

NA-107 Occurrence Investigation

Executive Summary

On March 11, 2016, a National Airborne Service Corps, Ministry of the Interior (NASC) Airbus AS365 N3 helicopter, registration number NA-107, with one pilot as pilot flying, one copilot as pilot monitoring, one crew chief, and two Coast Guard Administration-Special Services Company (CGA-SSC) members on board. The helicopter departed from Taipei Songshan Airport and headed toward the coast of Shimen (New Taipei City) to transport 6 oil spill surveyors, where a T.S. Lines cargo ship ran aground. When preparing to hoist personnel near the cargo ship, the aircraft fell into the sea to the left of the grounded cargo ship (latitude: N 25° 18' 5.80", longitude: E 121° 34' 33.02"). The helicopter was completely destroyed; the pilot and one CGA-SSC member were killed, and the copilot, crew chief, and another CGA-SSC member were seriously injured.

On the day of the occurrence, at 1045 Taipei local time the aircraft successfully completed a first six-men transport mission and returned to Taipei Songshan Airport. After receiving the order for an early return mission notice at noon, the flight crew did a crew briefing at 1237 and decided to use hoist rings to perform personnel hoisting (executed one person at a time and two times per transport). After arriving above the grounded cargo ship, the aircraft circled the cargo ship in clockwise direction to complete the environmental survey and began to approach the deck of the cargo ship. The crew chief began to perform the hoist mission, dropping off the CGA-SSC member. According to the copilot interview record, the CGA-SSC member had left the cabin when the aircraft was approaching the cargo ship. The GPS system indicated that the aircraft began yawing towards the left at 1317:44. Before the aircraft yawed towards the left, the pilot said, "mission abort, mission abort". Four seconds later (1317:48), the aircraft began to turn drastically. According to the copilot's interview, the aircraft was shaking in all directions as the aircraft drastically spun towards the left. The copilot also heard the pilot saying, "What is happening to the aircraft?" As the spinning speed of the aircraft accelerates, the CGA-SSC member performing the hoisting mission was thrown up by the great centrifugal force generated by the spinning motions and aircraft altitude changed. After the CGA-SSC

member impacted the main rotor and crashing into the sea, the aircraft plummeted on the sea surface to the left of the cargo ship at 1317:59 with a right roll in an easterly direction.

This investigation report identified range of contributing and other safety factors relating to the occurrence. After the occurrence, the aircraft manufacturers Airbus Helicopter have adopted improvement measures through service bulletins (SB).

According to the Aviation Occurrence Investigation Act and Annex 13 to the Convention on International Civil Aviation, the Aviation Safety Council (ASC) is an independent aviation occurrence investigation agency, was responsible for conducting the investigation. The investigation team also included members from Bureau d'Enquêtes et d'Analyses, France (BEA), manufacture Airbus Helicopter, National Airborne Service Corps, Ministry of the Interior (NASC), Coast Guard Administration, Executive Yuan (CGA).

The Investigation Draft Report of this occurrence was completed in September 2016. In accordance with the procedures, it was reviewed at ASC's 50th Council Meeting on October 25, 2016 and then sent to relevant organizations and authorities for comments. After comments were collected and integrated, the Final Report was reviewed and approved by ASC's 55th Council Meeting on 28 March 2017. The Final Report was published on 7 April 2017. There are a total of 20 findings from the Final Report, and 14 safety recommendations issued to the related organizations.

Findings Related to Probable Causes

1. Evidence showed that Airbus Helicopters South East Asia mechanics did the inspection in compliance with the Alert Service Bulletin AS365-05.00.61R4.-3.B.4 to the bearing rods. The distances were all within the normal range; no wearing-out was found. And mechanics also did the manual sensitivity check in compliance to 3.B.6.; this procedure can be subjectively affected and judged by mechanics. Therefore, it is difficult to spot if there are any abnormalities.
2. The bearing wear continued, which spalled off the inner ring shoulder, completely detached the outer ring, and eventually led to the

malfunction of pitch control in the tail rotor bearing. Due to the failure of the tail rotor pitch function, the pilot could not control the flight direction. Flying at a low altitude and driven by large horsepower, the main rotor was damaged from impact. The flight crew could no longer perform relevant emergency procedures according to the flight manual and eventually lost control and crashed into the sea.

Findings Related to Risk

1. The maintenance records indicated that the mechanic was monitoring the tail rotor control rod bearing in accordance with the Alert Service Bulletin AS365-05.00.61R4. The complete damage of the tail gear box control rod bearing was not detected through the 3.B.4. and i.a.w. 3.B.6. This suggests that the Alert Service Bulletin AS365-05.00.61R4 inspection procedure did not meet its purpose.
2. The Airbus Helicopters South East Asia exceeded one case of the tail gear box magnetic plug fifty landing cycles regular inspection of the occurrence aircraft. The exceeded inspection showed that the Airbus Helicopters South East Asia did not meet the regular inspection period control standard and fleet maintenance management.
3. The National Airborne Service Corps operation cycle columns from aircraft data and service record showed that three regular inspections exceeded the fifty landing cycle limit. The exceeded landing cycle was because the National Airborne Service Corps members failed to check the remaining flying hours and landing cycles before the next checkup and compare the flying hour and landing cycle columns to control the flying hour and landing cycle of the missions.
4. The lube oil inlet and air pipe joints of both engine bearings on the occurrence aircraft did not have visual position not markers, suggesting that the maintenance personnel of Airbus Helicopters South East Asia failed to thoroughly inspect the engine compartment preflight and post flight. This does not meet the maintenance quality standards; the professional and service disciplines of maintenance personnel remain to be improved. In addition, the National Airborne Service Corps members also failed to thoroughly inspect the engine compartment before and after flight operations and continue to track

and perform relevant aviation safety improvement recommendations from earlier periods.

5. The National Airborne Service Corps does not specify periodic flight simulator training for flight crew members due to limited training budget. AS365 pilots lacked flight simulator training prior to the occurrence.
6. Relevant National Airborne Service Corps manuals did not include standard procedures for communication methods related to abort mission and task assignment. This affects emergency response and aviation safety. Additionally, current pyrotechnic cable shearing specifications have yet to include the scenarios, principles, timing, and authorized personnel for varying emergency conditions.
7. The pilot of the occurrence aircraft was not wearing the standard life vest specified in the National Airborne Service Corps procedures. On-board rescue personnel did not wear life vests.
8. The Airbus Helicopters South East Asia has been releasing multiple Alert Service Bulletin notices related to tail gear box malfunction. However, no flight operation personnel participated in the National Airborne Service Corps related meetings and no written records indicated the participation of the Aviation Mission Division.

Other Findings

1. The flight crew were certificated and qualified in accordance with the National Airborne Service Corps regulations. The flight crew rest and activities 72 hours prior to the occurrence was normal. There was no evidence to indicate that the flight crew's performance might have been adversely affected by pre-existing drugs or alcohol during the occurrence flight. The weight and balance of the aircraft were also within the restricted limits. There is no evidence to show that the occurrence was related to the weight and balance of the aircraft.
2. The turbulence generated by the northeast airflow through the cargo ship had no substantial influence on the flow field surrounding the occurrence aircraft. The wind and the aircraft loading conditions were within the aircraft's safe operating limits.

3. The spinning centrifugal force and descending altitude of the occurrence aircraft increased the angle of the steel cable. Moreover, the crew chief did not have sufficient time to retract the hoist cable. As a result, the Coast Guard Administration-Special Services Company member was hit by the main rotor.
4. The currently available evidence cannot explain the possible reason of the pilot “mission abort” call out prior to the aircraft yaw start.
5. Relevant National Airborne Service Corps manuals contain no operating procedures on varying hoisting methods and are thus unfavorable for performing the mission. In emergency conditions, overwater emergency training courses did not enable helicopter crew and other joint crew members familiarize the functions of lifeboats and the survival equipment thereof.
6. The National Airborne Service Corps has management procedures for technical documents but no standard training guidance for relevant staff members in charge of airworthiness directives (AD).
7. The wreckage inspection and sound spectrum analysis showed that, during the occurrence, the engine was operating normally, the characteristic frequency of the main rotor was stable, and RPM output was normal. The characteristic frequency of the tail rotor dropped 6 seconds before crashing into the sea.
8. The search and rescue vessel did not implement the on scene commander dispatch principles; an identical communication frequency was not used; and when communication was unsuccessful, the aircraft did not establish indirect contact through notifying the affiliated service command center. This influenced the effectiveness of command and collaboration of on-site search and rescue (SAR).
9. The scramble nets on the sides of the Coast Guard Administration search and rescue vessel are suitable for physically capable survivors and are unsuitable for the nearly disabled.
10. The national law or regulation has not mandated the installation of flight recorders on the public aircraft. The cockpit voice recorders (CVR) and the flight data recorders (FDR) are not installed on the AS365 aircraft. Therefore, the aircraft system status and crew conversation cannot be retrieved. After checking with the aircraft

manufacturer, a solid state FDR can be installed on the AS365 N1/N2/N3 aircraft.

Safety Recommendations

To National Airborne Service Corps, Ministry of the Interior

1. The maintenance professionalism and discipline must be strengthened. The engine compartment must be checked to meet maintenance quality standards before and after flight operations and tracking mechanism must be established for correcting deficiencies in safety measures.
2. Review the mission flying hours and landing cycles control in the flight crew manual and in coordination with the Airbus Helicopters South East Asia maintenance control officer conservative and early control must be applied for managing and reinforcing regular inspection deadlines.
3. A National Airborne Service Corps exclusive AS365 aircraft operation manual must be reviewed or edited and compiled specific to the attributes of the National Airborne Service Corps missions based on the aircraft operation manual, procedure, and checklist formulated by the original manufacturer (Airbus Helicopters South East Asia) without violating relevant legal principles. Flight simulator training must also be considered as a prerequisite annual training course.
4. Establish Standard Operation Communication, task assignment, operation techniques, essentials and principles of use and operation procedures for various hoisting methods must be devised in relevant manuals.
5. The contents on the scenarios, principles, timing, and authorized personnel related to pyrotechnic cable shearing must be strengthened in the procedures and implemented in training to facilitate the response of personnel in case of emergency situations.
6. The regulations related to checking the life vests of personnel performing offshore rescue missions must be standardized and implemented in pre-service inspection to reinforce their intended survival functions during emergency conditions.
7. The overwater emergency training must be reinforced to instruct the on-board crew members to familiarize using the lifeboat and the

functions of survival equipment. This facilitates the effective use of limited resources by personnel members in emergency conditions, thereby increasing their chance of survival.

8. The procedures for field commander dispatch and common communication frequencies in joint search and rescue operation must be reexamined and implemented to improve the operation effectiveness.
9. Evaluate the necessity of light weight recorder installation on all public aircraft type. The risk evaluation and monitoring methods for government aircrafts must be reexamined to actively apply airborne recorded data.
10. All search and rescue aircrafts must be inspected for equipping instruments that track signals transmitted by the emergency locator transmitters (ELT) to facilitate quickly finding and accurately locating occurrence aircrafts and meeting the requirements specified in Annex 12 to the Convention on International Civil Aviation.

To Coast Guard Administration, Executive Yuan

1. The regulations related to checking the life vests of personnel performing offshore rescue missions must be checked and pre-service inspection must be implemented to ensure their intended survival functions during emergency conditions.
2. The procedures for field commander dispatch and common communication frequencies in joint search and rescue operation must be reexamined and implemented to improve the operation effectiveness.
3. The rescue equipment must be improved to provide effective rescue functions to nearly disabled casualties in the sea.

To Airbus Helicopters South East Asia Pte Ltd.

1. The mechanic professionalism and discipline must be strengthened so that regular inspection deadline management and pre- and post-flight engine compartment inspections conform to the contract service standards of the National Airborne Service Corps.

Safety Acts Accomplished or Being Accomplished

Airbus Helicopter

1. ASB 01.00.67R1 was issued on 2016.5.4 by Airbus Helicopter after the occurrence. The ASB required operator to remove the control shaft/rod assembly if the operator do not embody the latest modifications. At the latest when 350 flying hours are reached, replace with new double bearings or double bearings .If the operator do not embody the latest modifications , the ASB required operator to apply an alternating manual axial load to control rod (c) whilst turning control shaft every 55 flying hours maximum, remove the control shaft/rod assembly and carry out a tactile check to ensure that there is no axial play in double bearing.