European Aviation Safety Agency — Rulemaking Directorate

Notice of Proposed Amendment 2013-22

Helicopter Vibration Health Monitoring

RMT.0350 AND RMT.0351 (OPS.074 (A) AND OPS.074 (B)) — 19.11.2013

EXECUTIVE SUMMARY

This Notice of Proposed Amendment (NPA) addresses a regulatory issue regarding vibration health monitoring (VHM) system in commercial air transport (CAT) helicopters that have a maximum certified take-off mass of more than 3 175 kg or a maximum operational passenger seating configuration (MOPSC) of more than 9. A VHM system allows detecting mechanical failures before they could lead to a serious incident or accident.

Section II of Part III of ICAO Annex 6 contains a recommendation, not a standard, that this type of helicopters (large helicopters) should be equipped with a VHM system.

NPA 2013-10 'Helicopter offshore operations' already considered this recommendation. It proposes to mandate the installation of a VHM system in CAT helicopters operating in a hostile environment, but not for those operating in a non-hostile environment

Subsequently, the specific objective of this NPA is to validate the need for a regulatory requirement for VHM equipment to be installed in new, and retrofitted to existing CAT helicopters that are not involved in offshore operations, but have a maximum certified take-off mass of more than 3 175 kg or a MOPSC of more than 9.

The Agency has assessed all aspects related to operations by the relevant helicopters with specific attention to the safety level and the cost impact associated with instalment or retro-fitment of a VHM system. The assessment indicates that the major issues in helicopter operations are related to piloting. This information will be further considered during the RMTs addressing pilot licensing and operator pilot training. The Agency concludes that a regulatory requirement for VHM system is not required, as a significant safety improvement for the relevant helicopters would not be introduced. In addition, the associated costs cannot be justified. Consequently, the ICAO Annex 6 recommendation is not transposed into EU legislation for other than helicopter offshore operations in hostile environment.

With this NPA, the Agency publishes its assessment and proposes not to amend the Air OPS rules.

Nevertheless, the Agency encourages EHEST to promote voluntary installation of VHM equipment.

Applicability	
Affected regulations and decisions:	Commission Regulation (EU) No 965/2012 'Air Ops'
Affected stakeholders:	Commercial Air Transport (CAT) operators of helicopters with a MTOM of more than 3 175 kg or a MOPSC of more than 9 not involved in offshore operations. Design organisations of the same helicopters.
Driver/origin:	Legal obligation (ICAO alignment)
Reference:	N/A

Process map	
Concept Paper:	No
Terms of Reference:	23.08.2013
Rulemaking group:	No
RIA type:	Light
Technical consultation during NPA drafting:	No
Duration of NPA consultation:	2 months
Review group:	TBD
Focussed consultation:	TBD
Publication date of the Opinion:	2014/Q3
Publication date of the Decision:	2015/Q3

Table of contents

1. Procedural information

1.1. The rule development procedure

The European Aviation Safety Agency (hereinafter referred to as the 'Agency') developed this Notice of Proposed Amendment (NPA) in line with Regulation (EC) No 216/2008[1] (hereinafter referred to as the 'Basic Regulation') and the Rulemaking Procedure[2].

This rulemaking activity is included in the Agency's Rulemaking Program 2014-2017 under RMT.0350 and RMT.0351 (former task number OPS.074(a) and OPS.074(b)).

The text of this NPA has been developed by the Agency. It is hereby submitted for consultation of all interested parties[3].

The process map on the title page contains the major milestones of the rulemaking activity to date and provides an outlook of the timescale of the next steps.

1.2. The structure of this NPA and related documents

This NPA is based on a light RIA which is included in the safety risk assessment contained in Chapter 2.
The document is structured as follows:
Chapter 1: Procedural information related to the task.
Chapter 2: Explanatory Note on the core technical content.
Chapter 3: Proposed text for the new requirements.
Chapter 4: References to affected IR, AMC and GM.
Chapter 5: Appendices.

1.3. How to comment on this NPA

Please submit your comments using the automated **Comment-Response Tool (CRT)** available at **http://hub.easa.europa.eu/crt/**[4].

The deadline for submission of comments is **20 January 2014**.

1.4. The next steps in the procedure

Following the closing of the NPA public consultation period, the Agency will review all comments.

The outcome of the NPA public consultation will be reflected in the respective Comment-Response Document (CRD).

The Agency will publish the CRD together with the Decision.

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1 Regulation (EC) No 216/2008 of the European Parliament and the Council of 20 February 2008 on common rules in the field of civil aviation and establishing a European Aviation Safety Agency, and repealing Council Directive 91/670/EEC, Regulation (EC) No 1592/2002 and Directive 2004/36/EC (OJ L 79, 19.3.2008, p. 1), as last amended by Commission Regulation (EU) No 6/2013 of 8 January 2013 (OJ L 4, 9.1.2013, p. 34).

2 The Agency is bound to follow a structured rulemaking process as required by Article 52(1) of the Basic Regulation. Such process has been adopted by the Agency's Management Board and is referred to as the 'Rulemaking Procedure'. See Management Board Decision concerning the procedure to be applied by the Agency for the issuing of Opinions, Certification Specifications and Guidance Material (Rulemaking Procedure), EASA MB Decision No 01-2012 of 13 March 2012.

3 In accordance with Article 52 of the Basic Regulation and Articles 5(3) and 6 of the Rulemaking Procedure.

4 In case of technical problems, please contact the CRT webmaster (crt@easa.europa.eu).

2. Explanatory Note

2.1. Issue

2.1.1. Overview of the issues to be addressed

Due to their design, helicopters are potentially vulnerable to catastrophic mechanical failures because of the number of single-load-path critical parts within the rotor and rotor drive systems and the reduced redundancy within their design. These facts and the previously very high accident rates led to the development of Vibration Health Monitoring (VHM) systems which are now established as proven safety tools used to identify the onset of mechanical failure.

Part III of ICAO Annex 6 includes a recommendation that helicopters with a maximum certificated take-off mass in excess of 3 175 kg or a maximum seating configuration of more than 9 should be equipped with a vibration health monitoring system.

NPA 2013-10 'Helicopter offshore operations' included the ICAO recommendation in its consideration when suggesting a regulatory requirement for VHM system in commercial air transport (CAT) operations with helicopters operating in a hostile environment. Helicopter offshore operations are, therefore, not further considered in this NPA.

As a result, this RMT shall address the question if a general requirement for VHM system is considered necessary for CAT helicopters that are not involved in offshore operations, but have a maximum certified take-off mass of more than 3 175 kg or a maximum operational passenger seating configuration (MOPSC) of more than 9. This corresponds with the definition of a large helicopter as given by the airworthiness certification specifications.

If so considered, Annex IV to Commission Regulation (EU) No 965/2012[5] should be amended to include a regulatory requirement on the installation of VHM systems.

2.1.2. Who is affected?

CAT operators which are not involved in offshore operations but utilise helicopters with a maximum certified take-off mass of more than 3 175 kg or a maximum operational passenger seating configuration (MOPSC) of more than 9. These operators are presently not regulatory committed to install a VHM system.

2.1.3. Safety risk assessment

(a) General

The high helicopter accident rates in the 1970s and 1980s were reduced over a period when a number of initiatives implementing quality and safety management systems was introduced. VHM systems were among them. It is, however, difficult to quantify if a safety improvement was attributable to VHM systems.

The principal purpose of a VHM is to increase the likelihood of detection of incipient faults in the rotor and rotor drive system that could prevent continued safe flight and landing by providing timely warning of potential failures to the pilot and maintenance personnel.

[5] Commission Regulation (EU) No 965/2012 of 5 October 2012 laying down technical requirements and administrative procedures related to air operations pursuant to Regulation (EC) No 216/2008 of the European Parliament and of the Council.

The safety risk assessment will indicate if the VHM system should be recommended to be installed in the relevant helicopters.

(b) Number of relevant existing helicopters

The assessment of the Agency's databases indicates that approximately 160 relevant CAT helicopters of different manufacturers and types are operated in the Member States. The majority of the helicopters (97 %) are involved in medevac/air ambulance/HEMS operations. The remaining 3 % perform public transport.

The same databases indicate that another 130 helicopters are involved in 'Utility (civil multi-role)' operations. As the database does not specify if these are CAT operators, they are not considered within this RIA.

(c) Accidents involving the relevant helicopters

From 2001 to the end of 2012, the relevant helicopters were involved in 37 accidents, and 12 different helicopter types were represented according to the Agency's database[6]. The database does not identify if helicopters are equipped with a VHM system, but it is known that the S-92 was so equipped.

Table 1 Helicopters and accidents

EC 145/Bölkow BK-117	9
MIL MI-2 (No longer in service)	9
Sikorsky S-76	4
Bell B-412	3
Eurocopter AS-365	3
Bell B-212	2
PZL Swidnik W3	1
MIL MI-8	1
Eurocopter SA-330	1
Eurocopter AS-332	1
Sikorsky S-61	1
Sikorsky S-92	1
Sum	**36**

[6] See 5.1 for details of the accidents.

According to the accident reports available to the Agency, the accidents are within 4 flight categories;

Table 2	**Accident categories**
Medical	**21**
Passenger	7
Ferry/repositioning	6
Training	2
Sum	**36**

For the purpose of this RMT, the accidents are divided into being technical or non-technical. 32 of 36 accidents appear as non-technical.

Table 3	**Non-technical accident**
Collision with obstacles/CFIT[7]	**21**
Loss of control in flight	4
Damage caused by rotor downwash	3
Mid-air collision	1
Fuel starvation	1
Engine failure due to inlet icing	1
Military intervention (shot down)	1
Sum	**32**

The military intervention is not linked to the operation of the helicopter. Therefore, 31 of the 32 accidents are linked to the operation of the helicopter, representing 86 % of the accidents.

The remaining 4 accidents were due to technical faults (technical accidents). They are individually different and involved 4 helicopter types.

Table 4	**Technical accidents**			
Year	**Accident**	**Cause**	**Helicopter**	**Category**
2003	Gearbox failure	Unknown	MI-2	Ambulance. Over land.
2005	Rotor failure	Servo failure	S-76	Passenger fight. Over water.
2007	Engine failure	Fuel pump failure	S-61	Passenger flight. Over land.
2011	Engine failure	Unknown	Bell 212	Passenger flight. Over land.

[7] CFIT: Controlled flight into terrain.

These accidents represent 11 % of all accidents. Each accident represents less than 3 %.

A presentation of the number of accidents in table 5 illustrates the relationship between operational and technical accidents. In addition, the military intervention is included.

Table 5 Accidents by numbers

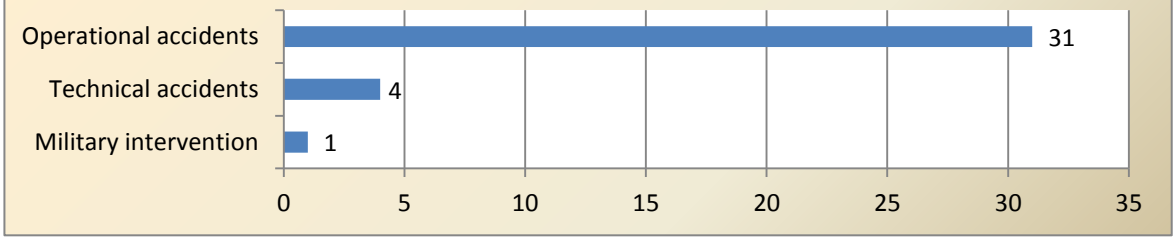


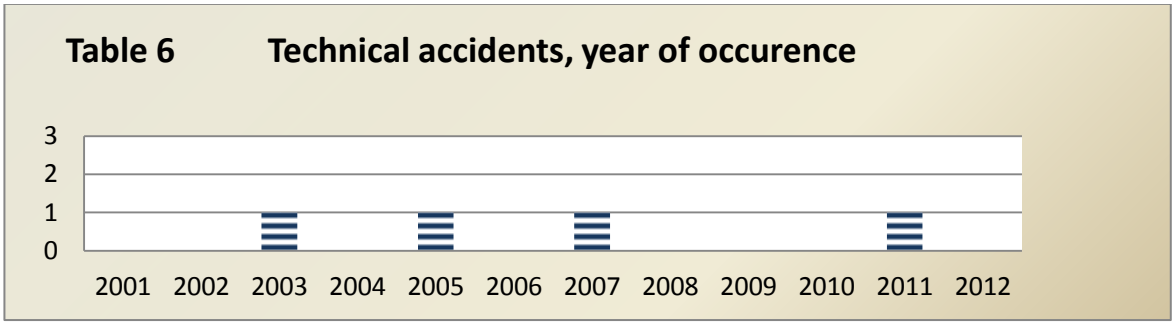
Table 5 illustrates that the main problem areas for the relevant helicopters are found within the operational (non-technical) accidents. This information will be further considered during the RMTs addressing pilot licensing and operator pilot training.

(d) Safety benefits from VHM system in the relevant helicopters

According to the Certification Specification for Large Rotorcraft (CS-29), VHM is vibration monitoring of rotors and/or rotor drive systems. If the VHM system is requested by the applicant or required by operational regulations as specified in CS 29.1465, a safety analysis must be used to identify all component failure modes for which VHM could provide reliable means of early detection, and necessary thresholds for alerts must be established.

The 4 technical accidents that happened during the period from 2001 through 2012 are pictured in table 6.

Table 6 Technical accidents, year of occurence



Statistically the table indicates that technical accidents are few and they are spread throughout the selected timeframe.

The involved helicopters were not equipped with a VHM system.

Engine failure was the cause in 2 of the accidents. A VHM system can monitor the engines but it is unlikely that a pre-warning would have been possible in the case of the fuel pump failure. In the case of the unknown engine failure, a possible VHM warning cannot be disregarded, however, it cannot be substantiated.

The gearbox failure that caused one of the remaining accidents might have been preventable by using VHM. However, as the cause of failure remains unknown, it is impossible to substantiate this statement.

A main rotor failure was caused by failure of a servo actuator. It is unlikely for this to have resulted in significant vibration prior to the accident.

Future failure of rotor and transmission systems can be minimised by good design, but they may still occur. In this respect, VHM can provide additional benefits.

There are also other factors to be considered. Operations solely over land under VFR have the prerogative to make unscheduled precautionary or emergency landings should a technical problem arise. The potential benefit of a VHM system for these operations may not be as significant. When flights are performed under IFR, over water, at night or over hostile land areas, the operator may, however, see an advantage in a VHM system.

(e) Safety risk assessment – conclusion

The majority of the helicopters covered by this NPA are used in ambulance/HEMS operations (157). Those operations are typically conducted in VMC. The remaining helicopters are passenger flights (5) over water or over land.

During a 12-year period (2001 – 2012) these helicopters experienced 4 technically related accidents out of a total of 36 accidents. There are no similarities between the accidents except that the end result was an engine failure in 2 of the accidents.

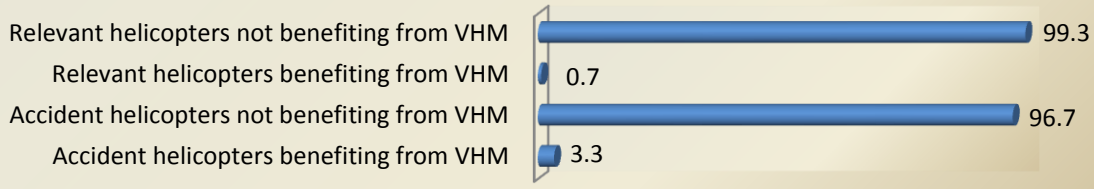
The 4 technical accidents involved 4 of the 12 helicopter types exposed to accidents in general.

According to CS-29, a VHM system is vibration monitoring of rotors and/or rotor drive systems. If the system is requested by the applicant or required by operational regulations, component failure modes and necessary thresholds for alerts must be established based on a safety analysis.

The helicopters did not have a VHM system installed. In 2 of the accidents, the initiation causes might have been detectable by a VHM system. It would, however, be speculative to apply that such system, if it was installed, would have provided a pre-warning. VHM systems are assumed to initiate warnings for approximately 60 % of all potentially catastrophic rotor drive system failure cases.

By applying statistics to the above figures; of the 162 relevant helicopters, 36 experienced accidents. 4 of them were technical accidents of which 2 had a 60 % possibility to be detected if a VHM system was fitted. This indicates that 0,7 % of all the relevant helicopters or 3,3 % of the helicopters involved in accidents might have benefited from a VHM system as shown in table 7.

Table 7 Potential effectiveness of VHM system on past accidents



As stated in (d) above, a VHM system is not a panacea that will prevent all failures as it will have its own limitations.

The Agency concludes that based on the review of accidents, mandatory fitment of a VHM system cannot be justified.

However, as it is a general assumption or acceptance in the industry that a VHM system may provide extra safety benefits, the Agency is proposing to the European Helicopter Safety Team (EHEST) to promote voluntary installation of VHM equipment in the relevant helicopters and to develop guidance for operators how best to use the data to improve operations.

2.2. Objectives

The overall objectives of the EASA system are defined in Article 2 of the Basic Regulation. This proposal will contribute to the achievement of the overall objectives by addressing the issues outlined in Chapter 2.1.

This NPA shall validate if a VHM system introduces a significant safety improvement for helicopter operations.

2.3. Policy options

Three policy options were suggested in the Pre-RIA as detailed in table 8.

Table 8 Selected policy options

Option	*Short title*	**Description**
0	Do nothing	Baseline option. Leave regulations unchanged. Regulatory requirement for VHM system will not be introduced.
1	Amend regulations	Regulatory requirement for VHM system will be introduced A) for new helicopters B) for new helicopters and helicopters in service
2	Encourage instalment	Regulatory requirement for VHM system will not be introduced, but instalment and use of the system will be promoted.

2.4. Analysis of impacts

2.4.1. Safety impact

On the one hand, the installation of a VHM system allows detection of incipent faults in mechanical systems. This could prevent hazardous and catastrophic failure conditions arising as appropriate maintenance action can be taken. On the other hand, the accidents

review shows that most of the helicopter accidents are due to loss of control or controlled flight into terrain. It cannot be established with certainty that in the few accidents that were caused by mechanical failures, the systems would not have failed, had a VHM system been installed. In addition, it is to be considered that most operations take place in accordance with VFR and that onshore helicopter operations are conducted in a manner that allows a safe forced landing. A clear safety benefit by installing VHM system cannot, therefore, be established. Nevertheless, it could be for certain type of operations and operating environment. This is, however, a decision to be taken by the operator based on its hazard identification process. Option 2 is, therefore, seen as having a slightly positive impact while options 0 and 1 are neutral.

2.4.2. Environmental impact

Not affected.

2.4.3. Social impact

Not affected.

2.4.4. Economic impact

A VHM system retro-fitted or installed in a helicopter will reduce the available payload which for some operations may be significant. Necessary upgrading or training within the maintenance facilities will be required to interpret and use the data to improve operations. These facts have an economic impact.

Retro-fitment of a VHM system into existing helicopters must be performed during a major overhaul, some of which are not planned before 2018 according to operators. For some of the relevant helicopters, retro-fitment is expected to be not technically challenging. For helicopter types that do not already use VHM system, and for those where manufacturer retrofit SB[8] or STC[9] does not exist, the installation requires a very long downtime, and for some of them, installation is not considered technically feasible. The associated economic impact for a similar safety gain will, therefore, vary substantially for the different helicopter types if at all available.

Installation of VHM system prior to delivery of a new helicopter is feasible at an extra cost of approximately EUR 0.5 million, which is approximately 12 % of the basic price for a helicopter (Bell 429: EUR 4.2 million). An annual service/support cost is quoted at EUR 15 000.

The economic impact associated with VHM system retro-fit or installation is related only to option 1 which is affected negatively. Options 0 and 2 do not have an economic impact (neutral).

2.4.5. Proportionality issues

The potential cost impact of option 1 may create an undue higher burden for small operators in comparison to larger operators.

This is a negative influence for option 1.

2.4.6. Impact on 'Better Regulation' and harmonisation

Based on the analysis above, 'Better Regulation' and harmonisation is not achieved by any of the options. Options 0 and 2 do not initiate any requirements for regulation. Therefore, harmonisation remains unchanged without negative consequences. This influences options 0 and 2 neutrally.

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[8] Service Bulletin
[9] Supplemental Type Certificate

Option 1 will introduce a not wanted or not required regulation, but will harmonise regulations in a not wanted direction. This influences option 1 negatively.

2.4.7. Comparison and conclusion

Comparison of options

Table 8 depicts the comparison between options 0, 1 and 2.

The options are graphically introduced by assigning values to the influences;

— Positive = +
— Neutral = 0
— Negative = -

Table 8 Comparison of options

Impacts	**Option 0**	**Option 1**	**Option 2**
Safety	0	0	0/+
Economic	0	-	0
Proportionality issues	0	-	0
'Better Regulation' and harmonisation	0	-	0
Result	**0**	**-**	**0**

Conclusion

As a general rule the safety and economic options are weighed highest during comparison. Based on this and also the remaining options, it is evident that options 0 'No amended regulation' and 2 'Encourage installation' are preferred.

This indicates that a regulatory requirement for VHM system in the relevant helicopters will not be proposed, but the Agency will encourage installation of the system on a voluntary basis.

2.5. Overview of the proposed amendments

2.5.1. Which IR or ACM and GM might need amendment

Based on the above explanations the Agency will not amend Commission Regulation (EU) No 965/2012 or EASA Acceptable Means of Compliance (AMC) or Guidance Material (GM) to Part CAT to include a requirement for VHM system in CAT helicopters that are not involved in offshore operations, but have a maximum certified take-off mass of over 3 175 kg or a MOPSC of more than 9.

ICAO compliance is not affected as the corresponding ICAO provision has the status of a recommendation.

3. Proposed amendments

3.1. Draft Regulation (Draft EASA Opinion)

Amendments to Commission Regulation (EU) No 965/2012 are not proposed.

3.2. Draft Acceptable Means of Compliance and Guidance Material

Amendments to the associated AMC and GM are not proposed.

4. References

4.1. Affected regulations

Commission Regulation (EU) No 965/2012 is not affected.

4.2. Affected AMC and GM

EASA Acceptable Means of Compliance (AMC) and Guidance Material (GM) are not affected.

4.3. Reference documents

The Agency is going to bring this issue to EHEST with a recommendation to encourage installation of VHM equipment on a voluntary basis in those large CAT helicopters that are not involved in offshore operations in hostile areas.

5. Appendices

5.1. Reported accidents

Occurrence 1 of 36

File number		**Local Date**	2001-03-24	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	None
Aircraft Make/Model /Series	SIKORSKY - S76			**Damage Level**	Minor
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-tree / tall vegetation - **– *during*** Landing - Vertical landing -				

Occurrence 2 of 36

File number		**Local Date**	2002-02-09	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** LALT: Low altitude operations	**Injury Level**	None
Aircraft Make/Model /Series	BK117			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Passenger
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Weather encounters - - - **– *during*** En-route - - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-tree / tall vegetation - **– *during*** En-route - **Event 3 :** Consequential events - Forced landing - - - **– *during*** Post-impact - -				

Occurrence 3 of 36

File number		**Local Date**	2002-02-13	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** RAMP: Ground Handling	**Injury Level**	Fatal
Aircraft Make/Model /Series	MI 2			**Damage Level**	Minor
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-person - **– *during*** Standing - Standing : Rotors turning -				

Occurrence 4 of 36

File number		**Local Date**	2002-05-12	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** LOC-I: Loss of control - inflight	**Injury Level**	None

Aircraft Make/Model /Series	MI-2			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft/system/component - - - - **– *during*** En-route - Cruise - **Event 2 :** Aircraft operation general - Helicopter flight path deviation - Helicopter - inadequate rotor rpm - - **– *during*** Manoeuvring - - **Event 3 :** Aircraft operation general - Aircraft handling - Hard landing - - **– *during*** Landing - Emergency landing or off-runway landing -				

Occurrence 5 of 36

File number		**Local Date**	2002-11-24	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CFIT: Controlled flight into or toward terrain	**Injury Level**	Fatal
Aircraft Make/Model /Series	BELL-412			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Weather encounters - IMC - - **– *during*** Approach - - **Event 2 :** Consequential events - Missed approach - - - **– *during*** Approach - - **Event 3 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - - **– *during*** Approach - Missed approach or go-around - **Event 4 :** Aircraft/system/component - Non-component specific events - Explosions / fire/ fumes / smoke - Fire - **– *during*** Post-impact - -				

Occurrence 6 of 36

File number		**Local Date**	2003-01-29	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** SCF-PP: power plant failure or malfunction	**Injury Level**	None
Aircraft Make/Model /Series	PZL - W3			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft/system/component - 7200 Turbine engine - - - **– *during*** Manoeuvring - - **Event 2 :** Consequential events - Engine shutdown/flameout - - - **– *during*** Manoeuvring - - **Event 3 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - high terrain - **– *during*** Landing - -				

Occurrence 7 of 36

File number		**Local Date**	2003-06-03	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** SCF-NP: System/component failure or malfunction [non-power plant]	**Injury Level**	None

Aircraft Make/Model /Series	MI 2			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft/system/component - 6300 Main rotor drive system - 6320 Main rotor transmission - - ***– during*** Take-off - Initial climb - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - level terrain - ***– during*** Take-off - Initial climb -				

Occurrence 8 of 36

File number		**Local Date**	2003-06-05	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** ADRM: Aerodrome **2:** TURB: Turbulence encounter	**Injury Level**	Serious
Aircraft Make/Model /Series	BK117			**Damage Level**	None
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Injuries to persons - Injuries-propeller/jet blast - - ***– during*** Landing - Vertical landing -				

Occurrence 9 of 36

File number		**Local Date**	2003-12-18	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CFIT: Controlled flight into or toward terrain	**Injury Level**	Serious
Aircraft Make/Model /Series	BELL-212			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Ferry/positioning
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - level terrain - ***– during*** En-route - Cruise -				

Occurrence 10 of 36

File number		**Local Date**	2003-12-19	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	None
Aircraft Make/Model /Series	BK117			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Emergency

					Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-other object - **– *during*** Taxi - Air taxi/hover taxi -				

Occurrence 11 of 36

File number		**Local Date**	2004-03-30	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	Fatal
Aircraft Make/Model /Series	AS365			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-cable/wire/power line - **– *during*** Take-off **Event 2 :** Consequential events - Emergency descent - - - **– *during*** Take-off - - **Event 3 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - - **– *during*** Take-off - -				

Occurrence 12 of 36

File number		**Local Date**	2004-06-11	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	Minor
Aircraft Make/Model /Series	BK117			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - - **– *during*** Landing - Vertical landing - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - - **– *during*** Landing - -				

Occurrence 13 of 36

File number		**Local Date**	2004-09-18	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CFIT: Controlled flight into or toward terrain	**Injury Level**	None
Aircraft Make/Model /Series	SIKORSKY - S76			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive	**Event 1 :** Aircraft operation general - Aircraft handling - Undershoot - - **– *during*** Approach - Final approach -				

Factors	**Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - level terrain - **– *during*** **-**Final approach -

Occurrence 14 of 36

File number		**Local Date**	2004-11-21	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** LALT: Low altitude operations	**Injury Level**	None
Aircraft Make/Model /Series	SA 365			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Training/check
Events and Descriptive Factors	**Event 1 :** Consequential events - Ditching - - - **– *during*** Manoeuvring - Hovering - Hovering in ground effect **Event 2 :** Aircraft operation general - Aircraft handling - Altitude related - Too close to ground - **– *during*** Manoeuvring - Hovering - Hovering in ground effect				

Occurrence 15 of 36

File number		**Local Date**	2005-03-14	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** LOC-I: Loss of control - inflight	**Injury Level**	Serious
Aircraft Make/Model /Series	MI 2			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Helicopter flight path deviation - Helicopter - other deviation from flight path - - **– *during*** Landing - Vertical landing - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - level terrain - **– *during*** Landing - Emergency landing or off-runway landing -				

Occurrence 16 of 36

File number		**Local Date**	2005-03-31	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** AMAN: Abrupt maneuvre **2:** LOC-I: Loss of control - inflight **3:** F-POST: Fire/smoke (post-impact)	**Injury Level**	Serious
Aircraft Make/Model /Series	MI 2			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft handling - Abrupt manoeuvre - Crew-manoeuvre - **– *during*** Take-off - Vertical take-off - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-other object - **– *during*** Vertical take-off - **Event 3 :** Aircraft/system/component - Non-component specific events - Explosions / fire/				

	fumes / smoke - Fire - – ***during*** Post-impact - -

Occurrence 17 of 36

File number		**Local Date**	2005-04-21	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** SEC: Security related	**Injury Level**	Fatal
Aircraft Make/Model /Series	MI 8			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Passenger
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Security generally - Military intervention - - – ***during*** En-route - -				
Narrative	Unofficial: The helicopter was ferrying pax when it went down. The national army claimed responsibility for shooting down a helicopter and killing all 11 people onboard -- one of them apparently executed after surviving the crash.				

Occurrence 18 of 36

File number		**Local Date**	2005-08-10	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** SCF-NP: System/component failure or malfunction [non-powerplant] **2:** LOC-I: Loss of control - inflight	**Injury Level**	Fatal
Aircraft Make/Model /Series	SIKORSKY - S76			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Passenger
Events and Descriptive Factors	**Event 1 :** Aircraft/system/component - 6700 Rotorcraft flight control system - - - – ***during*** En-route - - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - level terrain - – ***during*** En-route - -				

Occurrence 19 of 36

File number		**Local Date**	2005-08-17	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	None
Aircraft Make/Model /Series	BK117			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-tree / tall vegetation - – ***during*** Landing - - **Event 2 :** Aircraft operation general - Aircraft handling - Hard landing - - – ***during*** Landing - -				

Occurrence 20 of 36

File number		**Local Date**	2005-09-06	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** LOC-I: Loss of control - inflight	**Injury Level**	None
Aircraft Make/Model /Series	MI 2			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Air Navigation Services - Operational issues - Communications - - **– *during*** Approach - Final approach - **Event 2 :** Aircraft operation general - Aeroplane flight path deviation - Aeroplane - mush/stall - - **– *during*** Approach - Final approach -				

Occurrence 21 of 36

File number		**Local Date**	2005-09-28	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CFIT: Controlled flight into or toward terrain	**Injury Level**	Fatal
Aircraft Make/Model /Series	BK117			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - high terrain - **– *during*** En-route - Cruise -				

Occurrence 22 of 36

File number		**Local Date**	2005-11-04	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** TURB: Turbulence encounter	**Injury Level**	Serious
Aircraft Make/Model /Series	BELL-412			**Damage Level**	None
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Injuries to persons - Injuries-propeller/jet blast - - **– *during*** Landing - Run-on landing -				

Occurrence 23 of 36

File number		**Local Date**	2005-12-14	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** TURB: Turbulence encounter	**Injury Level**	Minor
Aircraft Make/Model	BK117			**Damage Level**	Substantial

/Series					
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Damage to aircraft - Propeller/rotor/jet blast - - **– *during*** Landing - Vertical landing - **Event 2 :** Aircraft operation general - Damage to aircraft - Damaged by object - - **– *during*** Landing - Vertical landing -				

Occurrence 24 of 36

File number		**Local Date**	2006-01-25	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** F-POST: Fire/smoke (post-impact) **2:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	Fatal
Aircraft Make/Model /Series	SA330 J			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Passenger
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - - **– *during*** Take-off - Vertical take-off - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - - **– *during*** - -				

Occurrence 25 of 36

File number		**Local Date**	2006-03-05	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CFIT: Controlled flight into or toward terrain	**Injury Level**	Fatal
Aircraft Make/Model /Series	SA365			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Ferry/positioning
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - high terrain - **– *during*** En-route - -				

Occurrence 26 of 36

File number		**Local Date**	2006-11-27	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CFIT: Controlled flight into or toward terrain	**Injury Level**	Fatal
Aircraft Make/Model /Series	BELL-412			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Ferry/positioning
Events and	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft -				

Descriptive Factors	Collision aircraft - terrain - Aircraft collision - high terrain - **– *during*** En-route - Climb to cruising level or altitude -

Occurrence 27 of 36

File number		**Local Date**	2007-03-05	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** MAC: Airprox/ ACAS alert/ loss of separation/ (near) midair collisions	**Injury Level**	Fatal
Aircraft Make/Model /Series	AS332 - DA20 -			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Ferry/positioning
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Aircraft collision - moving aircraft - Aircraft collision - both aircraft aloft - **– *during*** En-route - -				

Occurrence 28 of 36

File number		**Local Date**	2007-04-03	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	None
Aircraft Make/Model /Series	SIKORSKY - S76			**Damage Level**	Minor
Registration		**Operator**		**Operation type**	CAT Training/check
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft handling - Beside landing surface - - **– *during*** Landing - - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-other object - **– *during*** Vertical landing - **Event 3 :** Consequential events - Evacuation - - - **– *during*** Post-impact - - **Event 4 :** Aircraft operation general - Damage to aircraft - - - **– *during*** Vertical landing -				

Occurrence 29 of 36

File number		**Local Date**	2007-04-18	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** SCF-PP: powerplant failure or malfunction	**Injury Level**	None
Aircraft Make/Model /Series	SIKORSKY - S61 N			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Passenger
Events and Descriptive Factors	**Event 1 :** Aircraft/system/component - 7200 Turbine engine - 7201 Turbine engine - generally - Turbine engine - mechanical failure - **– *during*** Approach - - **Event 2 :** Aircraft/system/component - 7200 Turbine engine - 7201 Turbine engine - generally - Turbine engine - fuel starvation - **– *during*** Approach - - **Event 3 :** Consequential events - Engine shutdown/flameout - Engine shutdown (hard) - - **– *during*** Approach - - **Event 4 :** Aircraft operation general - Aircraft handling - Hard landing - - **– *during*** Approach -				

Occurrence 30 of 36

File number		**Local Date**	2007-12-06	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** LOC-I: Loss of control - inflight	**Injury Level**	Serious
Aircraft Make/Model /Series	MI 2			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Ferry/positioning
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Flight crew - - - **– *during*** Standing - Standing : Other - **Event 2 :** Aircraft operation general - Weather encounters - IMC - - **– *during*** Final approach - **Event 3 :** Aircraft operation general - Flight crew - - - **– *during*** Approach - Final approach - **Event 4 :** Consequential events - Missed approach - - - **– *during*** Approach - Final approach - **Event 5 :** Consequential events - Missed approach - - - **– *during*** Approach - Final approach - **Event 6 :** Aircraft operation general - Weather encounters - Loss of visual reference - - **– *during*** Approach - Final approach - **Event 7 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - level terrain - **– *during*** Final approach -				

Occurrence 31 of 36

File number		**Local Date**	2008-07-07	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** FUEL: Fuel related	**Injury Level**	Serious
Aircraft Make/Model /Series	MI 2			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Ferry/positioning
Events and Descriptive Factors	**Event 1 :** Aircraft/system/component - 7200 Turbine engine - 7201 Turbine engine - generally - Turbine engine - fuel starvation - **– *during*** En-route - - **Event 2 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - level terrain - **– *during*** En-route - -				

Occurrence 32 of 36

File number		**Local Date**	2008-12-21	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	None
Aircraft Make/Model /Series	BK117			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-tall structure - **– *during*** Landing - -				

Occurrence 33 of 36

File number		**Local Date**	2009-02-17	**State of Occurrence**	

Occurrence Class	Accident	**Occurrence Category**	**1:** WSTRW: Windshear or thunderstorm. **2:** LALT: Low altitude operations	**Injury Level**	Fatal
Aircraft Make/Model /Series	MI 2			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - - – ***during*** En-route - -				

Occurrence 34 of 36

File number		**Local Date**	2011-03-30	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** ARC: Abnormal runway contact	**Injury Level**	None
Aircraft Make/Model /Series	SIKORSKY - S92			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Passenger
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft handling - - - – ***during*** Standing - - **Event 2 :** Aircraft operation general - Aircraft handling - Hard landing - - – ***during*** - -				

Occurrence 35 of 36

File number		**Local Date**	2011-10-18	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** SCF-PP: powerplant failure or malfunction	**Injury Level**	None
Aircraft Make/Model /Series	BELL-212			**Damage Level**	Substantial
Registration		**Operator**		**Operation type**	CAT Passenger
Events and Descriptive Factors	**Event 1 :** Aircraft/system/component - 7200 Turbine engine - 7201 Turbine engine - generally - - – ***during*** En-route - - **Event 2 :** Consequential events - Emergency autorotation (helicopter) - - - – ***during*** En-route - Emergency descent en-route - **Event 3 :** Aircraft operation general - Helicopter flight path deviation - Helicopter - dynamic roll-over - - – ***during*** Landing - Emergency landing or off-runway landing -				

Occurrence 36 of 36

File number		**Local Date**	2012-07-21	**State of Occurrence**	
Occurrence Class	Accident	**Occurrence Category**	**1:** LOC-I: Loss of control - inflight **2:** CTOL: Collision with obstacle(s) during take-off and landing	**Injury Level**	Minor

Aircraft Make/Model /Series	BK117			**Damage Level**	Destroyed
Registration		**Operator**		**Operation type**	CAT Emergency Medical Service
Events and Descriptive Factors	**Event 1 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - object ground - Collision aircraft-cable/wire/power line - – ***during*** Take-off - Vertical take-off - **Event 2 :** Aircraft operation general - Helicopter flight path deviation - Helicopter - deviation from heading - - – ***during*** Take-off - Uncontrolled descent during take-off - **Event 3 :** Aircraft operation general - Aircraft - collisions with obstacle/terrain/aircraft - Collision aircraft - terrain - Aircraft collision - level terrain - – ***during*** Take-off - Uncontrolled descent during take-off -				

Source: EASA database

5.2. Oversight of relevant helicopters

Row Labels	Count of Aircraft Type
Agusta-Bell	**11**
14	**11**
Medevac / Air Ambulance / EMS / Airborne Hospital	11
AgustaWestland	**21**
15	**21**
Medevac / Air Ambulance / EMS / Airborne Hospital	19
Passenger	2
Bell Helicopter Textron	**13**
14	**13**
Medevac / Air Ambulance / EMS / Airborne Hospital	12
Passenger	1
Eurocopter	**110**
10	**91**
Medevac / Air Ambulance / EMS / Airborne Hospital	91
12	**19**
Medevac / Air Ambulance / EMS / Airborne Hospital	19
NH Industries	**1**
20	**1**
Medevac / Air Ambulance / EMS / Airborne Hospital	1
Sikorsky	**4**
12	**2**
Medevac / Air Ambulance / EMS / Airborne Hospital	2
24	**2**
Passenger	2
WSK-PZL Swidnik	**2**
12	**2**
Medevac / Air Ambulance / EMS / Airborne Hospital	2
Grand Total	**162**

Source: EASA database Ascend