

NA-302 Occurrence Investigation

Executive Summary

On 7 November 2015, a Beech Super King Air 350 aircraft, registration number NA-302, of the National Airborne Service Corps, Ministry of the Interior (hereinafter NASC), with four persons on board: one check pilot, one co-pilot and two aerial photographers, was performing an aerial photographic mission in the airspace from Nantou to Miaoli.

The occurrence aircraft took off from the Ching-chuan-kang Airport (hereinafter CCK Airport) at about 1034 Taipei local time, it completed its aerial photographic mission around 1310. When this aircraft was about to land in CCK Airport, the flight crew put down the landing gear and, upon finding that only the indication light for the nose gear was on, requested for go around. During the down wind side in the second landing attempt, the check pilot put down the landing gear and press the landing gear indication lights and found the result was indication lights on for nose gear and the right main landing gear, but no indication light for the left landing gear, and the hook for locking the landing gear control lever did not came out. The flight crew judged that this condition was resulted from the failure of landing gear indication lights.

Onto the final approach around 1348 when the aircraft was 10 nautical miles from the CCK Airport, only light for the left landing gear was off, but the hook for locking the landing gear control lever came out and locked. The flight crew could see that both right and left landing gear were down, so they asked the Control Tower to confirm. The reply was: “(as) we can see the landing gear is down.” The flight crew thought that such abnormal situation was only the result of faulty landing gear indication light bulbs. Upon obtaining permission for landing from the

Control Tower, the check pilot extended the flap to down position; immediately there came a landing gear warning sound. The check pilot retracted the flap to approach position, the warning sound disappeared; so he extended the flap to the full position, again came the warning sound consecutively until finally this aircraft landed.

Upon touching ground, landing gear on both sides and the nose gear simply retracted; forcing this aircraft to slide on its belly until it came to a full stop. The investigation team found, upon checking, that nacelle for the right and left landing gear, the right and left engines, the right and left flaps and both propellers were damaged.

Pursuant to the Aviation Occurrence Investigation Act of the Republic of China and, referring to Annex 13 to the Convention on International Civil Aviation, the Aviation Safety Council (hereinafter ASC), an independent aviation occurrence investigation agency, started the investigation. The organization or agency been invited to join the investigation team included: Air Force Command Headquarters of the Ministry of National Defence, NASC, Aerospace Industrial Development Corporation and National Transport Safety Board of the USA.

The ‘Draft Investigation Report’ of the occurrence was first reviewed and approved by the ASC’s 47th Board meeting on July 26, 2016. This Report was sent to relevant agencies for comments. Upon compilation and integration of comments and suggestions, this Report was finally approved as amended on October 25, 2016 by the 50th Board meeting of the ASC.

Based upon the factual information gathered during the investigation process and the results of analysis, 19 findings were obtained and 9 safety recommendations for improvements were issued as follows.

Findings as the result of this investigation

The ASC presents the findings derived from the factual information gathered during the investigation and the analysis of the occurrence. The findings are presented in three categories: **findings related to probable causes, findings related to risk, and other findings.**

The **findings related to probable causes** identify elements that have been shown to have operated in the occurrence, or almost certainly operated in the occurrence. These findings are associated with unsafe acts, unsafe conditions, or safety deficiencies associated with safety significant events that played a major role in the circumstances leading to the occurrence.

The **findings related to risk** identify elements of risk that have the potential to degrade aviation safety. Some of the findings in this category identify unsafe acts, unsafe conditions, and safety deficiencies including organizational and systemic risks, that made this occurrence more likely; however, they cannot be clearly shown to have operated in the occurrence alone. Furthermore, some of the findings in this category identify risks that are unlikely to be related to the occurrence but, nonetheless, were safety deficiencies that may warrant future safety actions.

Other findings identify elements that have the potential to enhance aviation safety, resolve a controversial issue, or clarify an ambiguity point which remains to be resolved. Some of these findings are of general interests that are often included in the ICAO format accident reports for informational, safety awareness, education, and improvement purposes.

Findings Related to Probable Causes

1. The 2-ampere circuit breaker which controls power source for the landing gear popped up after the occurrence aircraft having landed shows that electricity for the power pack was cut off when the aircraft was in the process of landing, so the motor could not operate to build up pressure. (1.6.5, 1.12.1, 1.16.2, 2.2)
2. When the occurrence aircraft was landing the first time, abnormal status of the indicating light for the landing gear down-and-locked was already existed. It was possible that the 2-ampere circuit breaker which controls the power for power pack of the landing gear had popped up before the first landing attempt, thus incapacitating the hydraulic system, rendering it impossible to build up necessary pressure for operating the landing gear. The subsequent two more operations by the flight crew to lower and down lock the landing gear also failed due to insufficient pressure within the landing gear system. (1.6.5, 1.12.1, 1.16.2, 2.2)
3. During the occurrence aircraft landing, the landing gear not down and lock indication and warning sound came out when the flight crew extended the landing gear and flaps. The flight crew erroneously judged the not down and lock indication and warning were false alarm. Instead of executing the manual extension procedure as required by the operation manual to lower and down lock the landing gear, the flight crew decided to land anyway. The heavy weight of the aircraft causing all landing gear to retract upon touching ground and causing the aircraft landed on its belly. (1.17.4.2, 1.18.1.1, 1.18.1.2, 2.2, 2.3.2, 2.3.3, 2.3.4)

Findings Related to Risk

1. The occurrence flight crew was not sufficiently knowledgeable about

the landing gear and warning system of this type of aircraft; thus affecting the judgment of the flight crew when facing a situation of abnormal indication about the landing gear. (1.17.4.2, 2.3.4)

2. The crew resources management among the occurrence flight crew, including their judgment about abnormal condition of landing gear, their awareness level of possible impact of such situation upon aviation safety, and the discussion among the crew, failed to show full crew communication and effective decision-making as a team. At a critical moment when facing abnormal landing gear indication, judgment by the flight crew on how to handle this situation will be very much affected. (1.17.4.1, 1.17.4.2, 2.4.1)
3. During the occurrence, the check pilot might have, from his previous personal experience in the encountering of landing gear indication light off, ignored or refused to believe the information then present, which was inconsistent with his expectations, thereby influencing his judgment about the condition of landing gear. (1.18.1.1, 2.4.2)
4. The flight crew did not perform the pre-landing check during the landing process by complying with Flight Operations Management Manual and the check procedure for this particular type of aircraft. (1.17.4.1, 2.3.1)
5. Training programs for new recruited pilot in the fixed wing fleet of NASC were not sufficient to achieve the objects and purposes required for the pilots in terms of subject-teaching and practical training. Without clear-cut course for crew resources management, the current training programs will not be able to familiarize the flight crew with functions of various systems and operational procedures. (1.17.2.1, 1.17.2.4, 2.5.1.1)

6. Regular yearly training for the fixed wing fleet of NASC offered teaching programs and practical training for operations regarding landing gear; but it did not offer detailed training programs for related systems and abnormal/emergency procedures, there was no record of implementation of such programs, nor had any training for manual operation of landing gear been conducted. This occurrence shows that the flight crew did not sufficiently understand the landing gear system, and that their regular yearly training had not yet shown the results. (1.17.2.1, 1.17.2.5, 2.3.4, 2.5.1.2)
7. Mission Performance Procedures and the current Operation Manual of NASC were without comprehensive standard operation procedure, this is not helpful to the flight crew in their routine operation and their handling of abnormal/emergency situations. (1.17.4.3, 2.5.2)
8. The manpower shortage of flight instructors and insufficient training resources for the fixed wing fleet of NASC might impact upon not only the operations of fixed wing fleet but also the training result and the performance of their missions. (1.17.2.5, 1.18.1.1, 2.5.3)

Other Findings

1. There were no abnormal entry in the Deferred Defects record, Service Difficulty Report, Pre-Flight and Post-Flight Check in the latest six months, Airworthiness Directives for Aircraft and Engine, Service Bulletin, Log Book, Periodic Check Items and the latest Periodic Check Record. (1.6.4, 2.1)
2. Overhaul for landing gear of the occurrence aircraft was completed within the 6-year period as required. (1.6.4, 2.2)
3. Post occurrence test of the landing gear system showed that the

indicator bulb and the bulb socket had problem of bad contact, and that the indicator bulbs were in good order after bulbs change. Testing personnel put down and retracted the landing gear for 10 times consecutively, and the result was normal; indicating that circuit system for the landing gear was normal. (1.16.1, 2.2)

4. Relevant license and certificate of the flight crew comply with the requirements of the NASC; alcoholic testing showed that none of the flight crew was under influence during this flight. (1.5.1.1, 1.5.1.2, 2.1)
5. This occurrence has nothing to do with weight and balance of the occurrence aircraft. (1.6.3, 2.1)
6. Annual training and validation of pilot certificate for flight crew of fixed wing fleet of NASC did not differentiate between B350 and B200 aircraft models, did not offer detailed programs for specialized subjects on how to fly aircraft, nor was there any record of teaching or training. (1.17.2.1, 1.17.2.3, 2.5.1.2, 2.5.4)
7. NASC has had mechanism for checking flight and ground safety, but dynamic checkup for fixed wing fleet of NASC has not been solidly implemented; causing the failure to detect the fleet's shortcomings in both flight and training in time. (1.17.3, 2.5.5)
8. No flight data of routine operations was available when required as the occurrence aircraft was not equipped with flight data recorder; consequently, the requirement of safety management of flight operations by NASC could not be met, nor could investigation be thoroughly conducted in case of any occurrence. (1.11, 2.6)

Safety Recommendation

To the National Airborne Service Corps, Ministry of the Interior

1. Require flight crew to follow Flight Operations Management Manual and Aircraft Operation Manual in carrying out the related inspections required; when encountering abnormal circumstances during flight, they should also follow Aircraft Operation Manual in handling the situations and making judgments over the contingency.
2. Check the contents of training programs for new recruited pilot of fixed wing fleet in terms of the subjects taught and practical work; planning the contents of difference training for B350 and B200 aircraft models; and explicit training for crew resources management should be in place.
3. Improve flight crew's aircraft system knowledge to facilitate the handling of abnormal situations during flight.
4. Emphasize crew resources management training to keep the flight crew's teamwork spirit intact and to ensure effective communication and decision-making among them.
5. Check regular yearly training method and validation of pilot certificate for flight crew of fixed wing fleet and differentiate between B350 and B200 aircraft types. In addition, such training should include thorough program for abnormal/emergency landing procedure, specialized subjects on flight, and the implementation process of such training should be meticulously recorded.
6. Stipulate a comprehensive standard operation procedure and made known to all the flight crew, this will be conducive to normal operation by flight crew and to the handling of abnormal/emergency circumstances.

7. Check human resources and training resources for check pilot and assess fleet renewal plan of fixed wing fleet to facilitate flight crew's training, examination and the execution of mission.
8. Implement dynamic audit of fixed wing fleet to ensure discovery of any training deficiency in time.
9. Evaluate the feasibility of equipping the aircraft with flight data recorder or, alternatively, simplified flight recording device.