

Interim Report

Identification

Type of Occurrence:	Serious incident
Date:	20 December 2012
Location:	Phuket, Thailand
Aircraft:	Airplane
Manufacturer / Model:	Airbus / A 330-223
Injuries to Persons:	No injuries
Damage:	Minor damage to aircraft
Other Damage:	None
Information Source:	Investigation by BFU
State File Number:	BFU 6X015-12
Published:	February 2013

Factual Information

History of the Flight

The airplane took off at 1341 hrs¹ (2041 hrs local time) from Phuket Airport, Thailand, to Abu Dhabi Airport, United Arab Emirates, with 241 passengers and ten crew members on board. At 1354 hrs in Flight Level (FL) 220 during climb the crew noticed a loud bang. At the same time a intense vibration of the airplane began.

¹ All times UTC, unless otherwise stated.

The sound was coupled with a decrease of Engine 1 rotational speed of the low pressure compressor (N1) and an increase of rotational speed of the high pressure compressor (N2). The Flight Data Recorder (FDR) data showed that the vibration level and the Exhaust Gas Temperature (EGT) increased simultaneously. During the occurrence the Master Warning occurred three times and on the ECAM-system the warnings ENG1 EGT OVER LIMIT and ENG1 N2 OVER LIMIT were indicated, among others; autothrust disengaged automatically. The crew reduced Engine 1 thrust to flight idle. The Engine 1 EGT decreased and about one minute and 15 seconds later dropped below the limit of 600°C. The FDR recording showed that five minutes after the first occurrence the EGT increased again and exceeded the limit after another 25 seconds. Simultaneously, N2 increased. A short time later the engine was shut off.

Immediately after the first indication of an engine failure the crew decided to perform an In-Flight Turn Back (IFTB) and return to Phuket Airport. The crew declared emergency and concluded to fly a holding pattern to prepare for landing. The crew decided to conduct an overweight landing. For the calculation of the landing distance they assumed an aircraft mass of 200 t and landing configuration 3. On the flight back to Phuket Airport ECAM indicated Hydraulic G System Leak and shortly afterwards a low pressure warning for the blue System appeared. It was not clear to the Pilot in Command (PIC) which overall problems he was facing when the ECAM indicated hydraulic problems and therefore decided to hand controls over to the co-pilot in order to attend to the ECAM and the system page. The crew selected flaps/slats configuration 2 at 1420 hrs and extended the landing gear. Immediately afterwards the low pressure warning for the green system appeared and flight controls changed into F/CTL ALTN LAW mode. At 1423 hrs, at about 2,000 ft, flaps/slats configuration 3 was selected.

At 1426 hrs an overweight landing with a mass of 198 t was conducted. During the subsequent braking manoeuvre using alternate brake pressure without anti-skid three tires burst. The airplane came to a stop in the area of the intersection of taxiways F and G. The passengers disembarked via the stairs. No one was injured.

Personnel Information

Pilot in Command (PIC)			
Age:	60	Sex:	Male
	Type	Initial Issue	Valid until
License:	ATPL (A)	5 February 1986	19 September 2014
Ratings:	A318/319/320/321 PIC/IR A330 PIC/IR		31 December 2013 30 June 2013
Medical Certificate:	Class 1		22 February 2013
Restrictions:	TML VML OML OSL REV		
Total flying experience:	14,811 hours and 7,273 hours as Flight Engineer		
Last 90 days:	115 hours		
Last 24 hours:	6 hours		
Experience on the type (A330-200/300):	2,219 hours		
Last 90 days:	115 hours		
Last 24 hours:	6 hours		

Co-pilot			
Age:	49	Sex:	Male
	Type	Initial Issue	Valid until
License:	ATPL (A)	20 February 1997	26 November 2014
Ratings:	A318/319/320/321 COP/IR A330		31 March 2013

	COP/IR		30 September 2013
Medical Certificate:	Class 1		26 November 2013
Restrictions:	VNL		
Total flying experience:		10,429 hours	
Last 90 days:		165 hours	
Last 24 hours:		6 hours	
Experience on the type (A330-200/300):		3,921 hours	
Last 90 days:		165 hours	
Last 24 hours:		6 hours	

Aircraft Information

Aircraft Information	
Manufacturer:	Airbus
Type:	A330-223
Manufacturer's Serial Number (MSN):	0288
Year of manufacture:	1999
Maximum Take Off Mass (MTOM):	230,000 kg
State of Registry:	Germany
Airworthiness Review Certificate valid until:	14 April 2013
Engine	
Manufacturer:	Pratt & Whitney
Type:	4168A
Serial number:	733525
Aircraft Maintenance Records	
Total airframe hours:	59,156 hours
Cycles:	10,585

The aircraft A330 is a twin-engine low-wing airplane. The aircraft had a German Certificate of Registration. The PW4168A is a dual-spool, axial-flow, high bypass turbofan engine that features a 100-inch (2,540 mm) diameter fan, 5-stage low pressure compressor (LPC), 11-stage high pressure compressor (HPC), annular

combustor, 2-stage high pressure turbine (HPT) that drives the HPC, and a 5-stage LPT that drives the fan and LPC. The Federal Aviation Administration, USA had issued the Type Certificate Data Sheet E36NE for the PW4168A engine.

According to the maintenance records the engine was subject to repair work on 15 March 2011 at SR Technics. At that time the engine had 36,955 hours TSN (time since new) and 6,156 CSN (cycles since new). The operator stated at the time of the serious incident the engine had 45,221 hours TSN and 7,228 CSN.

The airplane is equipped with three hydraulic systems: Green, Blue and Yellow.

The maximum allowable landing mass is 182,000 kg. The calculated take-off mass was approximately 203,638 kg.

Meteorological Information

According to the aviation routine weather report (METAR) of Phuket Airport issued at 1330 hrs the following weather conditions prevailed:

Wind: 080°/ 03 kt

Visibility: 8,000 m

Clouds: 1-2 oktas at 2,000 ft, 3-4 oktas at 12,000 ft, 5-7 oktas at 30,000 ft

Temperature: 26°C

Dewpoint: 24 °C

Air Pressure: 1,009 hPa

No significant changes in the forecast for the next two hours.

Communication

Radio communications with the responsible air traffic service providers were conducted in English.

Aerodrome Information

Phuket Airport (VTSP) is an international airport. It has one runway oriented 090°/270°.

Flight Recorder

The airplane was equipped with an FA 2100 Flight Data Recorder (FDR) and an A 200S Cockpit Voice Recorder (CVR). Manufacturer of both recorders was L-3 Communications Corporation. The recorders have been made available to the BFU for the investigation.

Wreckage and Impact Information

After the landing it was determined that parts of the low pressure turbine had penetrated the LPT cases of the engine. The right thrust reverser door showed several impact marks on its inner surface. The nacelle had not been penetrated.

The maintenance personnel stated that after the repair work about 38 to 40 litres of hydraulic fluid had been replaced in the Green System. In the other systems - Blue and Yellow - no hydraulic fluid had to be replaced. In the section of the case drain line of the mechanical pump of the Green System a pipe connection was loose.

Engine examination:

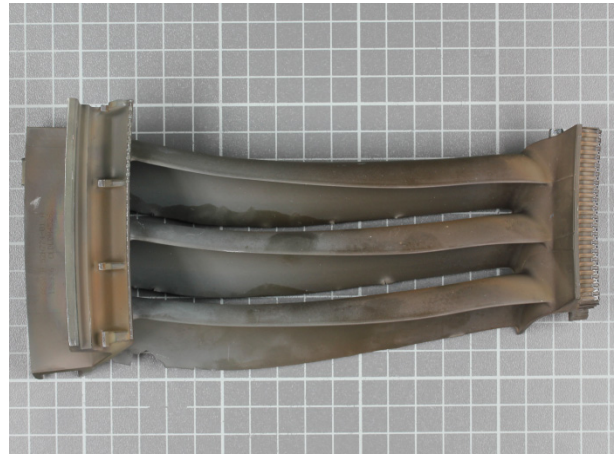
The engine was examined at SR Technics in Zurich, Switzerland, in the presence of the National Transportation Safety Board (NTSB), Pratt & Whitney, Airbus, Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (French civil aviation safety investigation authority, BEA), the operator and the BFU.

The investigation determined a 425 mm long circumferential and 45 mm wide axial hole in the area of the 4th stage and several other smaller holes in the casing of the LPT. Beginning with the 4th stator stage all subsequent rotor and stator stages showed damages in various degrees. For the investigation purposes, the vane clusters were labelled clockwise from 1 to 44 starting at the 12 o'clock position. The 4th stage vane clusters with the position numbers 2 and 3 were no longer in their original places. One complete 4th stage vane cluster was found loose in the debris in the LPT 4th stage. For the investigation purposes, it was labelled with "A". No pieces of the second missing 4th stage vane cluster were identified. The 4th stage vane clusters number 4 and "A" exhibited visual gusset fillet cracking. Two vane clusters next to the missing vane clusters showed rub marks on the rear face of their inner platforms. All of the 4th stage airfoils had a notch rubbed in the leading edge at the airfoil platform fillet radius. Eleven of the 130 4th stage turbine airfoils had a flat, planar fracture surface. The remaining 4th stage turbine airfoils had a coarse, grainy, and irregular fracture surface.



The 4th stage stator stage with two missing vane clusters

Photo: BFU



LPT 4th vane cluster No 4

Photo: SR Technics

The inner surface of the right thrust reverser showed a multitude of impact marks. The seal and insulation layer had been penetrated in 46 places. The composite structure below had been damaged in 12 places. Damage to the outer surface was not visually detected.

Fire

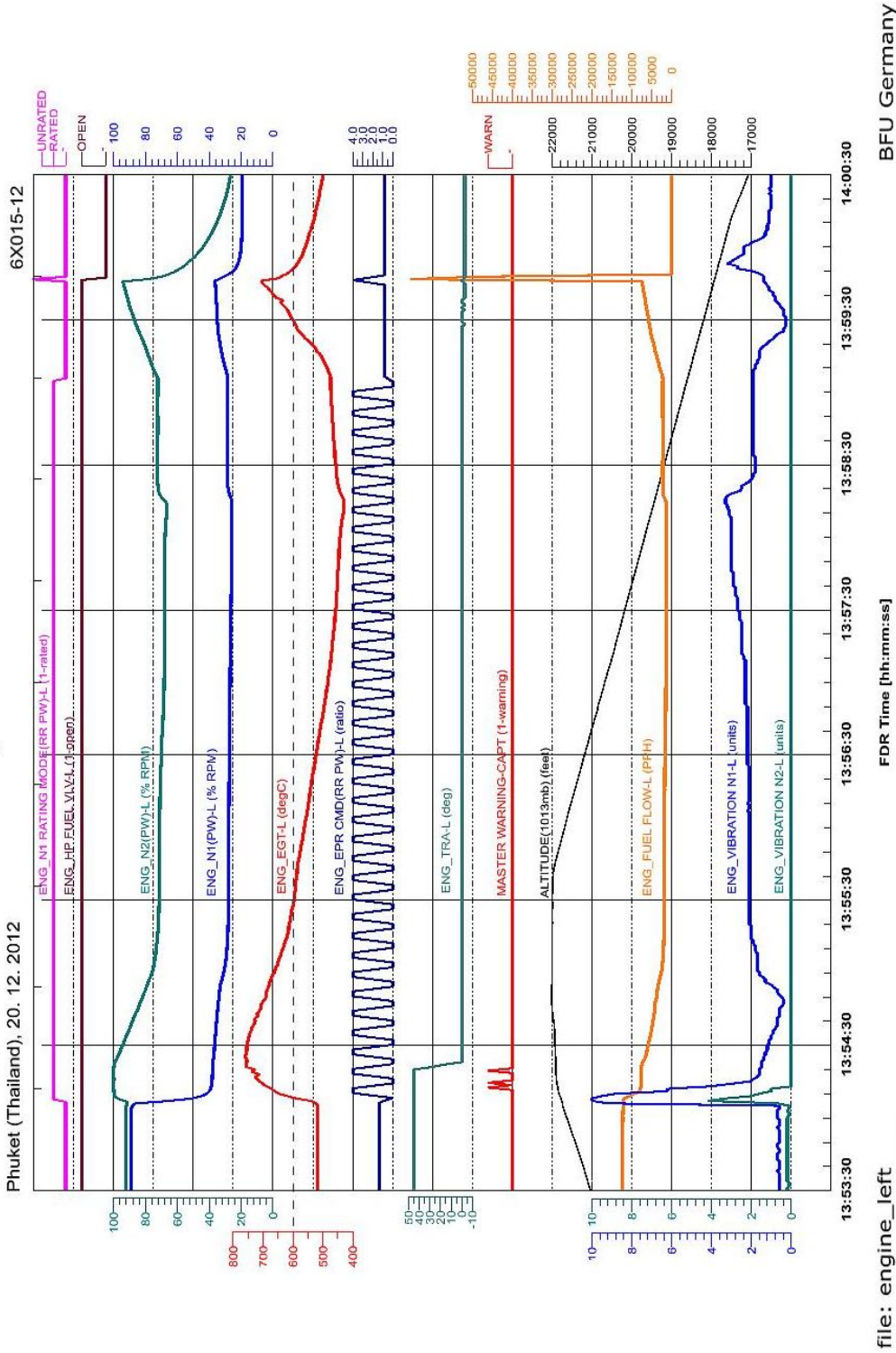
The FDR did not record a fire in the left engine. The airplane and the engine did not show any traces of fire.

Additional Information

On 21 December 2012 the Department of Civil Aviation Thailand informed the BFU that it will not conduct an investigation. On 7 January 2013 the BFU decided to conduct an investigation of the occurrence because the BFU represents the State of Registry.

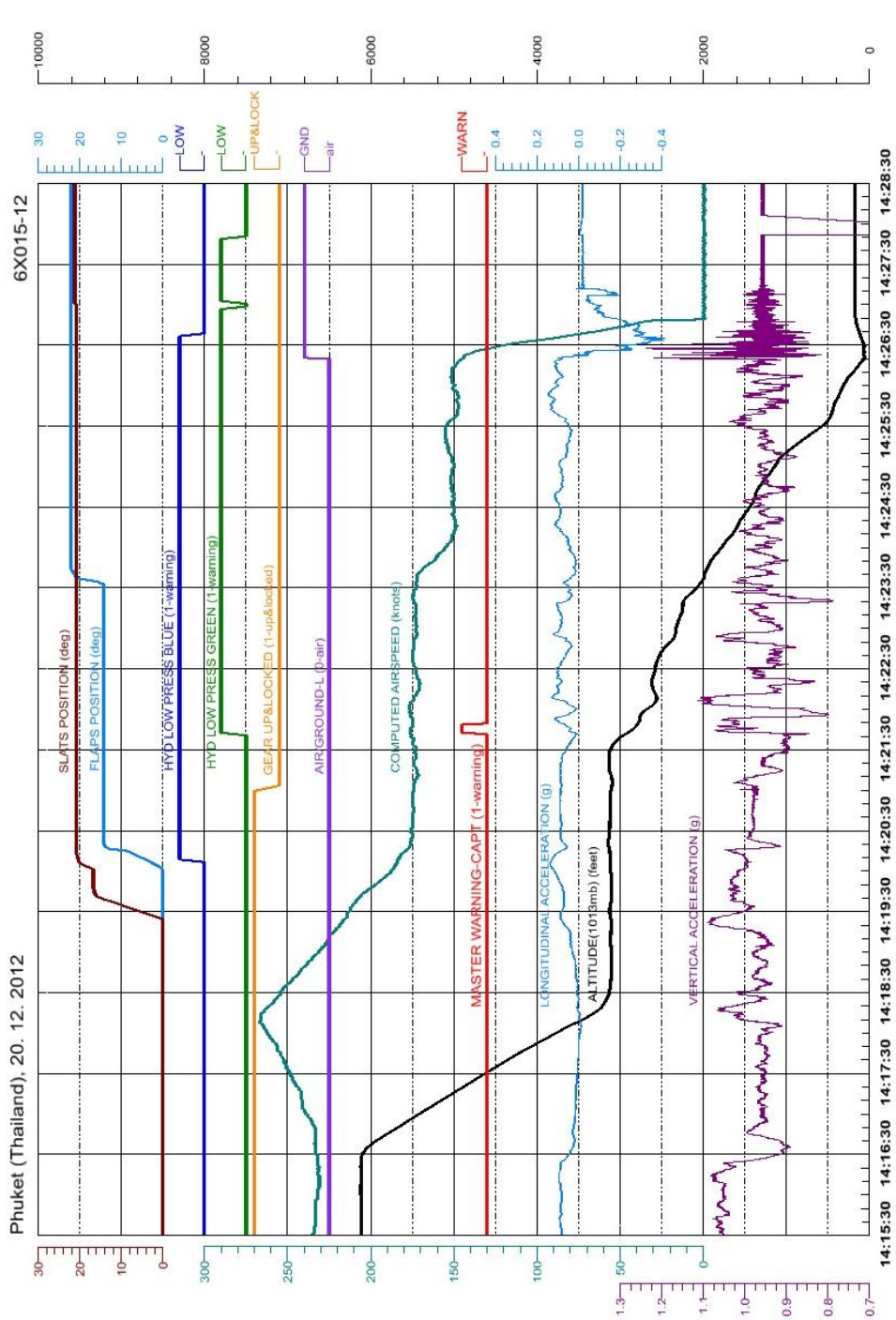
Investigator in charge: Karge

Appendices



Excerpt of engine FDR data

Source: BFU



BFU Germany

FDR Time [hh:mm:ss]

file: Final Approach
 Created: February 13, 2013
 Revised: February 13, 2013

Excerpt of engine FDR data

Source: BFL

This investigation is conducted in accordance with the 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 and the Federal German Law relating to the investigation of accidents and incidents associated with the operation of civil aircraft (*Flugunfall-Untersuchungs-Gesetz - FIUUG*) of 26 August 1998.

The sole objective of the investigation is to prevent future accidents and incidents. The investigation does not seek to ascertain blame or apportion legal liability for any claims that may arise.

This document is a translation of the German Investigation Report. Although every effort was made for the translation to be accurate, in the event of any discrepancies the original German document is the authentic version.

Published by:

Bundesstelle für
Flugunfalluntersuchung

Hermann-Blenk-Str. 16
38108 Braunschweig

Phone +49 531 35 48 - 0
Fax +49 531 35 48 - 246

Mail box@bfu-web.de
Internet www.bfu-web.de