

## 4. Conclusion

Based on our investigation reports on accidents (six cases) mentioned in this digest and other helicopter accidents, we summarized how these accidents and serious incidents occurred, and lessons which will help prevent recurrence as follows.

### How “helicopter accidents and serious incidents” occurred

#### ◆ Breakdown of type of accidents

By the type of accidents and serious incidents, the number of crashes was 27 (42.9%) in accidents, and the number of near misses with another aircraft was 6 (42.9%) in serious incidents, each of which accounts for nearly half of the total accidents and serious incidents.

#### ◆ Breakdown of operation phase

By the operation phase at the time of accidents and serious incidents, the number of accidents during cruising was 47 (67.1%), during landing phase 14 (20.0%), take-off phase 7 (10.0%). The occurrence during cruising accounts for nearly 70% of all operation phases.

#### ◆ Breakdown of cause categories

#### Approx. 80% of accidents and incidents are caused by human factors

The number of accidents and serious incidents caused by human factors and by human/environmental factors is 16 (22.9%) each, and human/organizational factors is 8 (11.4%). Approximately 80% accounts for “human factors or combination of multiple factors involving human factors”.

Among various classifications of human factors, there are 19 (33.3%) of “Inappropriate actions” cases, which include carelessness, omission of confirmation and sloppy operational practices and this type of human factors accounts for the highest number in all human factors.

### Lessons from accident investigation

- Lesson 1. Flight operations should be reviewed to check whether there were non-compliance activities against laws and regulations. Personnel engaged in safety-related works including pilots and mechanics should be reminded of the importance of observing fundamental safety standards such as minimum safe altitudes, and internal emergency communication procedures should be reviewed.
- Lesson 2. If towing a sling cable without any attached load, an appropriate amount of ballast should be attached to the hook to maintain the balance of the sling cable. Sudden sharp movements, a reduction in load factor and sudden lowering of the tail section should be avoided during flight. When towing a sling cable, it should be appropriately monitored with a rearview mirror or other device, and an appropriate airspeed should be maintained so as to ensure appropriate distance between the airframe and the cable being towed.
- Lesson 3. In case for the tail rotor losing the thrust, it is necessary to select appropriate emergency landing sites in advance, and to sustain necessary skills through periodical training on emergency procedures.
- Lesson 4. When a helicopter hovers in a small confined area, it is imperative to keep close watch against obstacles to maintain safe distance between the obstacles and a main rotor and Fenestron.
- Lesson 5. Because it becomes easier to enter VRS boundaries roughly when the descent rate is a large value between about 40% and about 160% of the induced velocity and the forward airspeed becomes smaller than the induced velocity, flight within this range of conditions needs to be avoided.
- Lesson 6. During lift-off and landing of a helicopter, access to a helipad and its surrounding area, where it might hamper aircraft operations, needs to be prohibited.
- Lesson 7. A system should be established to allow a pilot to perform appropriate emergency procedure that must be performed immediately in a prompt and certain manner through his memory in a state of emergency.

#### A word from Director for Analysis, Recommendation and Opinion

In helicopter accidents, human factors, such as carelessness and inappropriate operational discipline, seem to be a prominent factor, while a combination of other factors such as weather conditions and operational system also appears to contribute to the accidents in many other cases.

Because of a wide variety of flight purposes in helicopter flights, it is expected that accident prevention measures are based on various aspects. This means that besides a skill enhancement system for pilots and a perfect aircraft maintenance system, various aspects on accident prevention measures, such as training on appropriate responses to climate changes and equipment failures and an emergency communication system, are also expected.

We welcome your comments on “JTSB Digests” and inquiries for on-site trainers

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