

DUPLICATE INSPECTIONS

Some recent occurrences illustrate the vital importance of carrying out a thorough duplicate inspection.

At the very start of the post-maintenance check run, the rotary pilot experienced an uncommanded yaw, the aircraft spinning to the left. The spin was arrested when the fuel was cut off to the engine. Fortunately, the aircraft had barely become light on the skids.

Within minutes, in what the chief pilot calls “quite a moment”, it was discovered the tail rotor push-pull tube forward attachment bolt had not been fitted correctly. (For non-engineers: the tail rotor flight control had not been reinstalled properly.)

When the bolt was installed, it didn’t go through the control tube rod end, before the nut was secured. It was only the clamping force on the bellcrank that secured the rod end in place. This was what led to the loss of tail rotor authority during the check run.

How it happened

So what went wrong? Two normally diligent engineers dropped the ball – the first by not making absolutely sure the bolt was installed correctly; and the second by not checking it closely enough during the second part of the duplicate inspection.

“It could have been a terrible outcome,” the operator’s chief pilot told *Vector*. “If the rod had held in for a bit longer, the aircraft could have got to a low altitude before it gave way. It would have been a very tough thing to deal with, once airborne.”

The operator’s investigation found that the maintenance and duplicate inspection were carried out in a very confined area, which led to the second engineer, according to the investigation report, not really being able to absolutely “confirm the bolt had gone through the rod end and that the nut was secure.

“The tail rotor control pedals were moved and appeared to work in the normal sense, this gave both engineers the assumption that the work was completed correctly...”

What should have happened

CAA Aviation Safety Advisor John Keyzer says engineers certify in their release-to-service statement that a safety inspection has been carried out, that the control system functions correctly, that it was assembled correctly and locked correctly.



// Very hard to see. The bellcrank to rod end bolt is half a metre away from the engineer’s head and 90° right to their field of vision.

“Although a system may appear to function correctly, it cannot be taken as evidence that the work has been done properly,” John says.

“A greater emphasis is often put on the first part of a duplicate, but the second duplicate inspection can be more important. It’s the last chance to identify something isn’t correct.”

John considers this stage important enough to recommend that if staffing levels allow, there be two independent inspections following the maintenance task.

“That is, that the first or second duplicate is *not* carried out by the same person performing the task.”

While the second part of the duplicate inspection can be carried out by someone who has adequate training, knowledge and experience¹, John says it’s important that that person is not simply led by the person who carried out the task, and the first part of the duplicate inspection.

In this incident, the engineer who performed the maintenance task and first inspection was senior to the engineer who completed the second part of the duplicate inspection.

While the chief pilot doesn’t believe this imbalance in experience had a role to play in the occurrence, the report by an independent engineer, commissioned by the operator, notes there was an “assumption by a junior engineer that the task had been completed correctly by the senior engineer”.

Stopping it happening again

The operator accepted the recommendation of the independent report that both maintainer and ‘inspector’ should have refresher training on the particular aircraft type.

The operator has also emphasised the importance of using inspection aids such as a mirror and cellphone camera when inspecting in confined spaces.

The operator’s safety manager told *Vector* that the incident has led to improvements through their safety systems.

Not only has he increased the safety focus on duplicate inspections, but the staff realise that in the company’s ‘just culture’, they can report near-misses or mistakes, without fear of some sort of penalty.

“Which is just about a perfect situation,” he says.



Photo courtesy of operator

// The bolt and retaining nut correctly installed in the bellcrank and control rod end bearing.

// IT COULD HAVE BEEN MUCH WORSE...

...had the pilot concerned not followed the normal procedure of running the helicopter up to 100% rotor RPM and placing in some control inputs before lifting off.

"The great thing about flying a helicopter," says the operation's chief pilot, "is that you generally prove it can fly before you're committed. But some test flights I've witnessed are a bit 'grip it and rip it'.

"But it really is a test flight after maintenance, and the guys did that well, which is why the outcome is not as bad as it could have been."

“Having your mate’s back”

There’ve been other instances of failures in duplicate inspections, including very recently, which, former CAA Chief Advisor Human Factors Matt Harris says, indicates that more focus is needed on this important task.

“If the dup is carried out with the expectation that the maintenance will be all good, confirmation bias² will corroborate what we anticipate we’ll see.” »

¹ See rule 43.111(b)(2).

² We pay attention mainly to information confirming our expectations, and we ignore, or don't see, or minimise, information which doesn't.

// There was an assumption by a junior engineer that the task had been completed correctly by the senior engineer. //

» But the threat and error management guidance on the CAA website says, “As humans we are all fallible and errors are to be expected. Even the most experienced and well-trained person can make an error.”

So duplicate inspections should be carried out with healthy scepticism, says Matt.

“That second engineer should be looking for what has not been done correctly, or is out of the ordinary. Their fresh eyes are essential to the maintaining engineer.

“Maybe it’s been a busy day with lots of distractions – go in with the intention of finding anywhere those distractions could have prevented your colleague doing their job fully.

“It’s about having your mate’s back.” ➤

For more information on what the rules say, read rule 43.113 *Duplicate safety inspection of control system*.

Comments or queries?

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// OUR THANKS

The CAA thanks this operator, and others who've reported their duplicate inspection failures, for telling us about their occurrences. Reporting is the only way we can know where education should be aimed.

Thanks too, to the operator highlighted in this article, for being willing to share their story with Vector readers. It means the rest of you get a free lesson about the importance of duplicate inspections being done effectively.

AIRCRAFT AIRWORTHINESS CATEGORIES SOME BASICS



The reason there are different airworthiness categories is because the certification requirements are tailored to how the aircraft is intended to be used.

Standard and restricted category

Standard category aeroplanes and helicopters have a type certificate fully complying with an airworthiness design standard.

These are the typical factory-produced aircraft you see at your local aerodrome, many operated by flight training organisations and airlines.

Because of the robust certification process and requirements applied to these aircraft, they can do any operations the rules and their flight manual allow, for example, passenger transport in IMC.

There’s also a restricted category type certificate used for specific operational purposes. For instance, a helicopter with a spray system can’t meet some rules, say, for passenger safety and emergency exit. The CAA allows that, but with the restriction that the aircraft can’t carry passengers when fitted with the spray system.

It may be, however, that, after a morning of spraying, the helicopter can have the spray system removed, and be transporting passengers in the afternoon. So a dual category – restricted and standard – certificate is issued.