1.1. Holistic analysis of MCF

The following table analyses the whole MCF activity.

1.1.1. Table 3 - MCF activity

TE no.	Revised on	Description		Consequence	Most significative regulatory barriers (if any)	Likeli-Hood	Seve-rity	Risk before	Additional barriers implemented (if any)	Likeli-Hood	Seve-rity	Risk after	Ref. docu-mentation	Notes
TE 001	14/06/2020	Aircraft status not in standard conditions	The aircraft released for an MCF flight may be in a non-standard condition due to an incomplete maintenance status o due to a non-operative aircraft preparation	1. Inoperative systems or instruments 2. CG near limits (see TE 003) 3. Unexpected flight behaviour	I. Mass and balance II. Pilot's recurrent training (TR, OPC, etc.) II. Pilot's MCF course (Level A complex)	4	C	T	a. List of inoperative systems and instruments	2	C	A	a. MCF Form	
TE 002	14/06/2020	Pilot not skilled in the use of abnormal and emergency procedures	The pilot may be not proficient in the use of abnormal or emergency procedures related to the system to be checked	1. CFIT 2. LOC-I	I. Pilot's recurrent training (TR, OPC, etc.) II. Pilot's MCF course (Level A complex)	2	C	A		2	C	A		

TE no.	Revised on	Description		Consequence	Most significative regulatory barriers (if any)	Likeli-Hood	Seve-rity	Risk before	Additional barriers implemented (if any)	Likeli-Hood	Seve-rity	Risk after	Ref. docu-mentation	Notes
TE 003	14/06/2020	Aircraft CG near limits	The aircraft released for an MCF flight may be in a non-standard condition or not completely operatively prepared, and with a different position of the basic CG than usual	1. LOC-I	I. Mass and balance	1	D	A		1	D	A		
TE 004	14/06/2020	Aircraft improperly set for the flight	Due to maintenance operations, the aircraft may be not completely fit for the flight (open latches, loose object left in the vanes, etc.)	1. Aircraft damage 2. LOC-I 3. CFIT		3	C	T	a. Attentive pre-flight inspection by pilot-in-command b. Pilot-in-command pre-flight with support by an engineer	2	C	A	a. MCF Manual b. MCF Manual	
TE 005	14/06/2020	Failure of the checked system	In-flight failure of the system under check	1. CFIT 2. LOC-I	I. Pilot's recurrent training (TR, OPC, etc.) II. Pilot's MCF course (Level A complex)	2	C	A		2	C	A		Check tables 1 and 2 for a more detailed analysis. Herein risk takes into consideration also the real likelihood of a malfunction.
TE 006	14/06/2020	Failure of other-than-checked system	In-flight failure of systems not under check	1. CFIT 2. LOC-I	I. Pilot's recurrent training (TR, OPC, etc.) II. Pilot's MCF course (Level A complex)	2	C	A		2	C	A		

TE no.	Revised on	Description		Consequence	Most significative regulatory barriers (if any)	Likeli-Hood	Seve-rity	Risk before	Additional barriers implemented (if any)	Likeli-Hood	Seve-rity	Risk after	Ref. docu-mentation	Notes
TE 007	14/06/2020	Multiple failures	System under check may fail in combination with other systems	1. CFIT 2. LOC-I	I. Pilot's recurrent training (TR, OPC, etc.) II. Pilot's MCF course (Level A complex)	2	C	A		2	C	A		
TE 008	14/06/2020	Emergencies requiring an immediate or as-soon-as-possible landing	An emergency may require an immediate or as-soon-as-possible landing	1. CFIT 2. Aircraft damage		2	D	T	a. MCF area selection with availability of suitable emergency landing sites	2	C	A	a. MCF Manual	The availability of a suitable emergency landing area will reduce the potential outcomes of an emergency event
TE 009	14/06/2020	Pilot high workload	Pilot may be overloaded due to several overlapping tasks (flight, radio communications, data transcription, nearby traffic, etc.)	1. CFIT 2. LOC-I 3. MCF data not properly recorded	I. Co-pilot on board and/or II. Task Specialist on board	2	B	A		1	B	A		

2. Analysis of risk

A summary (summation) of the initial risk, final risk and acceptance criteria is described below.

The analysis of hazards related to the MCF flights shows a “tolerable” risk level, reduced to a final “acceptable” risk level by the implementation of the listed safety barriers.

The following is the count of the risk levels associated with the possible consequences.

RISK ANALYSIS - RISK COUNT BEFORE THE INTRODUCTION OF THE BARRIERS					
	1	2	3	4	5
A					
D	**1**	**1**			
C		**4**	**1**	**1**	
B		**1**			
A					

RISK ANALYSIS - RISK COUNT AFTER THE INTRODUCTION OF THE BARRIERS					
	1	2	3	4	5
A					
D	**1**				
C		**7**			
B	**1**				
A					

ACCEPTANCE COUNT		
A	T	N
6	**3**	

LEGEND:
A - Acceptable
T - Tolerable
N - Non-Acceptable

ACCEPTANCE COUNT		
A	T	N
9		

3. Recommendations

No safety recommendations.

4. Conclusions

Based on the analysis, it is believed that the maintenance check flights can be performed with an acceptable residual risk level.

Appendix 1 – Risk analysis methodology

The risk level of the potential consequences is assessed using the below risk matrix.

RISK SEVERITY	RISK PROBABILITY				
	IMPROBABLE (1)	RARE (2)	LOW (3)	PROBABLE (4)	FREQUENT (5)
CATASTROPHIC (E)	1 E	2 E	3 E	4 E	5 E
CRITICAL (D)	1 D	2 D	3 D	4 D	5 D
MAJOR (C)	1 C	2 C	3 C	4 C	5 C
MINOR (B)	1 B	2 B	3 B	4 B	5 B
NEGLIGIBLE (A)	1 A	2 A	3 A	4 A	5 A

The following table shows the definition of the probability (likelihood) of the possible consequence of the indicated hazard:

RISK PROBABILITY	MEANING	Value
FREQUENT	**Likely to occur many times.** Has already occurred in the Company (Freq. > 3 times per year). It has occurred frequently in the history of the aviation industry.	**5**
PROBABLE	**Likely to occur sometimes.** Has already occurred in the Company (Freq. < 3 times per year). Has occurred infrequently in the history of the aviation industry.	**4**
LOW	**Unlikely to occur, but possible.** Has already occurred in the Company at least once or. He has occurred in the history of the aviation industry.	**3**
RARE	**Very unlikely to occur.** Not known to have occurred in the Company but has already occurred at least once in the history of the aviation industry.	**2**
IMPROBABLE	**Almost inconceivable that the event will occur.** It has never occurred in the history of the aviation industry.	**1**

The following table shows the definition of severity levels of the possible consequence of the indicated hazard:

SEVERITY OF OCCURRENCE	MEANING				Value
	PERSONNEL	ENVIRONMENT	MATERIAL VALUES & ASSETS	REPUTATION	
CATASTROPHIC	Multiple fatalities	Massive effects (pollution, destruction, etc.)	Catastrophic financial loss Damage > 1 M	International impact	**E**
CRITICAL	Fatality	Effects difficult to repair	Severe financial loss with long term effects Damage < 1 M	National impact	**D**
MAJOR	Serious injuries	Noteworthy local effects	Substantial financial loss Damage < 250K	Considerable impact	**C**
MINOR	Light injuries	Little impact	Financial loss with little impact Damage < 50K	Limited impact	**B**
NEGLIGIBLE	Surface or no injuries	Negligible or no effects	Financial loss with negligible impact Damage < 10K	Light or no impact	**A**

Values in red indicate an "unacceptable" risk level, the values in yellow indicate a "tolerable" risk level, while the values in green indicated an "acceptable" risk level.

Each of the listed levels requires specific action by responsible staff who have the appropriate authority to accept the associated level of risk.

Level of Risk / Actions	**Unacceptable** Risk too high to continue operations	**Tolerable** The level of risk can be tolerated as long as appropriate safety barriers have been defined and implemented	**Acceptable** The level of risk can be accepted
Action Required	Prohibit/suspend operations. Bring the risk level to "tolerable" or "acceptable"	Implementation of appropriate safety barriers	No further safety barriers are required. Additional safety barriers if deemed necessary
Validation of the level of risk for the continuation of operations	Safety manager	Safety manager	Safety manager
Authorization to the continuation of operations	Operations cannot be authorized	Accountable Manager	No specific authorisations are necessary

Appendix 2 – Level A and B classification by emergency and malfunction area

This table is used to classify the MCF flight as Level A or Level B based on the aircraft emergency and malfunction areas.

Whenever a MCF flight is performed, the checked system is supposed to be not reliable, thus a malfunction or an emergency procedure, as described in the RFM, shall be executed. The difficulty and/or the conceivable consequences of the possible system failure drives the classification of the Level A or B of the MCF.

NOTE 1: The following table is an example based on Leonardo AW139 helicopter. A proper study shall be made for each aircraft type in the fleet.

NOTE 2: The table may be an appendix to the MCF risk assessment or it can be moved in an dedicated external document.

Note: the likelihood has been set to maximum (5) as the checked system or equipment has been identified as potentially unreliable.

Table 1

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Rotor	Rotor-overspeed		Rotor-overspeed	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Rotor speed system verification on ground-run and hovering before flight	5 B	Rotor speed system functionality verification on ground excludes major problems in flight	A
	Rotor under-speed		Rotor under-speed	If in an intentional autorotation (e.g., NR check) – Apply power If NR low during flight (e.g., NR regulator, engine(s) failure) – Initiate autorotation	5 D	Rotor speed system verification on ground-run and hovering before flight	5 B	Rotor speed system functionality verification on ground excludes major problems in flight	A
	Rotor vibrations		Rotor out of balance	Return to base	5 A		5 A		B

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Engine - Ground		Engine hot start Engine manual starting Manual on ground start procedure	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A

Engine - Flight	Engine drive shaft failure Engine idle Engine failure Engine failure recognition Single engine failure Single engine failure in hover (5 to 10 ft) Single engine failure on take off category B Single engine failure during cruise Single engine landing category B Engine shutdown in emergency Emergency/post crash shutdown Engine systems Engine oil pressure low Engine EEC fail Engine power turbine overspeed detect failure	Engine malfunctions Compressor stall Unusual engine noise Engine limit exceedance Engine oil temperature Engine oil pressure high Engine chip detector Engine fire detector system Engine control lever Engine control lever position Engine mode select switch Engine power turbine overspeed Engine electronic control data Degradation of engine control functions Torque limiter Inter turbine temperature limiter Engine restart in flight procedure Manual in flight restart procedure Engine shutdown using ECL/manual Engine and rotor parameters miscompare	One engine inoperative (OEI) All engine inoperative	Return to base Land on airport Off airfield precautionary landing	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Engine analogue sensor failure 2.5 minute rating							
	Double engine failure		All engine inoperative (AEI) Autorotation	Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A
Fuel		Fuel filter by-pass Fuel heater Fuel pressure low	One engine inoperative (OEI)	Return to base Land on airport Off airfield precautionary landing	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
Fuel		Fuel icing Fuel heater Fuel system Fuel low Fuel pressure low Double fuel pump failure Abnormal fuel consumption Fuel contents gauging unit failure Fuel contents gauging unit test system failure Fuel low sensor failure Fuel probe failure	All engine inoperative (AEI)	Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
Autorotation	Entry in autorotation Autorotative landing procedure on land Autorotative landing procedure on water		Autorotation	Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Fire - Ground	Engine bay fire (ground) Engine exhaust fire after shutdown Cockpit / cabin fire (ground) Electrical fire/smoke (ground) Wheel brake fire		Fire on ground	Engine shout-down Abort mission on ground	5 C	Support personnel off-board during start-up Firefighters on station	5 B	Early fire detection reduces consequences magnitude	A
Fire - Flight	Fire Engine bay fire (flight) Baggage bay fire Cockpit / cabin fire (flight) Electrical fire/smoke (flight) Wheel brake fire		Fire in flight	Return to base Off airfield precautionary landing	5 D	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Transmission	Transmission system failures Main gearbox Oil pressure low Oil pressure low (continued) Oil temperature high	Drive system Main gearbox overtorque Main gearbox chip detector Main gearbox oil filter Main gearbox oil low Main gearbox input bearing temperature Main gearbox input oil pressure Gearbox chip detect unit malfunction Gearbox chip detector sensor failure	Main gearbox and connected systems failure	Return to base Off airfield precautionary landing	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
Main rotor	Main rotor controls binding	Rotor speed selector	Rotor speed control failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
Tail rotor	Tail rotor system failures Yaw control diagnostics Tail rotor drive failure Tail rotor control system failure Tail rotor control binding	Intermediate or tail gearbox chip detector Intermediate or tail gearbox oil low Intermediate gearbox oil temperature high Tail rotor gearbox oil temperature high	Tail rotor failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Hydraulic		Hydraulic system Hydraulic pressure low Hydraulic fluid overheating Hydraulic fluid level low Hydraulic pump 1, 2 or 4 failure Main valve seizure in main or tail rotor servo	Flight control(s) failure Hydraulically driven system(s) failure	Return to base Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
Flight control – Ground		AP test abort	AP failure	Engine shout-down Abort mission on ground	5 A		5 A		B

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Flight control – Flight		Autopilot fail Autopilot off Autopilot axis off Autopilot axis disengage Attitude system off AFCS trim failure Pitch, roll, yaw trim fail Mistrim AFCS degraded SAS degraded Cyclic force trim off or fail Cyclic force trim release failure Collective force trim off or fail Collective force trim release failure AFCS quick disconnect procedure	Degraded aircraft stability In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A

Display unit		Display unit malfunctions Primary or/and multifunctional flight display unit failure PFD/MFD display failures Display unit overheating Display unit degraded Primary and multifunctional flight display messages Attitude display failure Heading display failure RAD ALT failure CAS warning message list discrepancy ADS failure Failure of CAS data MAU message on PFD Display unit graphic malfunction Engine state indication on PFD and MFD Failure of PI display Failure of NF display Decision height caption AHRS miscompare	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		ADS miscompare RAD ALT miscompare LOC/GS miscompare CAS caution message list discrepancy Loss of glideslope or VOR data FMS PFD messages							

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Avionics		Avionics AHRS failure ADS failure Aural warning system failure Avionic fault Modular avionics unit overheat/fail Multifunction control display unit Overheating System configuration failure Validate configuration Flight data recorder failure Cockpit voice recorder failure Flight management system failure GPS fail FMS/GPS miscompare FMS/GPS miscompare unavailable Aircraft never exceed speed miscompare Aircraft never exceed speed	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Communication		Communication system VHF overheat Audio panel failure MRC overheat Miscellaneous	Radio failure ICS failure	Return to base	5 B	Day VMC MCF flight	5 A		B
Electrical	Electrical system Double dc generator failure Extended flight endurance after double dc generator failure Services available on essential bus 1 and 2 Services lost during bus failures	Electrical Single DC generator failure DC generator overheat Bus tie open	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
Battery	Main and auxiliary battery hot	Main battery off Auxiliary battery off Loss of main and/or auxiliary battery supply DC main bus failure	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Landing gear	Landing gear fails to lock down	Normal landing gear pressure low Emergency landing gear pressure low Nosewheel unlocked (in flight) Park brake malfunction Park brake on Weight on wheels switch failure Landing gear retracted Landing gear fails to raise	Landing gear failure on landing Dynamic rollover on ground	Return to base Land on airport	5 B		5 B		A
Ice protection		Ice protection Pitot heater failure Pitot heater off	Icing Unreliable instruments In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 C	Day VMC MCF flight Outside icing conditions	5 A		B
Environmental control		Environmental control system Vent fan failure Nose avionic fans failure	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
Lightning	Lightning strike		Electrical failure Avionics failure Radio failure Structural damage	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
Static port	Static port obstruction		Unreliable instruments In flight loss of control (LOC-I)	Return to base	5 B	Day VMC MCF flight	5 A		B

Malfunction or Emergency area	Emergency procedures	Malfunction procedures	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Doors	Emergency exits	Cockpit door open Cabin door open Baggage bay door open External power socket door open	Aerodynamic-related problems Door detachment Structural damage	Return to base Off airfield precautionary landing	5 B	Do not fly high speed unless required by the maintenance check procedure	5 B		A

Appendix 3 – Level A and B classification by maintenance area

This table is used to classify the MCF flight as Level A or Level B based on the maintenance areas with reference to table 1 - Malfunction and emergency procedure areas.

The system that has undergone the maintenance, or the system to be checked in flight, is analysed for the possible malfunction or emergency procedures that could be used in flight by the pilot. Based on this, the related Level of the MCF flight is determined.

NOTE 1: The following table is an example based on Leonardo AW139 helicopter. A proper study shall be made for each aircraft type in the fleet.

NOTE 2: The table may be an appendix to the MCF risk assessment or it can be moved in an dedicated external document.

Note: the likelihood has been set to maximum (5) as the checked system or equipment has been identified as potentially unreliable.

Table 2

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Flight Control	Any Flight Control System verification, disturbance, or repair	Flight control – Ground	AP failure	Engine shout-down Abort mission on ground	5 A		5 A		B
		Flight control – Flight	Degraded aircraft stability In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
Engine(s)	Any engine(s) component or system, including Fuel Control Units, inlet and exhaust systems, engine(s) controls, starter/generators, gauges, indicators, valves, probes and associated electronic systems	Engine – Ground	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI)	Return to base Land on airport	5 D	Engine(s) performance verification on ground-run and	5 B	Engine(s) functionality verification on ground excludes	A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
			Autorotation	Off airfield precautionary landing Autorotation		hovering before flight		major problems in flight	
		Autorotation	Autorotation	Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
		Fire – Ground	Fire on ground	Engine shout-down Abort mission on ground	5 C	Support personnel off-board during start-up Firefighters on station	5 B	Early fire detection reduces consequences magnitude	A
		Fire – Flight	Fire in flight	Return to base Off airfield precautionary landing	5 D	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Display unit	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
Main and tail rotor	Main and tail rotor track and balance, systems disturbance, overhaul, or replacement	Main rotor	Rotor speed control failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Tail rotor	Tail rotor failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Hydraulic	Flight control(s) failure Hydraulically driven system(s) failure	Return to base Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
		Flight control – Ground	AP failure	Engine shout-down Abort mission on ground	5 A		5 A		B
		Flight control – Flight	Degraded aircraft stability In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
Engine start and shout down	Any check covering engine start and shout down, including high-wind start,	Engine – Ground	Engine hot start	Engine shout-down	5 B		5 B		A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
	accelerations and deceleration, and emergency shout down			Abort mission					
		Fire – Ground	Fire on ground	Engine shout-down Abort mission on ground	5 C	Support personnel off-board during start-up Firefighters on station	5 B	Early fire detection reduces consequences magnitude	A
Augmented stabilisation, autopilot	Any check involving augmented stabilisation, autopilot, or any system acting on flight controls	Flight control – Ground	AP failure	Engine shout-down Abort mission on ground	5 A		5 A		B
		Flight control – Flight	Degraded aircraft stability In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
Performance measurement	Any in flight performance measurement, included engine performance, power check, and autorotation	Rotor-overspeed	Rotor-overspeed	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Rotor speed system verification on ground-run and hovering before flight	5 B	Rotor speed system functionality verification on ground excludes major problems in flight	A
		Rotor under-speed	Rotor under-speed	Autorotation	5 D	Rotor speed system verification on ground-run and hovering before flight	5 B	Rotor speed system functionality verification on ground excludes major problems in flight	A
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI) Autorotation	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Autorotation	Autorotation	Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
Hydraulic	Any hydraulic component (pump, valves, etc.) and related systems (landing gear, rotor brake, flight controls, etc.)	Hydraulic	Flight control(s) failure Hydraulically driven system(s) failure	Return to base Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
		Flight control – Ground	AP failure	Engine shout-down Abort mission on ground	5 A		5 A		B
		Flight control – Flight	Degraded aircraft stability In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
		Landing gear	Landing gear failure on landing Dynamic rollover on ground	Return to base Land on airport	5 B		5 B		A
Electric system	Any electric system component	Engine – Ground	Engine hot start	Engine shout-down	5 B		5 B		A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
				Abort mission					
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI) Autorotation	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A
		Fuel	One engine inoperative (OEI) All engine inoperative (AEI)	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
		Display unit	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Avionics	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Communication	Radio failure ICS failure	Return to base	5 B	Day VMC MCF flight	5 A		B
		Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Battery	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Landing gear	Landing gear failure on landing Dynamic rollover on ground	Return to base Land on airport	5 B		5 B		A
		Ice protection	Icing Unreliable instruments In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 C	Day VMC MCF flight Outside icing conditions	5 A		B
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Lightning	Electrical failure Avionics failure Radio failure Structural damage	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
Air spillage	Any air spillage component, including cabin ventilation, air conditioning, and heating	Engine – Ground	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI)	Return to base Land on airport	5 D	Engine(s) performance verification on ground-run and	5 B	Engine(s) functionality verification on ground excludes	A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
			Autorotation	Off airfield precautionary landing Autorotation		hovering before flight		major problems in flight	
		Ice protection	Icing Unreliable instruments In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 C	Day VMC MCF flight Outside icing conditions	5 A		B
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
APU	Any APU component including ground rotor retainment system	Engine – Ground	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI) Autorotation	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A
		Fire – Ground	Fire on ground	Engine shout-down Abort mission on ground	5 C	Support personnel off-board during start-up Firefighters on station	5 B	Early fire detection reduces consequences magnitude	A
		Fire – Flight	Fire in flight	Return to base Off airfield precautionary landing	5 D	MCF flight over sparsely populated areas with	5 B		A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
						emergency landing spaces available			
		Main rotor	Rotor speed control failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Ice protection	Icing Unreliable instruments In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 C	Day VMC MCF flight Outside icing conditions	5 A		B
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
Fuel system	Any fuel system component, including tanks, interconnections, pumps, valves, and heat exchangers	Engine – Ground	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI) Autorotation	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A
		Fuel	One engine inoperative (OEI) All engine inoperative (AEI)	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Autorotation	Autorotation	Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
		Fire – Ground	Fire on ground	Engine shout-down Abort mission on ground	5 C	Support personnel off-board during start-up Firefighters on station	5 B	Early fire detection reduces consequences magnitude	A
		Fire – Flight	Fire in flight	Return to base Off airfield precautionary landing	5 D	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
Anti-icing, de-icing systems	Anti-icing and de-icing systems, included the related electric and hot air components, ice accretion measurement components and systems, windshields heaters, anti-ice structures and screens	Engine – Ground	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI) Autorotation	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A
		Electrical	Electrical black-out Radio failure ICS failure	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
			In flight loss of control (LOC-I)						
		Ice protection	Icing Unreliable instruments In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 C	Day VMC MCF flight Outside icing conditions	5 A		B
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
Navigation system	Any navigation system and any electronic related system, including FMS, integrated maps, and their representation in the cockpit	Display unit	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Avionics	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Lightning	Electrical failure Avionics failure Radio failure Structural damage	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
Landing gear	Any landing gear component and extension/retraction system	Hydraulic	Flight control(s) failure Hydraulically driven system(s) failure	Return to base Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
		Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Landing gear	Landing gear failure on landing Dynamic rollover on ground	Return to base Land on airport	5 B		5 B		A
Air data system	Any air data system component, included data input, output, representation and storage	Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
Flight control surface	Any flying control surface change, repair, balance, calibration, or re-rig (including trim tabs)	Rotor vibrations	Rotor out of balance	Return to base	5 A		5 A		B
		Autorotation	Autorotation	Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Main rotor	Rotor speed control failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Tail rotor	Tail rotor failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Flight control – Ground	AP failure	Engine shout-down Abort mission on ground	5 A		5 A		B
		Flight control – Flight	Degraded aircraft stability In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
Any incident and accident-related structural repair	Any incident and accident-related structural repair	Doors	Aerodynamic-related problems Door detachment Structural damage	Return to base Off airfield precautionary landing	5 B	Do not fly high speed unless required by the maintenance check procedure	5 B		A
Air sensor	Any air sensor and related systems and instruments, including static ports, pitot tubes, air instruments/data systems, and related connections, temperature sensors, and probes	Autorotation	Autorotation	Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
		Display unit	Reduced attitude, engine, or navigation	Return to base Land on airport	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
			information to pilot In flight loss of control (LOC-I)	Off airfield precautionary landing					
		Avionics	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Ice protection	Icing Unreliable instruments In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 C	Day VMC MCF flight Outside icing conditions	5 A		B
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Lightning	Electrical failure Avionics failure Radio failure Structural damage	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Static port	Unreliable instruments In flight loss of control (LOC-I)	Return to base	5 B	Day VMC MCF flight	5 A		B
Gyroscopic system	Any gyroscopic system and instrument, included the information transfer to the aircraft systems	Flight control – Flight	Degraded aircraft stability In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
		Display unit	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Avionics	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Lightning	Electrical failure Avionics failure Radio failure Structural damage	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Pneumatic system	Any pneumatic system and related sub-systems	Ice protection	Icing Unreliable instruments In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 C	Day VMC MCF flight Outside icing conditions	5 A		B
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
Aircraft storage	First flight following an aircraft storage period	Engine – Ground	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI) Autorotation	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A
		Fuel	One engine inoperative (OEI) All engine inoperative (AEI)	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
		Battery	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Aircraft dismantling and re-assembly	Following dismantling and re-assembly of aircraft	Engine – Ground	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A
		Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI) Autorotation	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A
		Fuel	One engine inoperative (OEI) All engine inoperative (AEI)	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
		Autorotation	Autorotation	Autorotation	5 D	MCF flight over sparsely populated areas with autorotative landing spaces available	5 B		A
		Fire – Ground	Fire on ground	Engine shout-down Abort mission on ground	5 C	Support personnel off-board during start-up Firefighters on station	5 B	Early fire detection reduces consequences magnitude	A
		Fire – Flight	Fire in flight	Return to base Off airfield precautionary landing	5 D	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Transmission	Main gearbox and connected systems failure	Return to base Off airfield precautionary landing	5 C	MCF flight over sparsely populated areas with	5 B		A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
						emergency landing spaces available			
		Main rotor	Rotor speed control failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Tail rotor	Tail rotor failure	Return to base Off airfield precautionary landing Autorotation	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Hydraulic	Flight control(s) failure Hydraulically driven system(s) failure	Return to base Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
		Flight control – Ground	AP failure	Engine shout-down Abort mission on ground	5 A		5 A		B
		Flight control – Flight	Degraded aircraft stability In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 D	Full flight controls test on ground before flight	5 B	Flight controls test on ground excludes major problems in flight	A
		Avionics	Reduced attitude, engine, or navigation information to pilot In flight loss of control (LOC-I)	Return to base Land on airport Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
		Communication	Radio failure ICS failure	Return to base	5 B	Day VMC MCF flight	5 A		B
		Electrical	Electrical black-out Radio failure ICS failure In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 B	Day VMC MCF flight	5 A		B
		Landing gear	Landing gear failure on landing Dynamic rollover on ground	Return to base Land on airport	5 B		5 B		A
		Ice protection	Icing Unreliable instruments In flight loss of control (LOC-I)	Return to base Off airfield precautionary landing	5 C	Day VMC MCF flight Outside icing conditions	5 A		B
		Environmental control	Engine spillage failure Degraded performance Compressor stall Autorotation (single engine a/c)	Return to base Land on airport	5 C	Single engine performance required MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Static port	Unreliable instruments In flight loss of control (LOC-I)	Return to base	5 B	Day VMC MCF flight	5 A		B
		Doors	Aerodynamic-related problems Door detachment Structural damage	Return to base Off airfield precautionary landing	5 B	Do not fly high speed unless required by the maintenance check procedure	5 B		A

Maintenance area		Malfunction or Emergency area	Consequence	Contingency action	Risk before	Safety barrier	Risk after	Note	MCF level
Ground run	Any ground run for post-maintenance, trouble shooting, system control or measurement, power check	Engine – Ground	Engine hot start	Engine shout-down Abort mission	5 B		5 B		A
		Fire – Ground	Fire on ground	Engine shout-down Abort mission on ground	5 C	Support personnel off-board during start-up Firefighters on station	5 B	Early fire detection reduces consequences magnitude	A
		Transmission	Main gearbox and connected systems failure	Return to base Off airfield precautionary landing	5 C	MCF flight over sparsely populated areas with emergency landing spaces available	5 B		A
		Flight control – Ground	AP failure	Engine shout-down Abort mission on ground	5 A		5 A		B
Power check	In-flight power check when performed not in conjunction or in consequence to any maintenance, troubleshooting or system verification	Engine – Flight	One engine inoperative (OEI) All engine inoperative (AEI) Autorotation	Return to base Land on airport Off airfield precautionary landing Autorotation	5 D	Engine(s) performance verification on ground-run and hovering before flight	5 B	Engine(s) functionality verification on ground excludes major problems in flight	A