

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

X Airlines

MAINTENANCE CHECK FLIGHT MANUAL

MCF MANUAL

JUT
1/15/2013

‘Maintenance check flight’ means a flight carried out to provide reassurance of the aircraft’s performance or to establish the correct functioning of a system that cannot be fully established during ground checks

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

Table of Contents

Table of Contents2

List of Effective Pages5

Record of revision6

Record of Temporary revision.....8

Introduction.....9

Purpose.....9

Distribution.....9

Effective Date9

Practical Use of this Manual9

Operator’s Declaration..... 10

1. General considerations 11

Introduction..... 11

Definitions 11

Specific requirements for Maintenance check flights (MCF) 13

Flight program (CFS) 13

Maintenance check flight manual (MCF)..... 13

Conditions requiring a maintenance check flight 13

 Requested by maintenance data 13

 Requested by the operator (elective)..... 13

 Requested by the maintenance organisation..... 14

 Requested to regain airworthiness 14

Appropriate maintenance release before the maintenance check flight 14

 Requested by the operator..... 14

 Requested by the maintenance organization..... 14

 Requested to regain airworthiness 14

Flight authorization 15

Process to develop a flight programme and procedures 15

 Contents of the flight programme and procedures..... 16

2. Aircraft status..... 17

 Requirements about the status of the aircraft prior to departure (e.g. MEL, CDL) for the maintenance check flight 17

 Fuel loading 17

 Weight and balance..... 17

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

- Specific test and safety equipment..... 18
- 3. Crew selection and other persons on board 19
 - Selection summary: 19
 - Flight crew qualifications..... 20
 - Experience and recency 20
- 4. Training 20
 - Flight crew training course 21
 - Simulated abnormal situations in flight 21
 - Course considerations..... 22
 - Course syllabus 23
 - Persons on board 23
 - The role of observing engineers 23
 - Crew composition and persons on board 24
 - Task Specialist assigned duties 24
 - Flight time limitations and rest..... 24
- 5. Briefings 25
 - Briefing participants 25
 - Specific pre-flight briefing topics 25
 - Risk management 26
 - Risk assessment 26
 - Safety meeting 26
 - Event reporting 29
 - Lesson learnt 29
- 6. Aircraft status..... 29
 - Summary of maintenance 29
- 7. Flight programme, specific procedures and limitations 29
 - Crew members’ responsibilities and coordination 30
 - Crew Resource Management 30
 - Headphone and Flight Deck Speaker Use 30
 - Synoptic Display 31
 - Callouts 31
 - Information to ATC 33
 - Post-flight briefing 33
- 8. External conditions..... 33
 - Terrain 33

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

ATC, airspace 33

Airport (runway, equipment)/operating site 34

9. Documentation 35

 Specific documentation on board 35

 In-flight recordings 35

 Result of the maintenance check flight and related data 35

 Accurate recording of required maintenance actions after the flight..... 36

10. Annexes..... 37

 Pilots briefing sheet..... 37

 MCF Schedule..... 38

 MCF Load Sheet..... 39

 MCF Training Syllabi..... 40

 List of MCF authorized crews 41

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

Administration and Control of MCF Manual

Record of revision

[illegible]

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

Highlights of changes

First edition.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

Record of Temporary revision

[illegible]

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

Introduction

Purpose

This manual contains the policy, procedures, and criteria for Maintenance Check Flights and recertification of airworthiness.

Distribution

This manual is distributed to selected offices on special mailing list.

- X Flight Operations
- X Dispatch
- X CAMO
- X Part 145 Belp
- X Part 145
- X FOCA

Effective Date

This manual is effective February 15, 2013.

Practical Use of this Manual

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

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

Operator’s Declaration

We, the undersigned, declare that:

- The Operations Manual Parts A, B, C, D, and associated documents have been established and will be maintained in full compliance with the provisions of COUNCIL REGULATION (EEC) 3922/91 ANNEX III (EU-OPS) , and in particular Annex VIII thereof, containing the requirements of Specialised Operations (Part-SPO).
- The Maintenance Check Flight Manual complies with the terms and conditions of the company’s Air Operator Certificate;
- We are responsible for the content of the Maintenance Check Flight Manual and confirm that besides COUNCIL REGULATION (EEC) 3922/91 (and JAR-FCL 1, where applicable) all relevant national rules and regulations as well as ICAO standards and procedures are reflected in the different chapters;
- We know and understand the content and meaning of the Maintenance Check Flight Manual and will perform our duties in full accordance with it;
- The detailed knowledge of the relevant content is mandatory to all concerned flying, ground and managing personnel who shall perform their duties accordingly. We undertake to ensure that they comply with the instructions given in the Maintenance Check Flight Manual; and
- We are aware of the fact that the Federal Office for Civil Aviation does not approve / accept the Maintenance Check Flight Manual as such, but only specific parts thereof, as shown on the respective compliance list. The responsibility for the completeness and the correctness of the Maintenance Check Flight Manual remains therefore solely with X Airlines.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

1. General considerations

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.

In 2011 EASA created a rulemaking group with the participation of experts from industry and aviation authorities and tasked it with the development of a Notice of Proposed Amendment (NPA).

Also, in accordance with the resulting text proposed in this NPA, maintenance organisations may be able to release the inconclusive maintenance to allow for a maintenance check flight when this is required by the aircraft maintenance manual, or a permit to fly may be required if there is a need to perform a maintenance check flight but, in accordance with the maintenance organisation requirements, the aircraft cannot be released.

During the performance of a maintenance check flight and in order to fulfill 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.

Definitions

‘CAMO’ Continuous Airworthiness Management Organisation

‘Check Flight’ a post-certification flight carried out as one of the processes to ensure that the aircraft continues to comply with the applicable airworthiness requirements.

‘CFS’ Check Flight Schedule. A check flight programme.

‘Elective Check Flight’ a Check Flight required by the operator, e.g. to fulfill part of the end of lease conditions.

‘Maintenance check flight’ means a flight carried out to provide reassurance of the aircraft’s performance or to establish the correct functioning of a system that cannot be fully established during ground checks.

‘Mandated Check Flight’ a Check Flight mandated by the Authority mainly associated with the issue of a Certificate of Airworthiness (C of A) for used aircraft imported from outside the European Union.

‘Maintenance Organisation’ the so called Part 145 organisation.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

'Test Flight' a pre-certification flight, usually carried out by the manufacturer. Test Flights are not dealt with in this manual.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

Specific requirements for Maintenance check flights (MCF)

Applicability SPO.SPEC.MCF.100

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

- Level A maintenance check flights are flights intended to be performed using the standard operating procedure for routine flights.
- Level B maintenance check flights are maintenance check flights other than level A.
E.g.: Stick shaker/pusher activation (below the minimum standard speeds), abnormal landing gear extensions.

Flight program (CFS)

Applicability SPO.SPEC.MCF.105

Before conducting a level B maintenance check flight with a complex motor-powered aircraft, the operator shall develop a written flight program (CFS).

Maintenance check flight manual (MCF)

Applicability SPO.SPEC.MCF.110

Operators intending to conduct level B maintenance check flights with complex motor-powered aircraft shall describe these operations and associated procedures in the operations manual or in a dedicated maintenance check flight manual.

The manual shall be updated when necessary.

All affected personnel shall be made aware of the manual and its changes that are relevant to their duties.

Commercial operators shall submit the manual and its updates to the competent authority.

Conditions requiring a maintenance check flight

There is the following possibilities:

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 (elective)

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

- after scheduled maintenance or unscheduled maintenance including repainting, as required by the operator; or handback of it from or to a lessor for contractual reasons; or

Requested by the maintenance organisation

- as required by the maintenance organization for verification of a successful defect rectification; or

Requested to regain airworthiness

- to assist with fault isolation or troubleshooting.

Appropriate maintenance release before the maintenance check flight

Depending on the aircraft defect and the status of the maintenance activity performed before the flight, different scenarios are possible and are described below:

Requested by maintenance data

The aircraft maintenance manual (AMM), or any other maintenance data issued by the design approval holder, requires that a maintenance check flight is performed before completion of the maintenance ordered. In this scenario, a certificate of release to service after incomplete maintenance when in compliance with M.A.801(g) or 145.A.50(e) should be issued by the maintenance organisation and the aircraft can be flown for this purpose under its airworthiness certificate.

Requested by the operator

Based on its own experience and for safety considerations and/or quality assurance, an operator may wish to perform a maintenance check flight after the aircraft has undergone certain maintenance while maintenance data does not call for such flight. Therefore, after the maintenance has been properly carried out, a certificate of release to service is issued and the aircraft airworthiness certificate remains valid for this flight.

Requested by the maintenance organization

After troubleshooting of a system on ground, a maintenance check flight is proposed by the maintenance organisation as confirmation that the solution applied has restored the airworthiness of the aircraft. During the maintenance performed the maintenance instructions were followed for the complete restoration of the system and therefore a certificate of release to service is issued before the flight. The airworthiness certificate is valid for the flight. An open entry requesting this flight may be recorded in the aircraft technical log.

Requested to regain airworthiness

An aircraft system has been found to fail, the dispatch of the aircraft is not possible in accordance with maintenance data and the satisfactory diagnosis of the cause of the fault

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

can only be performed in flight. The process for this troubleshooting is not described in the maintenance data and therefore scenario (3.4.1) does not apply. Since the aircraft cannot fly under its airworthiness certificate because it has not been released to service after maintenance, a permit to fly issued in accordance with Regulation (EC) No 1702/2003 is required.

Flight authorization

Maintenance check flights, as defined in the Regulation on Air Operations, are carried out under the control and responsibility of the aircraft operator. During the flight preparation, the flight and the post-flight activities and for the aircraft hand over, the processes requiring the involvement of the maintenance organisations or their personnel should be agreed in advance with the operator.

When the decision to undertake a Maintenance Check Flight has been made, the Postholder Flight Operation and the Postholder Continuous Airworthiness will brief the Technical Pilot who will then prepare the necessary documentation and supervise the organisation of the flight.

The Maintenance Check Flight order must be signed by the Postholder Flight Operation and the Postholder Continuous Airworthiness.

Preparation of the aircraft for, and recovery from, a Check Flight is the responsibility of the CAMO and, where applicable, other maintenance organisations.

Process to develop a flight programme and procedures

Check Flight Schedules are presented in a format such that the results are recorded directly on the Schedule.

Additional specific material to enable the conduct and analysis of results of Check Flights is sometimes needed. This could be in the form of a dedicated Supplement or Appendix to the Aircraft Flight Manual.

This additional material could include performance charts for use in analysing the performance climbs referenced in some Schedules. These charts give the performance in terms of rate of climb, whereas the main performance section of the Flight Manual will normally express climb performance in terms of gradients. In some cases it might be possible to calculate the scheduled performance from the gradient charts, but great care is necessary to ensure that the chart is applicable to the check flown, i.e. it refers to the same airspeed, power setting and engine air bleed condition and that it can be converted to provide 'gross' rather than 'net' performance.

Where the Schedule requires a climb to be carried out with the 'inoperative' engine at idle rather than fully shutdown, the gradient charts in the main performance section of the Flight Manual are not applicable. They assume a fully shutdown engine and the effect of an idling engine (which can be very significant) will only be taken into account in any additional rate of climb charts prepared for that purpose.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

As part of the generic procedures, the tests in the Schedules normally require the aircraft to be flown beyond VMO and MMO and hence outside the normal Flight Manual Limitations. Additional material in the Flight Manual permitted such excursions for the purpose of airworthiness flight testing.

In the absence of such a statement in the Flight Manual for the specific aircraft, owners/operators should consult manufacturers to determine a basis for small excursions beyond declared AFM limits.

Additional material may also include stall speeds in terms of indicated airspeed if the performance section of the Flight Manual only gives them in terms of CAS or EAS. Where quoted in the Schedules, values are usually indicated values, careful consideration of the aircraft standard and configuration is essential to ensure the Schedule is applicable. Subsequent modifications, service bulletins or AD's may invalidate a previously valid Schedule.

Contents of the flight programme and procedures

The procedure containing the checks to be performed in flight should be thoroughly developed by the operator using applicable current data would be available as read-and-do checklist, including:

- In-flight briefings;
- Limits (not to be exceeded);
- Specific-entry-conditions;
- Task sharing and call-outs;
- Contingency plans;
- Information to additional crew and ATC.

The detailed CFS will always be the responsibility of, and under the control of, the operator, agreed with the operator's CAMO and, where necessary, in liaison with the applicable maintenance organisation.

For a Maintenance Check Flight, the CFS will be determined by the functions and tests required by the maintenance organisation in conjunction with the CAMO. It should be noted that maintenance data may specify the functions and tests that need to be performed during Maintenance Check Flights and the flight conditions required to enable the flight to be safely and properly conducted. It is important that the operator ensures that they obtain all relevant information of this type, and that the flight crew who will conduct the flight are provided with the information and briefed accordingly.

For both Elective and Maintenance Check Flights, where only checks for functionality of equipment used by crew during routine operations are required, the schedule may consist of a simple list of checks to be performed, the order of the checks and the required flight conditions. Where the checks require operation outside normal Standard Operating Procedures (SOPs), the CFS should be constructed with the relevant conditions appertaining.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

It is the responsibility of the operator to ensure that the checks and limitations on the CFS are correct for the aircraft under check. The prime source of information is the Aircraft Flight Manual, and in the event of conflict this should be taken as overriding.

2. Aircraft status

Applicability SPO.IDE.A/H.140

The aircraft shall be equipped with a cockpit voice recorder in accordance with the applicable requirements for the aircraft’s normal operation NCC.IDE.A.160 or CAT.IDE.A.185.

Applicability SPO.IDE.A/H.145

The aircraft shall be equipped with a flight data recorder in accordance with the applicable requirements for the aircraft’s normal operation NCC.IDE.A.165 or CAT.IDE.A.190.

Requirements about the status of the aircraft prior to departure (e.g. MEL, CDL) for the maintenance check flight

The same provisions as for normal flights apply.

It is often not worth proceeding with a Check Schedule when operating with unserviceable equipment, albeit in accordance with the MEL. Depending on their nature, such unserviceabilities may render the checks invalid and, possibly more significantly, you must bear in mind that the first failure has, in effect, already occurred and thus the probability of a “second” failure is that much more likely. Such situations may also involve “knock-on” effects that are not readily apparent when the subject is first considered. It is highly beneficial to have a list of the existing Deferred Defects List on the check aircraft available at the briefing stage since their significance can then be considered in the calm of the briefing room.

Fuel loading

Fuel minima: Min Block for the intended flight + fuel required per each approach.

A selection of en-route alternate must be planned and at least two destination alternate.

Weight and balance

The importance of weight and balance, and in particular knowing the exact location of the CG, cannot be overemphasised. Dangerous flight characteristics are usually associated with an aircraft’s CG being beyond established limits. When intentionally approaching those limits, especially for the first time, disciplined procedures for determining the position of the CG are essential. Weighing the check aircraft in its precisely loaded pre-take-off condition is the recommended method for achieving this. If this is not practical, in the case of large aircraft for instance, accurate weight and balance data, based on a recent weighing, an inventory of configuration changes and a validated loading system, may be acceptable. The after landing condition is determined similarly. The precise

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

weight and balance of the aircraft at specific points can then be derived by considering fuel burn and elapsed time from engine start.

Like with all flights preparation, a weight and balance computation must be performed.

When the aircraft has been repainted, a weighing is required and a new basic weight and arm reflected on the new weighing report.

The normal weight and balance computation sheet might not be used in that case and a specific weight and balance computation sheet must be prepared.

As the center of gravity will usually be forward, load and secure weight ballast composed of stone bag in the cargo hold.

Specific test and safety equipment

Mandatory equipment test as per manufacturer documentation (AFM) have to be performed, including safety equipment and escape systems.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

3. Crew selection and other persons on board

Selection summary:

- Good Communicator
- Technically inquisitive
- Determined to get answers
- Good flying ability
- Admits errors and learns
- Takes responsibility
- Patient
- Makes balanced judgments
- “Defaults” towards Safety
- Team player

Skills:	Aptitude:			
○ Observation ○ Interpretation ○ Analysis ○ Communication ○ Use of ALL senses ○ Airmanship and Teamwork ○ Motor skills	Approach		Attitude	
	Logical Flexible Consistent	Creative Persistent Variable	Asking Learning	Telling Knowing
	Under confidence Right Over Confidence Manage these paradoxes To achieve the right balance INTEGRITY			
Experience:	Knowledge:			
○ Better risk evaluation ○ Better Prioritisation of task ○ Less errors	○ Aircraft ○ Theory ○ Role			

A Technical Flight Crew is a **crew of 3**:

- **2 Pilots**
Prerequisites: rated and current on Aircraft type with at least 6 month experience
- **1 Technical Flight Engineer (TFE)**
Prerequisites:
 - A third pilot, or
 - A Flight Engineer who has followed a familiarization course on the type, or
 - A Maintenance Engineer who has successfully followed the applicable maintenance type rating course as per Part 147 or equivalent, or

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

- A Flight Operations Engineer who has followed a familiarization course on the type

Flight crew qualifications

Applicability: SPO.SPEC.MCF.115

The operator shall select the flight crew members for level B maintenance check flights as follows:

For flights with complex motor-powered aircraft

For flights with complex motor-powered aircraft, the pilot-in-command shall:

- (a) hold a valid type rating, have completed a minimum of 1’000 flight hours as pilot-in-command on aircraft with similar characteristics, and have followed a training course in accordance with SPO.SPEC.MCF.120; or
- (b) hold a valid test pilot rating.

For flights with other-than-complex motor-powered aircraft

For flights with other-than-complex motor-powered aircraft, the pilot-in-command shall:

- (a) have completed a minimum of 1’000 flight hours flown as pilot-in-command in the appropriate aircraft category or, in the case of single piston-engine aircraft, sailplane or balloon, have completed a minimum of 300 flight hours flown as pilot-in-command in the appropriate aircraft category, and
- hold a valid type or class rating with a minimum of 50 hours on type or class as pilot-in-command; or
- (b) hold a valid test pilot rating; or
- (c) hold a valid type or class rating and a minimum total experience of 500 flight hours as pilot-in-command and shall have followed a training course in accordance with SPO.SPEC.MCF.120.

Experience and recency

The pilot-in-command shall not perform a level B maintenance check flight unless he/she has carried out a maintenance check flight within the preceding 24 months.

Recency as pilot-in-command on a level B maintenance check flight is regained after performing a level B flight as observer or pilot monitoring or after acting as pilot-in-command in a full flight simulator level B maintenance check flight.

4. Training

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

The difficulties (and decrease in safety) of MCFs do not lie in the abnormal or emergency situations that may arise from the MCF itself. These situations are commonly practiced during type ratings and recurrent trainings by all pilots. The real challenge is to mitigate the likelihood of such abnormal or emergency situations by proper preparation and flight performance and to be able to cope with them adequately. And the difference with routine flights lies with the different environment, pre-flight and during flight in addition to the increased workload during flight.

- **Pre-flight**, it is necessary to prepare, check, have an exhaustive walk-around, understand the maintenance achieved on the aircraft and the purpose of the flight.
- **During flight** the workload is higher than usual because of specific maneuvers, cockpit communication and ATC communication (especially when no dedicated "flight test area" ATC is used: accurate frequency monitoring and multiple frequency changes are necessary).

Flight crew training course

Applicability SPO.SPEC.MCF.120

A typical manufacturer course is the Technical Flight Familiarisation Course offered by Airbus which may be run at the manufacturer's premises or at the Operator's base and is a five day course consisting of 3 modules:

- A two day ground school
- Two four-hour full flight simulator sessions to:
 - train key checks in normal operations
 - analyse some abnormal situations
- One four-hour flight in an aircraft to train key procedures.

Classroom training should cover the following:

- Crew responsibilities and task sharing
- Flight preparation and authorisation
- Pre-flight briefing
- Recording of in-flight parameters
- Risk Management - operational and safety aspects of flight check profile and risk mitigation
- Aircraft-type specifics and use of special system checklists in flight

Full flight Simulator Training should provide demonstration and practice of representative system test sequences and possible outcomes. The importance of adherence to all applicable manufacturers' recommended flight check profiles should be stressed and where appropriate demonstrated.

Simulated abnormal situations in flight

SPO.SPEC.MCF.130

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

The requirement laid down in SPO.OP.185 is not applicable for maintenance check flights when the simulation of abnormal situations in flight is required to meet the intention of the flight and is identified in the flight programme.

Level B maintenance check flights training courses shall be conducted in accordance with a detailed syllabus. The operators of complex motor-powered aircraft shall describe this training in the manual referred to in SPO.SPEC.MCF.110.

The training course shall be conducted as follows:

- In a full flight simulator followed by at least one maintenance check flight as co-pilot or observer before acting as pilot-in-command on a maintenance check flight; or
- During a flight in an aircraft demonstrating maintenance check flight techniques.

The training course referred to above, followed on one aircraft category is considered valid for all aircraft types in that category.

Considering the aircraft used for the training and the aircraft to be flown during the maintenance check flight, the operator shall specify if differences or familiarisation training is required and the contents of such training

Course considerations

The training course stipulated in SPO.SPEC.MCF.120 (5.3.1) should comprise ground training followed by a demonstration of techniques for the checks in flight and failure conditions in a full flight simulator (FFS) or aircraft during dedicated flight or Maintenance Check Flight level B. In a demonstration performed in an aircraft, the trainer should not simulate a failure condition that could induce a safety risk, e.g., unexpected engine failure.

The ground training should cover the specified training syllabus (see AMC2 SPO.SPEC.MCF.120).

The flight demonstration should include the techniques for the most significant checks covered in the ground training. As part of this demonstration, the pilots under training should be given the opportunity to conduct checks themselves under supervision.

The ground training and flight demonstration should be provided by experienced flight crew with test or maintenance check flight experience. Flight demonstrations should be instructed by any of the following persons:

- A qualified test pilot; or
- An aircraft manufacturer's pilot experienced in conducting pre-delivery check flights; or
- A type rated pilot, currently authorised by the operator, to conduct maintenance check flights.

Upon successful completion of the training a record should be kept.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

Course syllabus

In the case of aeroplanes and helicopters, the training course syllabus includes the following subjects:

- Legal aspects: regulations concerning maintenance check flights.
- Organisation of maintenance check flights: crew composition, persons on board, definition of tasks and responsibilities, briefing requirements for all participants, decision-making, ATC, development of a flight programme.
- Environmental conditions: weather and light requirements for all flight phases.
- Flight preparation: aircraft status, weight and balance, flight profile, airfield limitations, list of checks.
- Equipment and instrumentation: on board access to various parameters.
- Organisation on board: CRM, crew coordination and response to emergency situations.
- Ground checks and engine runs: review of checks and associated techniques.
- Taxi and rejected take-off: specificities and techniques.
- Techniques for checks of various systems:

Aeroplanes: flight controls, high speed and low speed checks, autopilot and autothrottle, depressurisation, hydraulic, electricity, air conditioning, APU, fuel, anti-ice, navigation, landing gear, engine parameters and relight, anemometry.

Helicopters: engine power topping, track and balance, high wind start, autopilot, performance measurement, hydraulic, electricity, air conditioning, APU, fuel, anti-ice, navigation, landing gear, engine checks and relight, autorotation, anemometry.

- Review of failure cases specific to these checks.
- Post-flight analysis.

Persons on board

SPO.SPEC.MCF.125

With the cabin altitude greater than 10,000 ft, **use oxygen**. If passengers or observers are carried, there should be portable oxygen sets available for their use.

The role of observing engineers

Manufacturer’s typically recommend that all flights where aircraft systems will be intentionally degraded should be carried out with an appropriately qualified and experienced aircraft engineer (or alternatively a third pilot who has been trained to the same level as the designated aircraft commander) occupying one of the flight deck supernumerary seats. The role of this third person should be clearly defined in relation to the primacy of the operating flight crew and the aircraft commander in particular.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

Crew composition and persons on board

The minimum flight crew shall be two pilots, whenever the aircraft has at least two pilot stations.

For level B maintenance check flights on complex motor-powered aircraft, a task specialist is required in the flight crew compartment assist the flight crew to conduct the maintenance check flight if permitted by the aircraft configuration.

Notwithstanding the above and considering the workload of the flight crew based on the flight programme, when the operator can justify as part of its risk analysis that the flight crew would not require additional assistance, the operator may fly without a task specialist in the flight crew compartment.

The operator shall identify the need for additional task specialists as required for the intended flight.

The operator shall define in its manual the policy for other persons on board. As a general principle, only personnel essential to complete the flight (crew and task specialists) should be on board.

Task Specialist assigned duties

A task specialist is trained and briefed as necessary to perform his/her intended functions. Based on this, the operator is able to determine if a task specialist is suitable to assist the flight crew in the cockpit performing functions, such as:

- Assistance on ground for flight preparation;
- Assistance in navigation;
- Assistance in radio communication/radio navigation means selection;
- Reading of checklists; and
- Monitoring of parameters.

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 should be adequate to this function.

Flight time limitations and rest

Operators subject to Subpart FTL of Annex III (Part-ORO) shall apply this subpart when assigning crew members to maintenance check flights.

Appropriate additional time should be rostered for pre-flight briefing for all those persons who will occupy flight deck seats prior to the commencement of a non-standard flight.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

5. Briefings

Pre-briefings, during which team members are made aware of details for the planned operation, should be conducted prior to the various overall flight phases and then prior to each individual flight. All participants, should attend pre-flight briefings as should the relevant manager or authorising officer.

For certain maintenance check flights, the data obtained or verified in flight will be necessary for assessment or consideration after the flight by the maintenance organisation prior to issuing the maintenance release.

For this purpose, when the personnel of the maintenance organisation cannot perform these functions in flight, the maintenance organisation may rely on the crew performing the flight to complete these data or to make statements about in-flight verifications.

In this case the maintenance organisation should appoint the crew personnel playing such a role and brief them on their functions before the flight.

Briefing participants

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

The Operator will hold a briefing between the relevant services:

- Flight Operations
- Airworthiness Management
- Maintenance Organisation
- Ground Operations
- Lessee/lessor

Specific pre-flight briefing topics

Applicability SPO.SPEC.MCF.140

Prior to any Check Flight, a full pre-brief should be conducted between the CAMO, maintenance organisation and flight operations, during which the flight crew should be made aware of the specific reasons for the Check Flight.

In particular, specific note should be made of any maintenance tasks that have a direct effect on the aircraft's handling or performance. The briefings should include details of the data to be recorded, and the requirement to accurately record any defects or requests for maintenance.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

Risk management

The operating crew and any other personnel legitimately on the flight deck for airworthiness function / check flight is the final line of defense in risk management, where the principal risk is loss of control.

The operator will be responsible for ensuring that its crew thoroughly understands the CFS, the techniques to be used, the flight conditions required and all other aspects of the conduct of the flight.

Considerations to fly with potentially unreliable systems:

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

- Identify which check points carry more risk
- Plan how to fly them and then stick to your plan
- Decide and brief "break off" points
- If things don't look right they are probably wrong – so stop
- Take care with breaks in the sequence

Risk assessment

Risk management is normally conducted through a safety review process in which a flight check plan is examined by project and non-project personnel in order to draw out potential hazards and recommend mitigating (or minimising) procedures. It should consider the risks to other airspace users and persons on the ground and water as well as to the aircraft under check. Risk management can be carried out informally, however, most benefit will be gained through formalising the process and writing down the outcomes in a risk management plan. More information available at Appendix .

Factors:

- 1. Required crew experience;
- 2. Required meteorological conditions;
- 3. Required FTO review and approval levels;
- 4. Support and safety equipment.

Safety meeting

- hazards are identified;
- an assessment is made of the risks involved;
- mitigating procedures are established to reduce or eliminate the risks; and
- a conscious decision is made, at the appropriate level of authority, to accept residual risk.

Risk level table:

Hazard Outcome Category		Subjective Probability of Occurrence		
Probable	Possible	Unlikely	Remote	
Catastrophic	UNACCEPTABLE	HIGH	Medium	Low
Critical	HIGH	HIGH	Medium	Low
Marginal	Medium	Medium	Medium	Low
Acceptable	Low	Low	Low	Low

Factors Affecting Flight Check Risk Ratings:

- Some factors which may be worth taking into consideration when assigning flight check risk ratings are as follows:
- ☐ The check team’s proficiency with, currency on and familiarity with the aircraft and the type of checks being conducted.
 - ☐ The existence of any previous check program, the thoroughness thereof and the relevant results.
 - ☐ Check techniques and workloads.
 - ☐ Altitude and airspeed in relation to terrain and/or aircraft recovery systems.
 - ☐ Gross weight and centre of gravity.
 - ☐ Environment (weather, air traffic control, airfield conditions, darkness, turbulence etc.).
 - ☐ Aircraft internal environment (temperature, pressurisation level etc.).
 - ☐ Check sequencing.
 - ☐ Adverse system or software effects.
 - ☐ Specific aircraft limitations.
 - ☐ Consequence of failure in technique, system or structure.
 - ☐ Intentional multiple failure conditions.

Risk Level Examples:

Examples of tests which could be considered to carry different risk levels, initially and unmitigated, are grouped below. These are typical examples only and are provided for general guidance. The actual risk category for each test condition must be evaluated on a case-by-case basis.

- ☐ **High Risk:** Tests that could be considered to involve high risk factors are as follows:
 - o Stall Characteristics:

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

- ☐ Aft CG accelerated stalls with rapidly changing dynamic conditions.
- ☐ On aeroplanes equipped with unproved pusher systems that are masking potential deep stalls.
- ☐ High altitude stalls on aeroplanes with potential engine flameout problems.
- High speed tests above VNE/VMO/MMO.
 - VMCA tests at low altitude, particularly dynamic VMCA.
 - Flight control malfunction testing during take-off and landing phases of flight, and asymmetric deployment of roll controls at high speeds.
 - Maximum energy RTOs where wheel brake fires are a possibility.
 - Autopilot malfunction tests at low altitudes.
 - Nosewheel steering malfunction tests.
 - Dynamic lateral-directional testing (Dutch rolls) on aeroplanes that are unstable under certain conditions.
 - Pilot Induced Oscillations testing.
- ☐ **Medium Risk:** Tests that could be considered to involve medium risk factors are as follows:
 - Any tests involving low altitude operations (e.g. ground course pressure error correction testing).
 - Tests involving formation flying.
 - Aerobatic manoeuvres.
 - Actual V1 fuel cuts for take-off performance.
 - Inflight unusable fuel tests that result in engine flameout.
 - Stall speed, or glide performance, measurement with the engine actually inoperative.
 - Low speed and high speed stability and control tests.
 - Emergency electrical power landings at night using standby instruments and/or reduced lighting (both external and internal).
 - Emergency descents to demonstrate high altitude special conditions (possible physiological effects).
 - Abnormal flight control configuration testing. Includes pitch and roll disconnects or manual reversion for hydraulic systems.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

- Abnormal operation of onboard systems.
 - Flights involving Full Authority Digital Engine Control testing (Electromagnetic Interference, software, etc.).
 - Terrain Awareness Warning Systems ground proximity warning systems (GPWS/EGPWS).
- ☐ **Low Risk:** Examples of low risk testing could be as follows:
- Basic system function tests (electrical, hydraulic, fuel, environmental, anti-ice, avionics etc.) not involving abnormal or emergency conditions.
 - High altitude airspeed calibrations (e.g. GPS).
 - Climb performance/speed power etc.

Event reporting

Consider whether any of the defects observed warrant further, formal reporting under either Company reporting schemes or the Mandatory Occurrence Reporting (MOR) scheme.

Lesson learnt

6. Aircraft status

Due to incomplete maintenance, it is advisable to open a new entry on the aircraft technical log to identify the need for a maintenance check flight.

This new entry should contain or refer, as necessary, to data relevant to perform the maintenance check flight, such as: aircraft limitations due to incomplete maintenance, maintenance data reference and maintenance actions to be performed after the flight.

Summary of maintenance

A summary of the maintenance performed on the aircraft and the possible effects during flight will be described in the pilots briefing sheet and discussed with the Technical Pilot.

7. Flight programme, specific procedures and limitations

There may be occasions when the requirements of the Check Flight Schedule appear to conflict with Limitations or advice in the Flight Manual (AFM); in all such cases, the AFM must take priority. Specific dispensations may, when necessary, be given in an AFM Supplement, (Flight Testing and Training), and crews should make themselves familiar with this Supplement before carrying out Check Flights.

Note:

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

- Associate warnings and limits with check to be done
- Hard limits need clear DO NOT EXCEED warnings
- Avoid writing a check sequence over two pages
- Make them easy to handle. Not too big or detailed

Crew members’ responsibilities and coordination

The pilot in command of the Check Flight should ensure that the crew is suitable for the task and adequately instructed.

Ensure back-up for all procedural tasks on the flight deck.

Crew Resource Management

Crew resource management is the application of team management concepts and the effective use of all available resources to operate a flight safely. In addition to the aircrew, it includes all other groups routinely working with the aircrew who are involved in decisions required to operate a flight. These groups include, but are not limited to, airplane dispatchers, flight attendants, maintenance personnel, and air traffic controllers.

Situational awareness, or the ability to accurately perceive what is going on in the flight deck and outside the airplane, requires on going questioning, crosschecking, communication, and refinement of perception.

It is important that all flight deck crewmembers identify and communicate any situation that appears unsafe or out of the ordinary. Experience has proven that the most effective way to maintain safety of flight and resolve these situations is to combine the skills and experience of all crewmembers in the decision making process to determine the safest course of action.

The general principles of CRM, as applicable to the normal operational environment, can be easily extended to take in the additional support teams that will be involved in flight checking.

□ Knock-It-Off: The 'knock-it-off' (time-out) (KIO) principle can be usefully applied to flight check operations. A KIO call instigates an immediate halt to test proceedings and establishes the aircraft in a benign, straight and level, or climbing, state while situational awareness is recovered or the source of a problem is investigated. A positive decision regarding recommencement or termination of the sortie is then made. Pre-established company rules should normally be in place regarding who can make a KIO call and when one should be made although the best method is usually the most conservative – i.e. any team member should be encouraged to make the call when they note any limit exceedence, or dangerous trend toward such.

Headphone and Flight Deck Speaker Use

In the airplane, headphones or boom microphones/headsets are worn during takeoff until the top of climb and from the start of descent throughout approach and landing. During cruise, flight deck speakers may be used. Speaker volume should be kept at the

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

minimum usable level adequate to avoid interference with normal crew flight deck conversation, but still ensure reception of relevant communications.

Synoptic Display

Synoptic displays are provided as a means of assisting the flight crew in rapidly understanding the status of the airplane systems. However, crews should not rely solely on the displays for determining airplane status. The flight crew is encouraged to select a display at any time they feel it is the most efficient way to get desired information. Synoptic displays should only be used as necessary to get the desired information and then turned off. The clarity and simplicity of displayed information enable the flight crew to obtain necessary information from a brief scan.

If the flight crew elects to use synoptic displays in conjunction with accomplishment of procedures, they must assure no distraction from the intended task results. This is particularly true when accomplishing non-normal procedures.

Under certain conditions, system faults can result in missing synoptic information. Therefore, decisions regarding non-normal situations should be based on EICAS messages and other flight deck effects and indications. In every case where a non-normal procedure results in a need for memory items, they should be completed before selecting a synoptic display. Accomplishment of necessary procedures should take priority over use of synoptic displays.

Callouts

Both crewmembers should be aware of altitude, airplane position and situation. Avoid nonessential conversation during critical phases of flight, particularly during taxi, takeoff, approach and landing. Unnecessary conversation reduces crew efficiency and alertness and is not recommended when below 10,000 feet MSL / FL100. At high altitude airports, adjust this altitude upward, as required.

The Pilot Monitoring (PM) makes callouts based on instrument indications or observations for the appropriate condition. The Pilot Flying (PF) should verify the condition/location from the flight instruments and acknowledge. If the PM does not make the required callout, the PF should make it.

The PM calls out significant deviations from command airspeed or flight path.

Either pilot should call out any abnormal indications of the flight instruments (flags, loss of deviation pointers, etc.). One of the basic fundamentals of Crew Resource Management is that each crewmember must be able to supplement or act as a back-up for the other crewmember. Proper adherence to standard callouts is an essential element of a well-managed flight deck. These callouts provide both crewmembers required information about airplane systems and about the participation of the other crewmember. The absence of a standard callout at the appropriate time may indicate a malfunction of an airplane system or indication, or indicate the possibility of incapacitation of the other pilot.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

The PF should acknowledge all GPWS voice callouts during approach except altitude callouts while below 500 feet AFE. The standard callout of "CONTINUE" or "GO-AROUND" at minimums is not considered an altitude callout and should always be made. If the automatic electronic voice callout is not heard by the flight crew, the PM should make the callout.

Note: If automatic callouts are not available, the PM may call out radio altitude at 100 feet, 50 feet and 30 feet (or other values as required) to aid in developing an awareness of eye height at touchdown.

Standard Phraseology

A partial list of recommended words and phrases follows:

Thrust:

- "SET TAKEOFF THRUST"
- "SET GO-AROUND THRUST"
- "SET MAXIMUM CONTINUOUS THRUST"
- "SET CLIMB THRUST"
- "SET CRUISE THRUST"

Flap Settings:

- "FLAPS UP"
- "FLAPS ONE"
- "FLAPS FIVE"
- "FLAPS FIFTEEN"
- "FLAPS TWENTY"
- "FLAPS TWENTY-FIVE"
- "FLAPS THIRTY"

Airspeed:

- "80 KNOTS"
- "V1"
- "ROTATE"
- "SET _____ KNOTS"
- "SET VREF PLUS (additive)"
- "SET FLAPS _____ SPEED"

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

Information to ATC

Liaise with ATC to ensure that they are aware of your requirements.

Post-flight briefing

Post-flight briefings, whereby the success or otherwise of the mission and any safety lessons are drawn out while still fresh in the group's memory are also worthwhile.

8. External conditions

Weather and light conditions

Ref: OM A chap. 8.7.4

Weather minima: daylight only and actual and forecast WX for take-off, destination and alternate are at least 1000ft ceiling and min visibility for approach 1500m RVR.

On flights, where external visual reference on take-off is required, the required wx conditions will be specified by the Postholder FOP according to the circumstances, but may not be lower than the published circling minimum where the check flight takes place.

Ensure that the weather is suitable for the checks to be carried out, e.g., there is little point in carrying out performance climbs in heavy turbulence or in cloud since both will reduce the performance, perhaps requiring a re-fly. Never carry out stalls or high-speed runs when there is significant atmospheric turbulence around; remember that the normal margins are significantly eroded and the associated gusts may put the aircraft outside its certificated envelope. Be aware that after flight through icing conditions, some ice may remain on unprotected areas and this can have significant effects on handling and performance.

Check Flights should be carried out in day VMC and with a well-defined visible horizon since good attitude awareness may be necessary for precise control and in the remote event of extreme attitudes being reached, e.g. an unexpected and pronounced wing drop at the stall; in addition ensure that there is sufficient vertical clearance from cloud for any recovery to be completed visually.

Check Flights should not be carried out at night.

Terrain

For multi-engine aircraft, the single-engine climb should not be carried out below the minimum safety height of 3000 ft AGL.

ATC, airspace

Experience shows that it is best and most expeditious not to carry out Check Flights in controlled airspace where ATC requirements will necessarily take priority. It is usually best to exit and re-enter controlled airspace in accordance with ATC and company normal operating procedures.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

A special airspace dedicated for check flight should be requested if possible in order to reduce the workload.

Airport (runway, equipment)/operating site

The selection of the operating site should take in to account:

- Ease of access
- Facilities: Licensed airfield with appropriate runways, facilities and operating environment.
- Significant air-traffic problems or busy airspace environment.
- Limited approach and departure lanes or approach and departure lanes require complicated navigational procedures to negotiate.
- Emergency, crash recovery, fire fighting and medical services available and on stand-by.
- Some flight support or flight following available.
- Runway status (contamination, NOTAM)

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

9. Documentation

Specific documentation on board

List of Documents required prior to conduct of a Check Flight:

- 1 Certificate of Registration
- **2 Either:**
 - C of A (and ARC) or Permit to Fly (if in date)
- 3 Aircraft Flight Manual (or POH), including appropriate Supplements if applicable
- 4 Weight and Balance Statement
- 5 Radio Station Licence and Certificate of Approval
- 6 Noise Certificate
- 7 Certificate of Insurance
- **8 Either:**
 - Aircraft Technical Log
- **Or:**
 - Logbook for Aircraft/Engine/Propeller

In-flight recordings

The Check Flight Schedule will provide details of instrument readings to be recorded. Recording the climb data should not be started until the aircraft is stabilised in the climb at the correct speed and with the power set.

It is also necessary to establish the weight of the aircraft at a point approximately midway in each measured climb. This can be determined by reference to 'fuel gone' indicators, on a time and consumption basis or, where their accuracy is good enough, by reference to direct fuel gauge readings. It is acceptable to record the weight at the beginning and end of the climb and to use the average of the two for data reduction.

Result of the maintenance check flight and related data

Following the Check Flight, it is essential that the outcome be reported fully and formally.

The following processes should be completed as a minimum:

- Ensure that the Check Flight Schedule has been completed and all the appropriate data blocks filled.
- If appropriate, calculate the performance.
- Complete the Check Flight Report.
- Transfer the defects from the Schedule to the aircraft Technical Log.
- Consider whether any of the defects observed warrant further, formal reporting under either Company reporting schemes or the Mandatory Occurrence Reporting (MOR) scheme.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	--------------------------------

Where checks have been omitted for any reason, (weather, unserviceabilities, etc), ensure that this is clearly stated on the post flight Report, together with the need to re-fly them as appropriate.

The Schedule should be filled in, and stored together with the aircraft maintenance log book by MCC.

The Technical Pilot will keep a copy for reference.

Accurate recording of required maintenance actions after the flight

Any system defects should be recorded on the defect log of the Schedule and transcribed to the aircraft’s technical log for rectification.

After a successful maintenance check flight, the maintenance records should be completed, the remaining maintenance actions finalised and the aircraft released to service in accordance with the maintenance organisation approved procedures.

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

10. Annexes

Pilots briefing sheet

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

MCF Schedule

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

MCF Load Sheet

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

MCF Training Syllabi

	Maintenance check flights (MCF) Manual	Iss:0 Ver:0 15 FEB 2013
--	---	----------------------------

List of MCF authorized crews