CAMO P.H. |  |
| The CAMO P.H. retrieves the MCF procedure required from the Maintenance Manual or, if not available, it prepares a specific procedure for the MCF. |  |  |
| The CAMO P.H. prepares a new MCF form with the required information. The risk assessment of the required flight and the Level (A or B) of the MCF is extracted from Table 1/2 of the “MCF risk assessment” and is included or attached in the MCF form. |  |  |
| The CAMO P.H. hands the MCF form to the flight operation department |  |  |
|  |  | The Flight Operations P.H. completes the MCF form with the operational requirements and hand it back to the CAMO P.H. |
| The CAMO P.H. include the new MCF form into the maintenance check flight programme |  |  |

The procedure for the MCF is described in the CAME, [Ch. (…)].

## Relevant procedures to document MCFs in the aircraft record

Each MCF will be recorded in the MCF form provided with the working order.

The maintenance personnel, the task specialist and the MCF pilot-in-command will complete the MCF form with the required information and will sign it.

An entry will be made into the A/HTL with a reference to the working order.

## Policy for the determination of a level A or level B MCF

It is responsibility of the CAMO P.H. to determine the category Level of the MCF, based on the MCF risk assessment document.

The proper Level of MCF flight will be described in the MCF form.

# 3. Aircraft status

Before the MCF can be executed, the aircraft shall be released to service as indicated in paragraph 2.2.

## Requirements for the status of the aircraft prior to departure for the purpose of conducting an MCF

The same provisions as per normal flights apply.

Open and deferred defects may influence the test results and the conduct of the MCF. Moreover, the pilot may face unexpected or combined emergencies due to the combination of the existing defect and the possibility that the checked system will fail during the MCF.

Open and deferred defects are described before the flight in the MCF form in order to properly inform the pilot.

## Fuel loading

According to the Operations Manual.

The pilot shall consider extra fuel for possible supplemental tests in flight or for possible landing in an alternate destination.

## Mass and balance

The importance of mass and balance, and the knowledge of the exact location of the CG during the entire flight, cannot be overemphasized.

Flight performances may be influenced, and dangerous aircraft behaviour may be inducted by an aircraft’s CG being near or outside limits.

MCF may be conducted with aircraft configurations and masses well different from those used during normal operations, thus the mass and balance shall be fully checked before each MCF.

Correct values of basic empty mass and CG position in the mass and balance computation tool are verified prior any MCF, especially after a major maintenance and after a new aircraft weighing.

## Specific test and safety equipment

Specific equipment required for the MCF are indicated in the MCF form or a reference shall be inserted therein to the related work order.

# Crew selection and other person on board

## Qualifications

In order to be appointed as pilot-in-command for Level A MCFs for complex motor-powered aircraft, the pilot shall fulfil the following requirements. [NOTE: For Level B MCFs and/or for other-than-complex motor-powered aircraft, these requirements are not required but suggested.]

|  |  |  |
| --- | --- | --- |
| Experience in the same type of aircraft (airplane, helicopter, etc.) to be flown | Minimum flight time | Note |
| Total flight time | 1000 h |  |
| Pilot-in-command in a complex motor-powered aircraft | 400 h |  |
| Flight time on type | 50 h | In case of introduction of a new aircraft type in the fleet, the pilot may have less than 50 hours experience on the particular aircraft type. An appropriate risk assessment shall be performed. |

In order to be appointed as task specialist, the flight engineer shall be trained as necessary in crew coordination procedures and emergency procedures and be appropriately equipped. Evidence of initial and recurrent CRM training will count for crew coordination training.

When selecting the MCF pilots and the supporting technicians for the MCFs, [Operator] will choose among the personnel demonstrating the following characteristics.

* **Knowledge** - A deep knowledge of the aircraft is clearly required, the theory behind the task and the role. A determined inquisitive mind is essential. The candidate shall demonstrate self-reliance, i.e., not waiting for the information to come to him or her, but positively and proactively looking for it and developing good contacts and sources of quality information (including contacts to the OEM).
* **Skills** - Valued skills include observation, interpretation, analysis, and communication. So called “motor function” flying skills for the pilots need to be good, but pure flying coordination and technique are not necessarily the top priority as long as this aspect is at an acceptable level for the task. However, flying ability does have an impact on the capacity of the pilot to handle high workload situations. The task specialist should have the ability to read the instruments, record the parameters and to maintain an overall awareness about the meaning of the of the parameters related to the safety of the flight.
* **Aptitude** - Aptitude refers to the capacity to “think in the right way and to demonstrate the right judgment”.

A MCF crewmember should demonstrate the necessary self-confidence to allow the right decisions and intervention when necessary and in developing situations. Nevertheless, too much confidence may lead to underestimate the situation and to fly beyond the safe limits.

The candidate pilot or engineer should demonstrate a sound ability with the crew resource management (CRM) and at listening.

* **Experience** - Experience is a valuable characteristic in terms of improving judgment, prioritization of task and risk evaluation. High flight time does not necessarily mean high quality experience since most of the experience may be gained doing repetitive tasks rather than a range of different types of experience against which to make good informed MCF judgments.

For a Level A MCF in a complex motor-powered aircraft, a task specialist or additional pilot is required in the flight crew compartment to assist the flight crew member(s), unless the aircraft configuration does not permit it or flight requirements, considering the flight crew member(s) workload based on the flight programme, the flight crew member(s) do not require additional assistance.

## Experience and recency

The pilot-in-command shall not perform a Level A MCF in a complex motor-powered aircraft unless he/she has carried out a MCF within the preceding 36 months.

Recency as pilot-in-command on a Level A MCF is regained after performing a Level A MCF as observer or pilot monitoring or after acting as pilot in command in a full flight simulator during a MCF.

For flights with other-than-complex motor-powered aircrafts or for Level B MCF, the above requirements will be satisfied whenever possible. Alternatively, an active flight instructor may act as pilot-in-command for an MCF.

## Training [NOTE: Consider moving this chapter in the OM Part D]

Pilots are trained to handle abnormal or emergency situations during type ratings and recurrent trainings (TRs, OPCs).

The real challenge for a MCF pilot is to be aware of which system may fail, what abnormal or emergency procedure he is likely to perform, what contingency plan to follow, and how to reduce or eliminate the possible consequences following a failure of the tested system. This can be achieved by a proper flight preparation, by a due awareness of flight performances, and with a proper knowledge of the possible course of actions. This has to be prepared and reviewed before any MCF flight is performed.

### Flight Crew Training Course

Before acting as an MCF pilot-in-command for a Level A MCF in a complex motor-powered aircraft, the pilot shall follow a proper training course.

The full detailed syllabus is described in the OM Part D.

The following table reports the minimum training requirements. For Level B MCFs and/or for other-than-complex motor-powered aircraft, these requirements are suggested.

|  |  |
| --- | --- |
| Training device | Requirements |
| Aircraft | * Ground training * Demonstration in an aircraft of the techniques for the checks in flight and failure conditions. The trainer should not simulate a failure condition that could induce an unacceptable safety risk |
| FSTD | * Ground training * Demonstration in a simulator of the techniques for the checks in flight and failure conditions. The simulator shall adequately reflect the reaction of the aircraft and its systems to the checks being conducted * One Level A MCF as a pilot monitoring or as an observer |

[The WG recommends that the flight training for MCF should be performed in an appropriate FSTD if at all possible.]

A training course followed on one aircraft category is considered valid for all aircraft types of that category (e.g., all airplanes, all helicopters).

When considering the aircraft used for the training and the aircraft to be flown during the MCF, the training department will specify whether differences or familiarisation training is required and describe the contents of such a training.

### Flight Crew Ground training

The following elements, if relevant, are the minimum syllabus for aeroplanes and helicopters ground training.

1. Legal aspects: regulations concerning MCFs.
2. Organisation of MCFs: crew composition, persons on board, definition of tasks and responsibilities, briefing requirements for all participants, decision-making, ATC, development of a flight programme.
3. Environmental conditions: weather and light requirements for all flight phases.
4. Flight preparation: aircraft status, mass and balance, flight profile, airfield limitations, list of checks.
5. Equipment and instrumentation: on-board access to various parameters.
6. Organisation on board: CRM, crew coordination and response to emergency situations.
7. Ground checks and engine runs: review of checks and associated techniques.
8. Taxi and rejected take-off: specifications and techniques.
9. Techniques for checks of various systems:
   1. aeroplanes: flight controls, high-speed and low-speed checks, autopilot and autothrottle, depressurisation, hydraulic, electricity, air conditioning, APU, fuel, anti-icing, navigation, landing gear, engine parameters and relight, air data systems.
   2. helicopters: flight controls, engine power topping, track and balance, high-wind start, autopilot, performance measurement, hydraulic, electricity, air conditioning, APU, fuel, anti-icing, navigation, landing gear, engine checks and relight, autorotation, air data systems.
10. Review of failure cases specific to these checks.
11. Post-flight analysis.

Ground training elements are described in OM Part D.

### Task specialist training

In order to assist the flight crew, the task specialist shall receive the following training before operating in flight on a MCF.

* Ground assistance for flight preparation
* Reading of an MCF checklist
* Monitoring and recording of relevant aircraft or systems’ parameters
* Required tasks on board during MCF flights (e.g. reporting for vibrations or noise)
* Crew coordination
* Emergency procedures
* Appropriate equipment

If a task specialist’s assigned duties are not directly related to the flight operation but related to the maintenance check (e.g. reporting from the cabin on a certain vibration or noise), the required training and briefing will be adequate to this function.

Specific task specialist training is described in OM Part D.

### Course consideration

In order to act as pilot-in-command in a Level A MCF in a complex motor-powered aircraft, the pilot shall have followed a MCF training course.

The training course consists of a ground training followed by a demonstration in a full flight simulator (FFS) or in an aircraft. During the demonstration, in-flight maintenance check techniques and failure conditions are performed and explained. If the training has been conducted in a simulator, the pilot shall conduct at least one Level A MCF as a pilot monitoring or as an observer before flying as a pilot-in-command on a Level A MCF.

For Level B MCF the flight demonstration is not required, but it is suggested.

For Level B MCF and for MCF on other-than-complex motor-powered aircraft, the MCF course is not required, but a briefing on MCF techniques will be provided.

In a demonstration flight performed in an aircraft, the trainer will not simulate a failure condition that could induce a safety risk, e.g., unexpected engine failure.

The flight demonstration will include the techniques for the most significant checks covered in the ground training.

As part of this demonstration, the pilots under training will be given the opportunity to conduct checks themselves under supervision.

The ground training and flight demonstration will be provided by experienced flight crew with test or MCF experience, based on the described training syllabus:

* a type rating authorised instructor, current on the type of aircraft, and appointed by [operator] to conduct MCFs ground and/or flight MCF training/demonstration; or
* a pilot assigned by an aircraft manufacturer and experienced in conducting pre-delivery check flights; or
* a pilot holding a flight test rating.

Pilots holding a flight test rating in accordance with Regulation (EU) No 1178/2011 are given full credit for the MCF training course, but they shall receive initial and recurrent crew resource management training before operating as a pilot-in-command in a Level A MCF.

Pilots that have already acted as a pilot-in-command on a Level A MCF (as defined in SPO.SPEC.MCF.100) before 25 September 2019 will be given credit towards the MCF course.

## Persons on board

### Crew Composition and Person on Board

For a Level A MCF on complex motor-powered aircraft, a task specialist or additional pilot is required in the flight crew compartment to assist the flight crew members, unless the aircraft configuration does not permit it or it is justified, considering the flight crew members workload based on the flight programme, that the flight crew members does not require additional assistance.

The maintenance will report in the check form the required crew in order to complete the necessary MCF, indicating whether an additional pilot, a task specialist, or both of them is necessary.

Only personnel (crew and task specialists) required for the completion of the flight are allowed on board.

### Flight Time Limitations and Rest

MCF activity is computed according to the flight and duty time limitations and rest requirements, as described in OM A Ch. 7.

# Briefings

## Briefing participant

A briefing between [Operator] and the maintenance organisation will be held to establish the technical requirements.

A MCF briefing will be held between the involved personnel in due time before the flight. The personnel participating to the briefing, as a minimum, are:

* MCF pilot(s)
* Task specialist(s)
* Maintenance personnel

If specific information is deemed necessary or for a new type of MCF the following personnel may be involved in the briefing:

* Operations Post Holder
* CAMO Post Holder
* Maintenance Manager
* Ground Post Holder

Telephone or other means of communication are allowed.

## Specific pre-flight briefing topics

Prior to any MCF, a full pre-flight briefing shall be conducted between the involved personnel, during which the flight crew should be made aware of the specific reasons for the MCF including the risk assessment results. Depending on the complexity of the MCF or on its non-routine nature, a distance briefing (e.g., by phone) will be accepted.

A specific note will be entered in the MCF form for any maintenance task that may have a direct effect on the aircraft’s handling or performance. During the briefing, special emphasis will be given to the data that are needed to be recorded, and to any requirement for recording defects or indications for the maintenance staff. Following is a list, non-exhaustive, of briefing topics:

1. Aircraft status - By documentation from the maintenance organisation after maintenance
2. Summary of maintenance - As required by the maintenance organisation on the basis of the manufacturer’s specifications
3. Flight programme, specific procedures and limitations - Flight programme with specific procedures and limitations as described in the airframe/engine or other manufacturer’s maintenance manual. The programme is detailed in the MCF form or is referenced to the related work order instructions
4. Emergency procedures – All the abnormal and emergency procedures that could possibly be related with the systems to be checked shall be reviewed
5. Crew members responsibilities and coordination - The pilot in command of the MCF should ensure that the crew is suitable for the task and adequately instructed.
6. Documents on board

* MCF form or a copy of the required procedures to be followed
* A clear list of the parameters to be registered
* The QRH (Quick Reference Handbook) or similar document open on the most probable emergency procedure
* Any other useful or required document
* All the necessary documents for the flight (ref. Ch. 5.2.5):

### Aircraft Status

Before the aircraft can be dispatched for a MCF, a proper release to service certificate shall be issued, or a permit to fly shall have been granted. The release to service may be either a full release for a complete ready-to-fly aircraft or a release to service for a specific maintenance step or for a specific troubleshooting flight.

The MCF form will describe any limitation to the MCF due to incomplete maintenance, including:

* Aircraft limitations due to ongoing maintenance
* Aircraft systems affected by the check
* Defective systems and apparatus other than those affected by the check (e.g., open MEL, reported defects, etc.)

For a MCF of an aircraft otherwise used for CAT operations, the provisions for cockpit voice recorders (CVR) of Annex IV (Part- CAT) shall continue to apply.

### Summary of Maintenance

A summary of the maintenance performed on the aircraft and the possible effects during flight will be described in the MCF form and discussed during the briefing.

### Flight Programme, Specific Procedures and Limitations

During the pre-flight briefing MCF pilots and task specialist shall go through and discuss all the required manoeuvres, as described in the MCF form or referenced thereto.

During the briefing the following minimum information shall be discussed:

* Required manoeuvres
* Applicable limitations and specific emphasis on potentially upcoming boundary conditions
* Affected systems that could fail
* Related abnormal and emergency procedures likely to be applied in case of system failure
* Specific tasks for all personnel in flight (pilots, task specialist, etc.)
* Possible augmented risks during the flight and the implementation of the safety barriers

All the information shall be available in the MCF form that shall be available on-board during flight.

### Crew Members Responsibilities and Coordination

The MCF pilot-in-command shall be satisfied that the crew is suitable for the task and adequately instructed.

Unless otherwise stated in the pre-flight briefing, following are the additional tasks and responsibilities assigned to the crew during the MCF.

Pilot-in-command

* Overall safety of the flight
* Management of the flight and of the checks. He may delegate the conduct of the flight to the co-pilot
* Decision whether to continue or abort the MCF whenever an unexpected situation arises

Co-pilot

* Read and log the required parameters when required. This task may be delegated to the task specialist, if available
* Support and backup the pilot-in-command with the required manoeuvres and flight parameters
* Support the pilot-in-command with the abnormal and emergency procedures, promptly reading the related checklists

Task specialist

* Support the pilot-in-command with the sequence of the required manoeuvres and parameters to be maintained
* Record the required values during the manoeuvres
* Verify that the values recorded are within the required normal tolerances,

### Documents on Board

During the he pre-flight, the pilot-in-command shall verify that the necessary documents and papers are available inside the aircraft. As a minimum:

* + Aircraft required documents (e.g., certificate of registration, insurance, aircraft manuals, etc.)
  + A/HTL (if required)
  + Special flight permit/RSI (restriction and/or special instruction) or equivalent (if applicable)
  + Mass and balance documentation
  + MCF form
  + Abnormal and emergency procedures, opened at the most probable expected procedure
  + A list of the check procedures to be followed during the flight
  + A list of the required parameters with enough space for in-flight recording (if not already available in the check form)
  + Operational flight plan, or similar document, with all the flight legs, radio aids frequencies and ATS/ATC frequencies that may be needed in case of in-flight emergency

## Information to ATC

Depending on the airspace type where the MCF will be conducted, a proper notice or ATS flight plan will be provided to ATS/ATC services.

The pilot-in-command will brief if a (reduced) flight plan has been filled and with which ATS/ATC, if any, he will in contact with.

## Post-Flight Briefing

The post-flight briefing is a valuable moment to review the flight, the data and the possible lesson learned. The post-flight briefing will review, as a minimum, the following elements:

* Logged data and parameters for completeness and correctness
* In-flight procedures not performed as planned
* Use of abnormal or emergency procedures, why, and how to avoid entering in an abnormal situation
* Any safety concern during the flight and possible safety barriers to be implemented in future flights

Any occurrence or safety concern shall also be reported via a regular Safety Report to the Safety Department.

# Content of flight programme and procedures

Each MCF is covered by a dedicated MCF form. Each MCF form describes the information needed for the flight and the procedures to be used for the checks. The procedures may be written ad-hoc inside the form or a due reference to a maintenance manual procedure will be inserted. In this case, a copy of the maintenance manual reporting the specific tasks to be performed in flight will be attached to the MCF form.

The CAMO maintains an updated list of the required MCF forms.

The flight programme is identified as the collection of all the MCF forms describing the MCF flights set down by [Operator].

When an MCF is needed, the CAMO/Maintenance retrieves a copy of the suitable MCF form, completes it with the required information and issue it as part of the maintenance work order.

The MCF pilot and the task specialist will refer to this document for executing the MCF. The data to be recorded during the MCF will be recorded on the MCF form, and then returned to the CAMO/Maintenance organisation.

## External/internal Check

External and internal checks shall be executed before each flight as required by the aircraft normal procedures.

Specific pre-flight checks required by the maintenance manual or by the CAMO, will be described as procedure in the MCF form.

It is highly suggested that the pilot performs the pre-flight checks with the support of an engineer.

## In-flight briefing

All expected MCF manoeuvres shall be briefed before the flight in order to reduce the in-flight briefings to a minimum. In-flight briefings should be performed only to briefly introduce a planned manoeuvre or measurement, or for unexpected situations that need to be handled by the crew.

## Limits not to be exceeded

All maintenance flights shall be conducted within the limitations described in the flight manual, unless specifically required by the maintenance manual.

Specific limitations are described into the MCF form.

## Simulated abnormal situations in flight

Simulated abnormal situations in flight will be performed as required by the procedures described in the MCF form.

Any simulated situation should be briefed on ground before the flight, whenever possible.

By way of derogation from point SPO.OP.185 a task specialist may be on board a Level A MCF if the task specialist is required to meet the intention of the flight and has been identified in the MCF form.

## Specific entry conditions

Before entering an abnormal situation and before a specific check, the pilot shall clearly state the intention to the crew and briefly assign the tasks as briefed before the flight.

Entry conditions into an abnormal flight state shall be thoroughly defined before the flight.

## Task sharing and callouts

All the crew shall make use of the CRM concepts for crew coordination, task sharing, communication, assertiveness, situation awareness and leadership within each one’s function on board.

## Potential risk and contingency plans

An operational risk assessment/safe job analysis (ORM/SJA) shall be performed by the pilot-in-command and the MCF crew before the flight, along with the contingency manoeuvres to be performed in case of emergency situations. The ORM/SJA form is reported in Attachment B.

## Information to additional crew

All personnel required for the MCF shall be briefed before the flight.

## Adequate available airspace and coordination with ATC

Whenever the pilot-in-command plans to perform the MCF, or part of it, inside controlled airspaces, or whenever deemed necessary, a specific notification shall be forwarded to the competent air traffic office.

Due consideration shall be given to the Alerting Service assured by ATS on known traffic.

# External conditions

## Weather and light conditions

MCFs shall be conducted in day VFR with continuous visual reference to landmarks. A MCF may be conducted at night and/or in IMC conditions provided a specific assessment is performed by the pilot-in-command before the flight and due safety barriers and contingency procedures are set down before the flight in case of checked system malfunction.

Some MCFs may require higher minima than VFR, e.g., a climb to 2.000 ft for an autorotative descent.

If particular situations call for different weather and light conditions, this shall be agreed between CAMO/Maintenance, Operation Post Holder and the MCF pilot-in-command.

## Terrain

MCFs shall be conducted over non-congested and non-hostile environment to the maximum extent.

A specific MCF area with adequate emergency landing sites may be defined by the Operations Post Holder.

Minimum altitude is 1.000 ft AGL, unless otherwise required by the check procedures.

## ATC Airspace

ATC/ATS shall be notified about a MCF whenever possible.

It is highly suggested to be in positive radio contact with ATC/ATS for the entire check flight in order to take advantage of the Alerting Service when under a flight plan and the traffic information normally issued by ATS to all known traffic.

## Airport runway, equipment/operating site

If needed, the selection of the MCF site should take into account:

* Ease of access
* Facilities: licensed airfield with appropriate runways, facilities and operating environment
* Significant air-traffic problems or busy airspace environment
* Limited or demanding approach and departure paths
* Emergency, crash recovery, firefighting and medical services available and on stand-by
* Flight support and/or flight following services availability
* Runway status (contamination, NOTAM)

# Documentation

## Specific documentation on board

The pilot-in-command shall verify that all required documentation is available on board.

Furthermore, the pilot-in-command shall verify the presence of the following documents:

* The MCF form with the appropriate procedures and the required list of data to be recorded
* The abnormal and emergency procedures handbook. It is suggested to keep the handbook open to the most possible emergency foreseen during the flight, taking in consideration the aircraft system under check
* The mass and balance documentation
* The operational flight plan, if required
* The ATS flight plan, if filled up and transmitted to ATS/ATC

## In-Flight Recordings

Unless required by maintenance provisions, cockpit voice recorders (CVR), flight data recorders (FDR), image recorders and data link recorders (DLR), if installed, shall not be disabled.

Whenever possible, during the checks, the pilot-in-command shall be the pilot flying. If other crew is available, the pilot-in-command should delegate the other personnel in reading and recording the required flight and systems data.

The pilot-in-command shall make an instrument check and a fuel check before any check manoeuvre.

## Results of MCF and related data

Unless required for the continuation of the MCF and unless required by the MCF procedures, all the results will be analysed and evaluated on ground at the end of the MCF.

## Accurate recording of the required maintenance actions after flight

All the data will be recorded in the MCF form, or in the data sheet attached thereto, and returned to the maintenance organisation.

Discrepancies or system malfunctions shall be reported in the technical log.

# Risk management

A specific risk assessment of MCFs is available as a separate document. The risk assessment is made available and explained to the MCF pilots and task specialists as part of the MCF training.

Before any MCF the crew shall perform and share an operative risk assessment (brainstorm method).

# Crew resource management

MCF pilots and task specialists shall make large use of the CRM notions.

Specific MCF CRM concepts are part of the MCF training.

# Attachment A - Maintenance check flight form

|  |  |  |  |
| --- | --- | --- | --- |
| **MAINTENANCE CHECK FLIGHT FORM** | | | |
| Section 1 - Reserved to CAMO/Maintenance.  When filled up, this section is the CAMO authorisation for a maintenance check flight. | | | |
| MCF FORM No. |  | Revision: |  |
| Work order requesting MCF |  | Number: |  |
| Partial CRS before flight | ☐ | Number: |  |
| Aircraft type: | ☐  ☐ | Registration: |  |
| Is MCF authorized by CAMO? | Yes ☐ | | |
| Aircraft complexity: | Choose from the list | | |
| MCF type: | Choose from the list | | |
| MCF level: | Choose from the list | | |
| Maintenance carried out (e.g. 50 hours): |  | | |
| Involved/checked system(s) - ATA no. | Choose from the list | | |
| Choose from the list | | |
| Choose from the list | | |
| Other defective systems (open MELs, disabled systems, etc): |  | | |
| Specific limits not to be exceeded: |  | | |
| Authorisation before flight  CAMO signature |  | | |

|  |  |
| --- | --- |
| Section 2 - Reserved to MCF pilot-in-command.  Valid only if Section 1 is filled up by CAMO. | |
| As been the flight authorized by the CAMO? | ☐ |
| Mass and balance form (to be attached): | ☐ |
| Preflight briefing with crew: | ☐ |
| MCF risk assessment shared with the crew: | ☐ |
| Briefing on contingency plan in case of tested system fault: | ☐ |
| ATS/ATC notification: | ☐ |
| Fuel quantity: | LIT. / KG |
| MCF procedure, or ref. to worksheet (attached): |  |
| Data to be recorded, other than that described in the procedure: |  |

|  |  |  |  |
| --- | --- | --- | --- |
| Post-flight briefing: | ☐ | | |
| Place: |  | Date: | Insert a date |
| Landing place: |  | Time: |  |
| Ref. A/HTL (No., Pag.): |  | Total flight time: |  |
| Assigned MCF Pilot(s):  (Authorisation to be attached) |  | PIC signature: |  |
| Assigned TS(s) AMO 145: |  | Signature: |  |
| Other personnel: |  | Signature: |  |
| Task on board: |  |

End MCF flight

|  |  |
| --- | --- |
| Date: | Insert a date |
| MCF Pilot signature: |  |
| CAMO signature for acknowledgment: |  |

# Attachment B – MCF pre-flight risk assessment form

This MCF pre-flight risk assessment form shall be completed before each MCF flight and attached to the MCF form.

The pilot-in-command shall evaluate each item of the form and give the appropriate value (0, 1, 2).

At the end he shall sum all the values and compare the total with the type of risk level.

“Acceptable” risks level – The MCF flight may per performed with no further authorisation.

“Tolerable” risk level – The MCF flight may be executed only if:

* Proper safety barriers are implemented in order to reduce the total value of the risk level, following a re-evaluation of the related risk item. The safety barriers shall be reported in the related table area, and they have to be in force before and during the whole MCF flight.
* A specific approval shall be received from the Flight Operations [Post Holder] and the form shall be properly signed before the flight. Safety barriers may be required and implemented, and they shall be reported in the related table area. They have to be in force before and during the whole MCF flight.

“Non-acceptable” risk level – MCF shall not be performed.

[NOTE: the operator/organisation shall review the risk assessment form and change it appropriately to reflect its safety standards and its risk management programme.]

MCF PRE-FLIGHT RISK ASSESSMENT FORM

| No. | Element | P.ts 2 | P.ts 1 | P.ts 0 | 2 | 1 | 0 |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | MCF Level |  | Level A | Level B |  |  |  |
| 2 | Procedures required by checklist during MCF | Emergency procedures (e.g., autorotation) | Approach to aircraft limits (e.g., flight to Vne) | Normal flight procedures |  |  |  |
| 3 | Procedures to be used in case of tested system malfunction | Emergency procedures | Abnormal procedures | Normal procedures only |  |  |  |
| 4 | Emergency off-base landing sites | Off-base sites possibly needed but not promptly available | Off-base sites possibly needed and promptly available | Off-base sites not needed |  |  |  |
| 5 | ATS/ATC | No contacts with ATS/ATC | Flight plan opened, but not always in direct contact with ATS/ATC | Flight plan opened and always in direct contact with ATS/ATC |  |  |  |
| 6 | Crew | Single pilot | Single pilot with task specialist | Multi crew |  |  |  |
| 7 | Pilot-in-command experience on type | < 500 fh | 500 - 1.000 fh | > 1.000 fh |  |  |  |
| 8 | TRI/TRE  SFI/SFE | Not a TRI, TRE, SFI or SFE | TRI/TRE or  SFI/SFE not on type | TRI/TRE or  SFI/SFE on type |  |  |  |
| Total per column: | | | | |  |  |  |
| **Grand total:** | | | | |  | | |
| 0 – 8 p.ts  (0% - 50%)  Risk acceptable | | 9 – 12 p.ts  (51% - 75%)  Risk tolerable  Requires Flight Operations [Post Holder] approval | 13 – 16 p.ts  (76% - 1000%)  Risk not acceptable  MCF not to be performed |  | | | |
| Safety barriers used for reducing the final risk level and that shall be implemented before and during the whole MCF flight: | | | | | | | |
| Flight Operations [Post Holder] approval (signature): | | | | | | | |

1. Note from the guidance WG: this should probably read “continued airworthiness” and a wrong term may have been used in the regulation. [↑](#footnote-ref-1)