Accident Investigation Board Norway

Version 2, issued 27 May 2016

UPDATE TO PRELIMINARY REPORT ON ACCIDENT AT TURØY, NEAR BERGEN, NORWAY ON 29 APRIL 2016, INVOLVING AIRBUS HELICOPTERS H225, LN-OJF OPERATED BY CHC HELIKOPTER SERVICE AS

This report is a preliminary and incomplete representation of AIBN's investigations in connection with the relevant aircraft accident. The report may contain faults and inaccuracies. The final report will be the Accident Investigation Board's official document concerning the accident and investigation.

Aircraft:	
- Type and reg.:	Airbus Helicopters H225, LN-OJF
Serial No.:	2721
Call sign:	HKS241
No. and Type of Engines:	2 x Turbomeca Makila 2A1 turboshaft engines
Date and time (local):	Friday 29 April 2016 at 11:55 hours
Year of Manufacture:	2009
Accident site:	Turøy, Hordaland county, Norway (Pos. 60,45234°N 004,93028°E) Radial/Distance from ENBR: 330°/13 NM
Weather conditions:	METAR ENBR 290950Z 20017KT 9999 SCT018 SCT023 07/03 Q1005 NOSIG RMK WIND 1200FT 19020KT=
Light conditions:	Daylight
Operator:	CHC Helikopter Service AS
Type of Operation:	Commercial Air Transport (CAT), Non-scheduled operations
Persons on board:	Crew - 2 (Fatal) Passengers – 11 (Fatal)
Nature of damage:	Helicopter destroyed
Information Source:	AIBN Field Investigation

All times given in this report are local time (UTC + 2 hours) unless otherwise stated.

Introduction

This update to the Preliminary report is published to disseminate information obtained during the ongoing investigation[1]. The intention is to give a brief update on the progress and findings four weeks into the investigation.

The official investigation team led by AIB Norway (AIBN) met at Airbus Helicopters (AH) in Marignane on 24, 25 and 26 May 2016 with the additional participation, BEA France, AAIB UK, EASA, CAA UK and CHC.

[1] *Regulation (EU) No 996/2010 of the European Parliament and of the Council of 20 October 2010 on the investigation and prevention of accidents and incidents in civil aviation, Art. 2.*

The main purpose of this 3 days meeting was to agree on further investigation of the parts that the AIBN had sealed and sent to Airbus Helicopters, and to discuss a list of possible scenarios that could explain the detachment of the main rotor. The scenarios that are considered as possible initiating events are mentioned at the end of this updated preliminary report.

History of Flight

HKS241 was enroute from Gullfaks B (ENQG) to Bergen Airport Flesland (ENBR). The helicopter was cruising at 2000 ft when the Main Rotor Head (MRH) and mast suddenly detached.

The helicopter impacted on a small island and caught fire. The main wreckage thereafter ended in the sea where it came to rest at a depth of 1-9 meters. The accident was not survivable.

Initial Phase of the Investigation

The CVFDR (Combined Voice and Flight Data Recorder) was salvaged from the tail section of the helicopter the day of the accident. The recorder was taken to the Air Accidents Investigation Branch (AAIB) at Farnborough, UK for read-out. Two days after the accident, both voice and flight data was successfully downloaded.

The main wreckage was recovered from under water and brought to the naval base Haakonsvern the day after the accident. The Main Rotor Head (MRH) and other parts found on land were taken to the same place for preparation, registration and preliminary examination.

According to international Standards and Recommended Practices (ICAO Annex 13), the State of Occurrence shall institute and be responsible for the investigation. AIBN has taken on the responsibility for this investigation and has called upon assistance from France (the State of Design and Manufacture) and the UK AAIB (Air Accidents Investigation Branch)[2]. Le Bureau d'Enquêtes et d'Analyses (BEA) pour la Sécurité de l'Aviation civile is supported by technical advisors from Airbus Helicopters and the Engine manufacturer Turbomeca. From the UK, QinetiQ are contributing with their technical expertise.

In addition, the European Aviation Safety Agency (EASA) is the competent certification Authority for Airbus Helicopters H225 and participates as Advisor to the AIBN. The Norwegian Civil Aviation Authority (N-CAA), the UK Civil Aviation Authority (UK CAA) and the Operator CHC Helikopter Service are also advisors and part of the team.

Initial Examinations

The recordings on the CVFDR showed that everything appeared to be normal until a sudden catastrophic failure developed in 1-2 seconds. The CVFDR recordings ended abruptly at the same time. There are no indications that flight crew actions were a factor in the accident. A spectral analysis of the CVR data has been carried out. There was no obvious indication of an abnormality before the sudden detachment of the rotor head.

On 5 May, all the retrieved parts from the helicopter wreckage were taken from Haakonsvern to the AIBN premises in Lillestrøm, where all parts of particular interest for the investigation have been selected for more detailed inspections/examinations.

The Health and Usage Monitoring System (HUMS/PCMCIA) card was retrieved and has been examined by BEA. The logic of the HUMS system is that HUMS data is saved to the card after the

[2] *ICAO Annex 13 does not preclude the State conducting the investigation from calling upon the best technical expertise from any source. In particular if a State believes that a useful contribution can be made to the investigation or when such participation might result in increased safety.*

helicopter has landed onshore. Thus, data from the accident flight was not available. However, the system also stores some Flight Data parameters that are used for Flight Data Monitoring (FDM). On 12 May, the BEA succeeded in downloading FDM data that extended approximately 13 seconds beyond the CVFDR data. A preliminary analysis was ready a week later. It provides valuable information about the sequence of events and will be analysed further.

On 20 May, key pieces of wreckage were sent to selected laboratories, including Airbus Helicopters, for detailed examination. Detailed examination work continues to focus on the MRH suspension bar assembly, the main gearbox and the main rotor head. Other wreckage parts and components are also being examined in parallel.

Search for Components

Whilst several parts vital for the investigation have been recovered the four weeks since the accident, some key components are still missing. These components are in particular the epicyclical second stage planet gear carrier and parts of the forward suspension bar. A comprehensive search involving both civil and military resources was organised by AIBN until Friday 20 May. Before the next search phase is launched, the intention is to study in detail all information from the searches som far. A refined flight path and mapping of where the different components have been found will be carried out in order to possibly fine-tune a new search for these key components. Please refer to the AIBN web page for additional information on missing components and instructions on how to behave if 3rd parties discover parts from the helicopter.

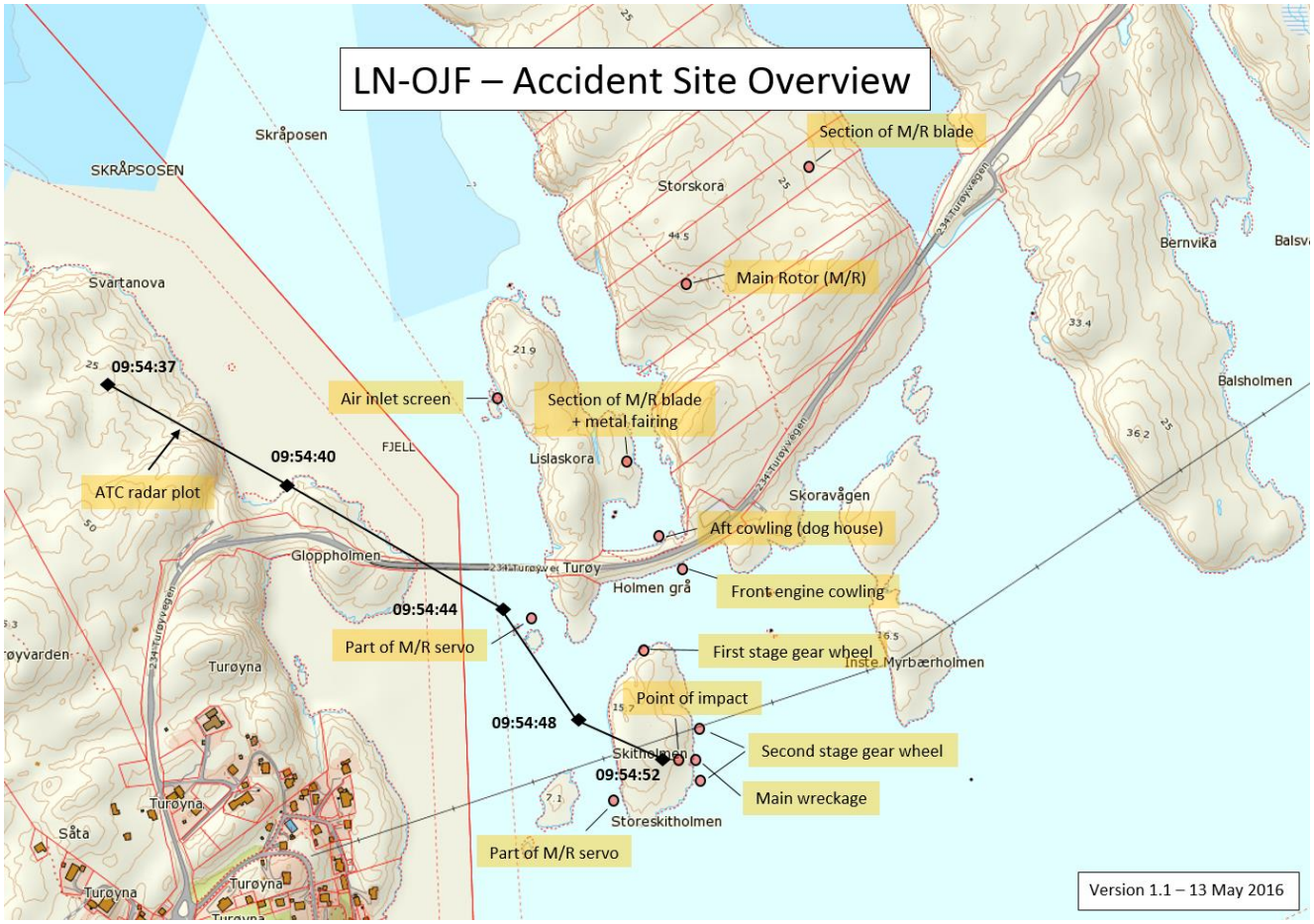

Figure 1: The Accident Site. (Time on ATC Radar Plot is UTC.) Map: © The Norwegian Mapping Authority. Illustration: AIBN

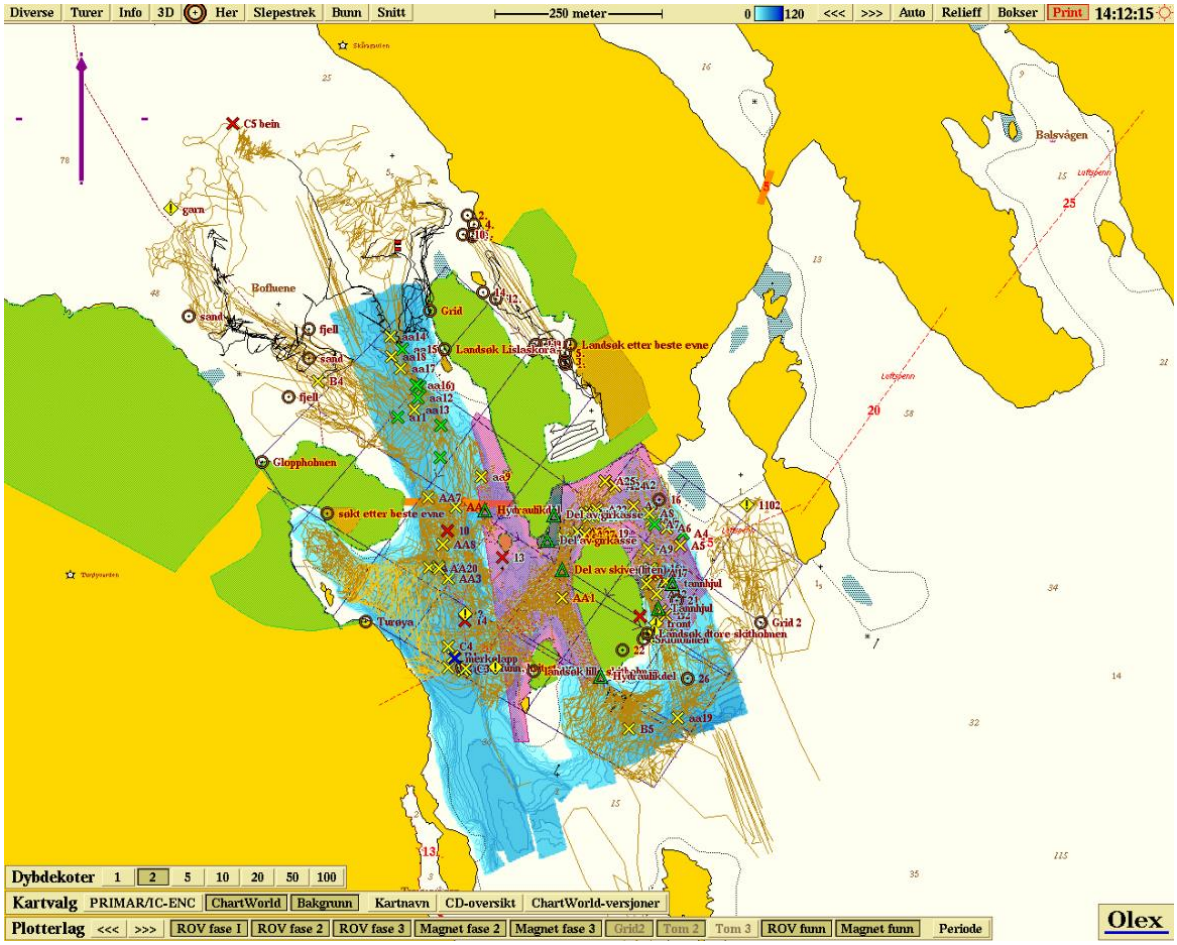

Figure 2: Illustration of underwater search grid.

Samples of retrieved components

Figure 3: MGB Right and left hand aft suspension bars with attachment fittings. Photo: AIBN

Figure 4: Upper forward suspension bar fitting. Photo: AIBN

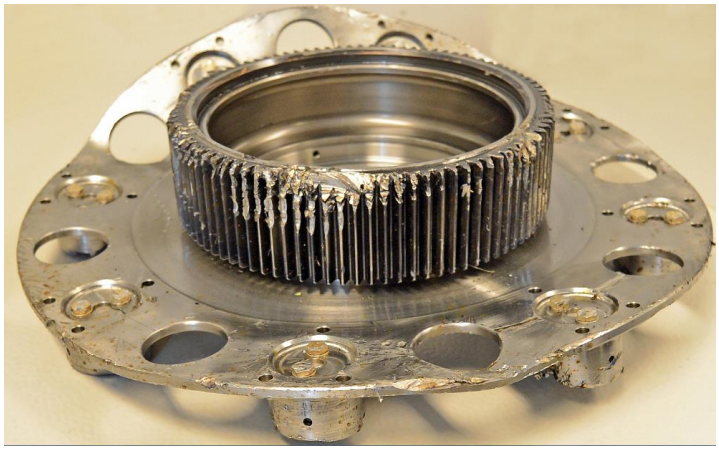

Figure 5: MGB first stage planetary gear carrier. Photo: AIBN

Figure 6: Parts from second stage planet gear. (The fractured gear is placed on top of a sample gear that was not involved in the accident.) Photo: AIBN

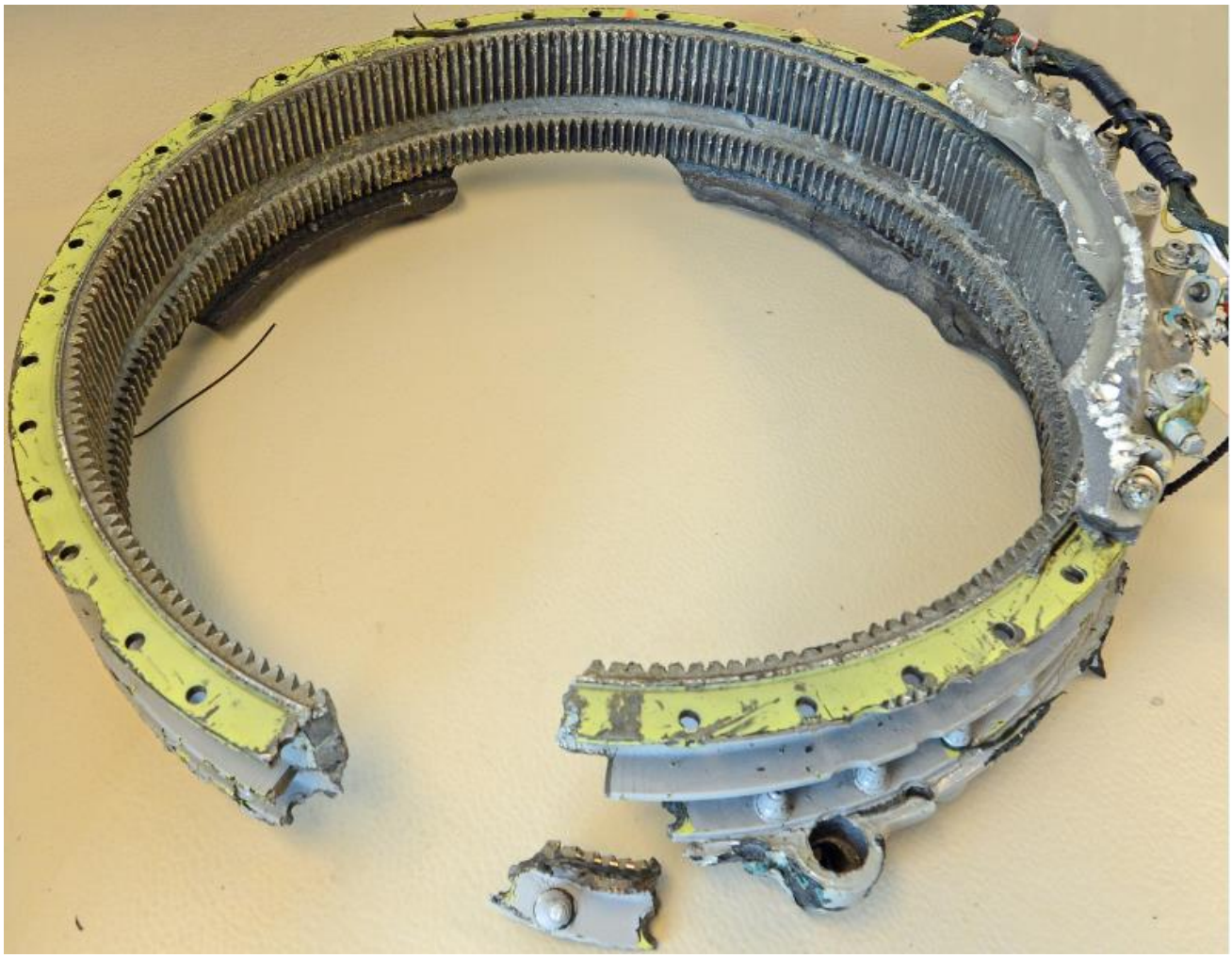

Figure 7: Ring Gear. Photo: AIBN

Figure 8: First stage Sun Gear. Photo: AIBN

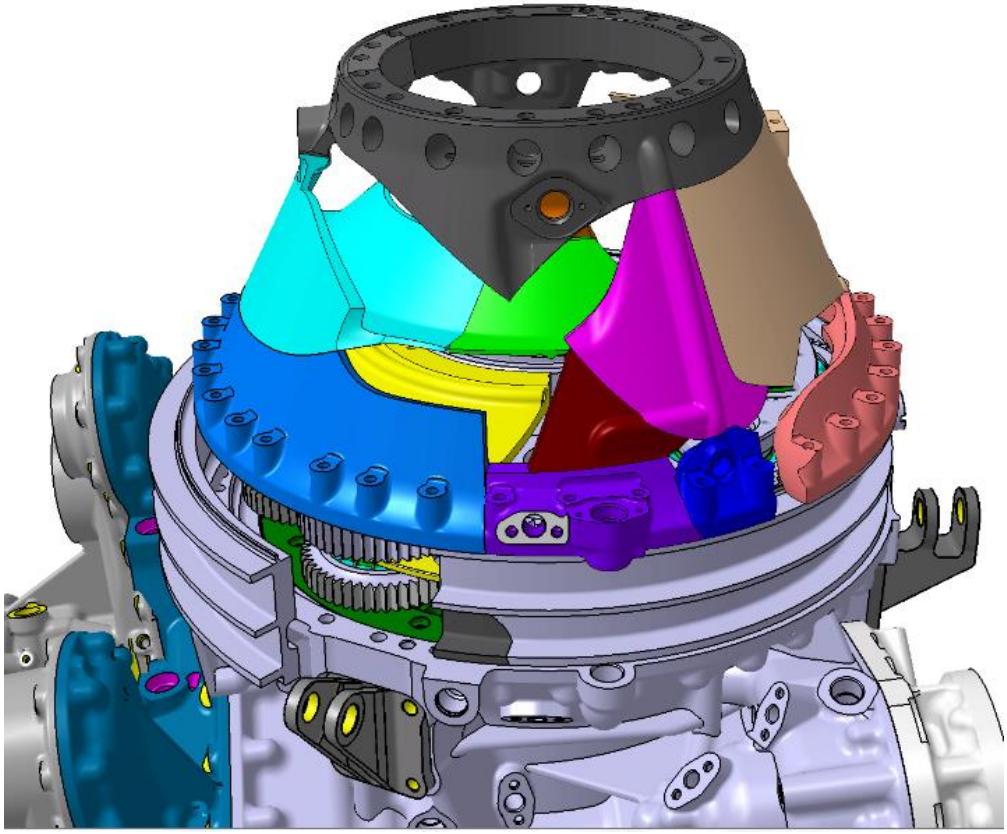

Figure 9: Illustration of how the retrieved fragments of the Conical Housing are pieced together in order to look for break-up sequence/mechanism. Illustration: Airbus Helicopters

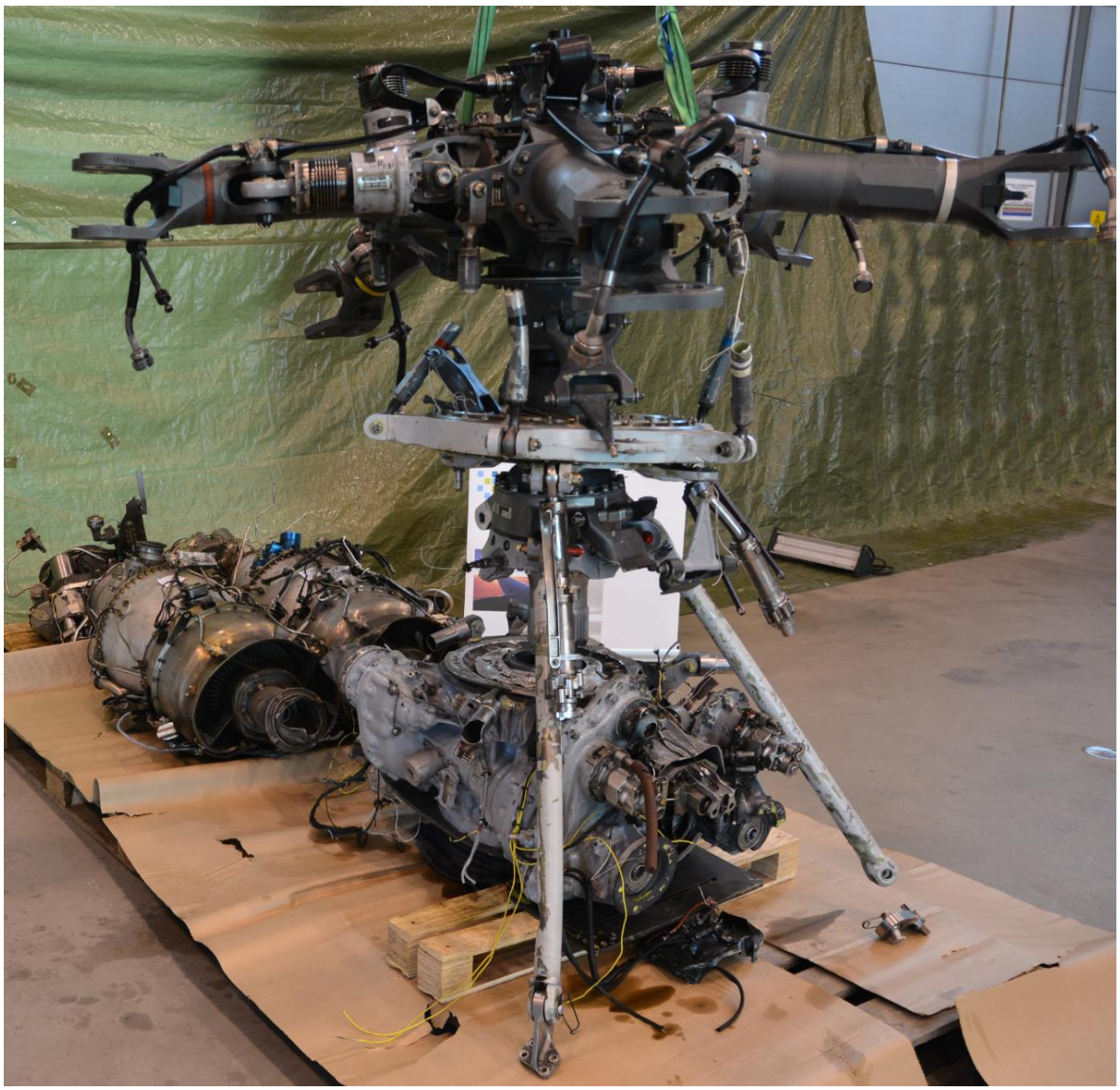

Figure 10: Main rotor head with rotor mast with aft suspension bars and power plants. Photo: AIBN

Further Examinations

The AIBN has collected and secured relevant maintenance documentation. This material is currently the subject of a thorough analysis in parallel with the technical examinations.

Detailed metallurgical examinations have been ongoing since 19 May, but are still at an early stage. So far, these examinations have not identified a conclusive primary cause of the accident.

Preliminary Analysis

The investigation team has discussed a list of scenarios that Airbus Helicopter prepared based on fault tree analysis. At this stage, the AIBN can confirm that the scenarios under consideration include failure of epicyclic module, suspension bar (lift strut) attachment and MGB conical housing.

The investigation is ongoing and updates will follow.

The Accident Investigation Board Norway

Lillestrøm, 27 May 2016