

# **NA-703 Occurrence Investigation**

## **Executive Summary**

On June 30, 2017, a UH-60 Black Hawk helicopter (registration number NA-703) operated by the National Airborne Service Corps (NASC), Ministry of the Interior, conducted a search and rescue joint training mission offshore of Taichung Harbor. There were 9 people on board including one foreign instructor pilot, one foreign flight engineer, one instructor pilot, one pilot, 2 flight engineers and 3 rescuers. At about 1105 Taipei local time, during their first training session the hook assembly was separated from the hoist system causing two rescuers to fall into the ocean. One rescuer sustained minor injury and the other sustained serious injury.

The occurrence training session was the 1<sup>st</sup> annual joint oversea training of NASC in the year. The foreign pilot completed the briefing at about 0850 and started the engines at 0925. The aircraft systems, rescue equipment and hoist operation were checked normal. The helicopter took off from Taichung Airport at 1010 and arrived training area at 1020. The crew started to perform consecutive 3 sessions (6 times hoist release and retrieve) joint training. The helicopter was hovering at altitude 70 feet and released one rescuer down to the ocean followed by the other rescuer performing his retrieval training. During hoist up rescue process, the hoist was spinning. When both rescuers were hoisted up to the belly of the helicopter (about 50 feet over sea level), the locking screws were loosening from the hoist bearing housing and bushing nut, separated from the hoist assembly. The 2 rescuers fell into the sea. The flight engineer examined hoist system and found that hoist hook assembly was separated from the hoist system. Onboard crew visually confirmed that the both rescuers were saved and boarded the coast guard vessel. The helicopter landed

safely at 1120 on Taichung Airport.

According to the Aviation Occurrence Investigation Act of Republic of China (ROC) and the content of Annex 13 to the Convention on International Civil Aviation Organization, the Aviation Safety Council (ASC), an independent aviation occurrence investigation agency, was responsible for conducting the investigation. The investigation team also included National Airborne Service Corps, Ministry of the Interior.

The draft final report was reviewed and approved by ASC 65<sup>th</sup> Council Meeting on January 26th, 2018.

There are a total of 15 findings from the Final Report and 9 safety recommendations issued to the related organizations.

## **Findings as the result of this investigation**

### **Findings related to probable causes**

1. During hoist cable replacement maintenance, an unknown external force may led the bearing moved and stuck in the bearing housing when the hook assembly was disassembled
2. When assembling the hook assembly, the mechanic could not properly bottomed the bushing nut to the bearing housing due to the bearing stuck in the bearing housing. A 1.5 mm gap was created between the lower flange bottom surface of the bushing nut and top surface of the bearing housing. The above gap caused the locking screws not properly engaged into the castled slots on the bearing housing.
3. The inspector did not properly check whether the two locking screws were

engaged into the castled slots on the bearing housing prior to the completion of the hoist cable replacement.

4. Due to the two locking screws were not properly engaged into the castled slots on the bearing housing, therefore the bearing housing did not lock with the bushing nut. Without lock mechanism, the bearing housing was loosening from the screw threads of bushing nut and separated from the hoist assembly when hook assembly swiveled during hoist retrieving process.

### **Findings related to risk**

1. The mechanics and the inspectors neither understood and followed the procedures correctly during assembling nor visually inspected the locking screws were properly engaged into the castled slots on the bearing housing. They misunderstood that the locking screws were properly seated in the castled slots once the cotter pin holes could be seen.
2. The National Airborne Service Corps did not assign a proper quality inspector to perform the hoist maintenance for the occurrence helicopter. The inspector who performed the inspection of the hoist maintenance did not complete the type hoist maintenance training, had limited understanding of the hoist manufacture maintenance manual, and failed to conduct the vital point inspection correctly.
3. Most maintenance manuals adopted by the National Airborne Service Corps (NASC) are in English. The NASC did not establish the English ability requirement and evaluation system of their mechanic.

4. The National Airborne Service Corps (NASC) did not have proper process to integrate/control both technical information from hoist manufacturer and technical manual from aircraft manufacturer regarding the hoist maintenance. The different understanding of how to use the manual existed in NASC different department that disadvantaged the NASC mechanic to use the manual correctly and conduct the training properly.
5. The National Airborne Service Corps did not record inspection results of vital point onto rescue hoist maintenance log as required by the hoist manufacturer maintenance manual.
6. There are neither Public Aircraft Oversight Act nor regulations related to safety, operations and management of public aircraft. The existing safety standards and management mechanism of public aircraft were all established by the National Airborne Service Corps itself, thus the safety standards and management mechanism of public aircraft might be hindered by the cost, mission requirements or performance consideration.
7. The National Airborne Service Corps established a task force “Aviation Safety Commission” instead of a permanent safety division, because of the proposal of such division made by the Ministry of the Interior was denied during the Central Government Agency reorganization process. After reviewing the job function and operation of the Aviation Safety Commission, it is unable to function effectively as a permanent safety division or external audit agency.
8. There were three National Airborne Service Corps occurrences in the past. The findings related to the probable causes of these occurrence are not only human errors but also systemic issues such as insufficient training,

improper management, and lack of safety procedures. The above findings showed that the task force, Aviation Safety Commission, was unable to function effectively and cover the internal safety management and external safety oversight.

### **Other findings**

1. There were no abnormal findings in the maintenance log book and records related to the event in the past year. All Airworthiness Directive and relevant Technical Bulletins were implemented prior to the occurrence.
2. During installation, the bearing housing and castled slots outer surface ring were covered with rubber bumper; the mechanic may not be able to see it if the mechanic did not move the rubber bumper.
3. The flight engineer may visually check that locking screws were properly positioned in slots and cotter pins were in position. However, the flight engineer was not able to visually check that the two locking screws were properly engaged into the castled slots on the bearing housing.

### **Safety recommendations**

#### **To the National Airborne Service Corps, Ministry of the Interior**

1. Establish standard procedures and enhance training to prevent the external force damage to the part/assembly from its disassembling to

assembling.

2. Ensure all mechanics understand maintenance manual and perform maintenance procedures correctly. Consider to provide mechanics with checklists of complex or easily misunderstanding procedures and vital point inspections. .
3. Enhance training preparations prior to the manufacturer conducting the training to promote effective training result, including: require trainees to pre-study manuals and get familiar with parts diagrams, name and number of parts; prepare diagrams, flow chart or vital point inspections for complex or easily misunderstanding procedures; assign qualified translator or mechanics to assist foreign instructors in course teaching.
4. Evaluate and set requirements for mechanics on adequate English ability to assure procedures understanding and maintenance quality.
5. Review and improve inspectors job assignment procedure and quality control ability.
6. Properly integrate and control the usage of the component maintenance manual and aircraft maintenance manual regarding the hoist maintenance to benefit maintenance practice and training purpose.
7. Enhance the control process of maintenance procedure changes as well as notification of such changes. Activate change management process accordingly when necessary. Provide all related supporting measures and complete required approval process. Lastly, ensure all relevant personnel

have common understanding to the scale of change.

**To Ministry of Interior**

1. Re-exam the organizational structure and operating effectiveness of the task force, Aviation Safety Commission, National Airborne Service Corps. Assist the National Airborne Service Corps, Ministry of the Interior to establish a formal Safety Management Division to enhance internal safety management.
2. Establish a formal, full time and effective safety oversight system to improve public aircraft aviation safety.