Aviation Safety Insights

Investigation Insights

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Planning for hazards, experiencing them differently

What happened?

An AS 350 B3 helicopter was tasked to retrieve two hikers from a remote alpine bivouac site. The landing area was a small, confined space above the tree line (approximately 4500 feet ASL), surrounded by rising terrain and rock outcrops.

Before landing, the pilot conducted a reconnaissance, assessing the shape and condition of the site, available approach and departure paths, and lighting and terrain effects. Conditions were clear, with negligible wind. Although unfamiliar with the exact location, the pilot had been briefed on what to expect. A second crew member was on board to assist with positioning and passenger handling.

During the landing, the helicopter made initial contact but did not settle securely. The skid gear slipped, leading to an uncommanded yaw and a tail rotor strike on nearby terrain.



Photo: iStock.com/Lakeview_Images

As the aircraft was repositioned, the main rotor also contacted terrain. These events occurred in quick succession.

The pilot shut down the aircraft. All occupants (both crew and passengers) were uninjured, and recovery was coordinated from a nearby site.

CAA investigations

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Operating at the edge of the landing environment

Confined area operations in alpine terrain often require pilots to work close to the limits of both aircraft and environment.

In this case, the landing area combined several constraints:

- limited usable surface area
- proximity of rock outcrops
- rising terrain and a nearby cliff face, and
- very little room to reposition once on the ground.


Photo: iStock.com/Ernest Kung

Individually, these hazards were manageable. Together, they reduced safety margins, meaning small changes in position or stability could have immediate consequences.

The helicopter had sufficient performance, and the approach was appropriate. However, once ground contact was made, the available margin for error reduced significantly.

When stability is uncertain

The critical point occurred after initial ground contact.

The helicopter did not settle firmly. The skid gear slipped, resulting in an uncommanded yaw. In a confined area, even minor movement can bring rotating components into contact with terrain.

The tail rotor strike marked a rapid escalation. Damage reduced anti-torque effectiveness and limited the pilot's ability to maintain directional control.

What began as a routine landing quickly became a dynamic situation with limited time and space to respond.

Limited recovery options

Once stable contact with the surface was lost, few safety barriers remained.

There were no environmental buffers. Terrain features were immediately adjacent, and the confined site left little opportunity to reposition without further risk.

As in many confined area operations, safety depended on maintaining stability from the outset. Once that stability was compromised, recovery options were minimal.

What does this event tell us?

This occurrence did not stem from a single decision or action.

The pilot was experienced, appropriately rested, and operating within their capability. Weather conditions were favourable, and the approach aligned with the aircraft's characteristics.

Instead, the outcome emerged from a combination of factors:

- a surface that did not provide secure footing
- tight clearance between aircraft and terrain
- sensitivity to small movements during landing, and
- immediate consequences of rotor system contact.

Each factor is typical in alpine confined area operations. In this case, their interaction reduced safety margins at a critical point in flight.

What can we learn?

This event highlights the importance of managing risk before and during confined area operations – at both individual and system levels.

Opportunities to strengthen that system include:

- defining minimum clearance expectations between rotor systems and terrain
- reassessing commonly used landing sites to confirm ongoing suitability
- using structured, performance-based criteria for site selection
- reinforcing confined area techniques through recurrent training, and
- integrating real occurrences into training and guidance.

The lesson is not about an unsafe decision. It is that even well-managed operations can become vulnerable when margins are tight and conditions interact.

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