Australian Government
Australian Transport Safety Bureau

# Safety Advisory Notice

To operators and maintainers of UH-1H helicopters

Number: AO-2022-006-SAN-001

# UH-1H helicopter main drive shaft failure

**Loss of drive to the main rotor system**

## What happened

On 14 February 2022, the pilot of a Garlick Helicopters UH-1H was providing aerial firefighting support to combat the 'Labrina' bushfire that had developed north of Launceston, Tasmania. That afternoon, the pilot was tasked to firebomb a localised hot-spot that had developed within the fireground. Witnesses both on the ground, and within a nearby helicopter, observed the early release of the water load from the underslung bucket, before the UH-1H commenced a left turn and descended toward nearby open terrain. The helicopter was then observed to slow and enter a hover, then rapidly yaw, before descending and impacting terrain. The pilot was fatally injured and the helicopter was destroyed.

## Why did it happen

The ATSB's on-site examination of the wreckage found anomalies with the helicopter's main drive shaft, identified as a KAflex and manufactured in the United States by Kamatics Corporation (Kamatics), that transmits engine power to the transmission. The shaft was found to have fragmented during the accident sequence, with 4 of the flex-frame attaching hardware (nuts, bolts, and their washers) and portions of the flexible frame elements unable to be accounted at the accident site. The ATSB subsequently commenced a detailed technical examination of the KAflex shaft assembly and importantly, severe frictional and wear damage was identified to have occurred to one portion of the shaft. The results of that work was presented to Kamatics and the Civil Aviation Safety Authority (CASA).

While the ATSB's investigation of this accident and further technical examination of the KAflex shaft remain ongoing, the manufacturer advised that the presence of the frictional damage was evidence that the shaft had entered fail-safe mode during operation. The frictional damage was consistent with other KAflex shafts that had entered fail-safe mode following the release of flex-frame attaching hardware, or, when one of the flexible frame elements had fractured during operation.

Kamatics further advised that, although the fail-safe feature is intended to allow for uninterrupted drive for up to 30 minutes of helicopter operation, if a flex-frame attachment bolt were to release, the time before complete shaft failure may be significantly reduced. Reports from other UH-1H accidents involving a partial KAflex shaft failure identified that the off-centre operation and corresponding imbalance can produce sudden loud noises, vibrations, and control difficulties for the pilot.

Kamatics also stated that, while the United States Federal Aviation Administration airworthiness directive AD 2021-26-16 became effective on 25 February 2022 for the inspection and potential replacement of KAflex shafts installed in UH-1H helicopters, some concern remains for shafts identifed in the serial number ranged 0635 and below. The manufacturer is uncertain of the configuration status of this serial number range, whereby these shafts may be fitted with legacy flex-frame attachment hardware that can exhibit signs of deterioration, increasing the potential for shaft failure.

While the specific circumstances of this accident are still under investigation, the ATSB has issued the following safety advisory notice to advise UH-1H operators and maintainers of the potential safety concern.

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The ATSB advises operators of UH-1H helicopters to note the preliminary details of this accident, the content of AD 2021-26-16 and CASA Airworthiness Bulletin AWB 63-004, and to look for the presence of:

- corrosion
- fretting
- frame cracking
- missing or damaged flex-frame attaching hardware

during all inspections of the KAflex drive shaft. Any identified defects should be notified to the Civil Aviation Safety Authority and the ATSB.

Additionally, operators should be aware of Kamatics concern of a certain serial number range of shafts for the UH-1H helicopter that may be fitted with legacy flex-frame attachment hardware. Kamatics (chris.prain@kaman.com) should be contacted if a shaft in the affected serial number range (0635 and below) is identified.

**Fragmented KAflex from the accident helicopter, source ATSB**

Read more about this ATSB investigation:
https://www.atsb.gov.au/publications/investigation_reports/2022/aair/ao-2022-006

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