



**Australian Government**

**Australian Transport Safety Bureau**

# Collision with terrain involving Yamaha RMAX

23 km W of Canberra, Australian Capital Territory, 6 April 2017

**ATSB Transport Safety Report**  
Aviation Occurrence Investigation  
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#### **Addendum**

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# Collision with terrain involving Yamaha RMAX

## What happened

On 6 April 2017, the operators of a Yamaha RMAX<sup>1</sup> remotely piloted aircraft system (RPAS) (Figure 1) were conducting aerial spraying about 23 km west of Canberra, Australian Capital Territory. One operator was acting as the remote pilot in command of the RMAX and the other was mixing chemical, ferrying it to the aircraft and loading it into the chemical tanks, or canisters, on the aircraft.

**Figure 1: Yamaha RMAX**



Source: Yamaha

The aircraft had been operating normally that day for about 1 hour and 15 minutes of flight time. At about 1400 Eastern Standard Time (EST), the aircraft was about 2 to 3 m above the ground returning to land, when the pilot and loader heard a ‘clunk’. The aircraft started yawing to the left and descending. The pilot selected opposite direction yaw input (right rudder servo), but the aircraft did not respond. The aircraft collided with terrain upright but in a nose-down attitude and then rolled onto its side, resulting in substantial damage (Figure 2). The pilot did not receive any warnings on the aircraft’s ground control station prior to the accident.

Subsequent inspection revealed that the tail rotor had separated from the aircraft and landed about 30 m from the rest of the aircraft.

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<sup>1</sup> Yamaha RMAX is a remotely piloted helicopter, body length 2.75 m (3.63 m including rotor), with a load capacity of 28 kg.

**Figure 2: Damage to the RMAX**

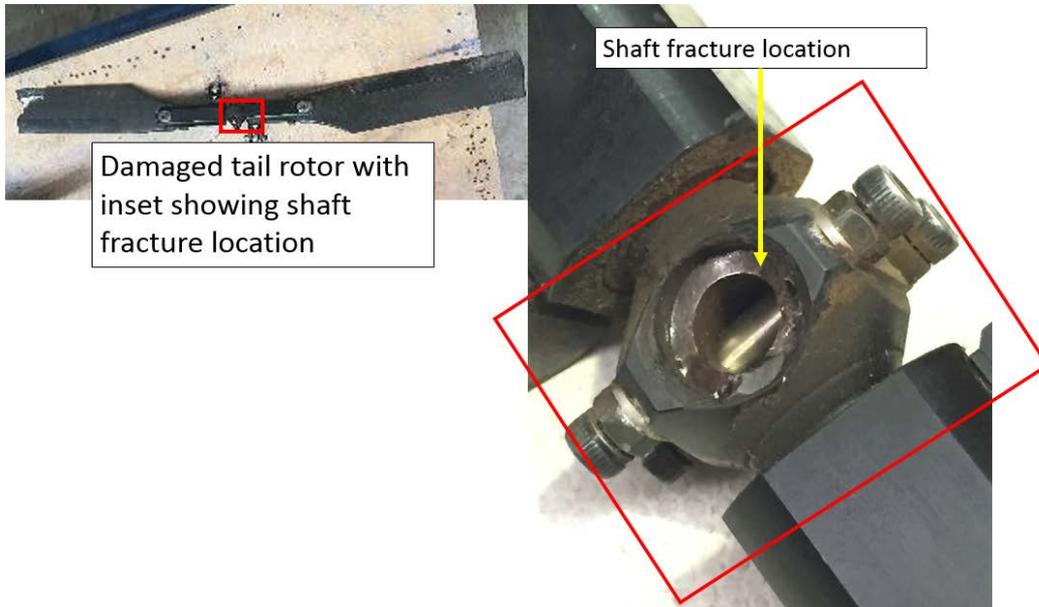


Source: Yamaha

***Post-accident inspection***

The manufacturer found that the tail rotor shaft had fractured, resulting in the tail rotor detaching from the aircraft (Figure 3).

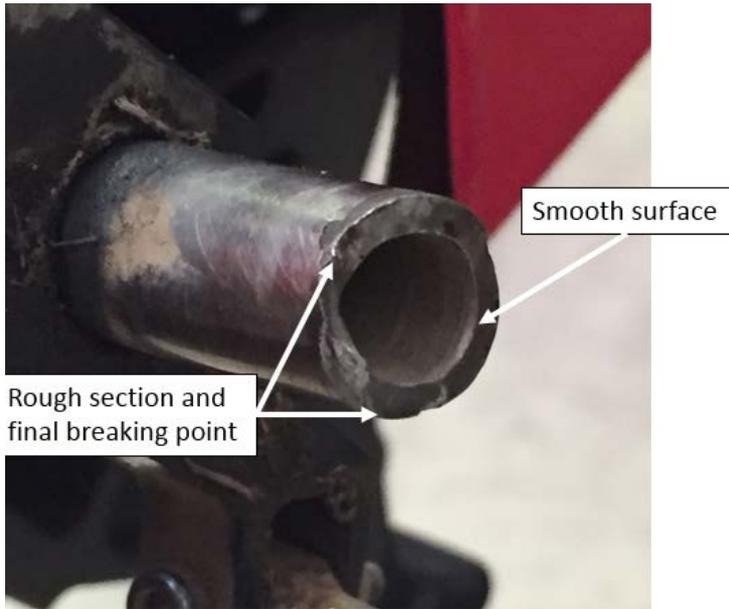
**Figure 3: Tail rotor showing fracture location**



Source: Yamaha

The manufacturer assessed that the fracture had probably existed for some time, as one section of the fracture site was smooth, indicating a pre-existing fracture. Another section of the fracture was rough indicating the failure occurred during the accident flight (Figure 4). The tail rotor blade (Figure 3) probably struck the tail cover after the shaft failed, as this allowed excessive movement in the tail rotor head.

**Figure 4: Fractured tail rotor shaft**



Source: Yamaha

### ***Manufacturer investigation report***

The manufacturer had conducted routine maintenance on the aircraft in October 2016. At that time, they found chips in the tail rotors and a broken antenna (fitted to the tail of the aircraft). The manufacturer replaced the antenna and tail rotor blades but was unable to determine how long the aircraft had been operating with the damage to the blades. Damage to the tail rotor blades may have caused an imbalance and extra load on the tail rotor shaft.

The manufacturer found the following factors may have contributed to the failure of the shaft:

- Impact with a small branch at the time the blades sustained chip damage.
- Possibly flying with rotor blades out of balance after the first impact, for an unknown period.
- Other damage to the aircraft indicative of mishandling during transport, which may have resulted in stress fractures to the rotor shaft.

### **Findings**

These findings should not be read as apportioning blame or liability to any particular organisation or individual.

- The tail rotor drive shaft probably failed due to an existing fracture, resulting in the aircraft colliding with terrain.

### **Safety action**

Whether or not the ATSB identifies safety issues in the course of an investigation, relevant organisations may proactively initiate safety action in order to reduce their safety risk. The ATSB has been advised of the following safety action in response to this occurrence.

#### ***Aircraft manufacturer***

As a result of this occurrence, the aircraft manufacturer has advised the ATSB that they are taking the following safety actions:

**Communication and reporting hub**

Yamaha Motor Australia (YMA) is implementing an online form so that operators can send information and notification of incidents directly to Yamaha operations and maintenance departments.

YMA will modify operator’s manuals to better reflect handling standards.

**Safety message**

This accident highlights the importance of reporting all incidents and accidents, particularly to ensure adequate inspection and maintenance is conducted before returning the aircraft to operations.

**General details**

**Occurrence details**

Date and time:	6 April 2017 – 1400 EST	
Occurrence category:	Accident	
Primary occurrence type:	Collision with terrain	
Location:	23 km W of Canberra, Australian Capital Territory	
	Latitude: 35° 17.03' S	Longitude: 148° 56.62' E

**Aircraft details**

Manufacturer and model:	Yamaha RMAX	
Registration:	N/A	
Serial number:	N/A	
Type of operation:	Aerial work – aerial agriculture	
Persons on board:	Crew – 0 (Unmanned)	Passengers – 0
Injuries:	Crew – 0	Passengers – 0
Aircraft damage:	Substantial	

**About the ATSB**

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; and fostering safety awareness, knowledge and action.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to operations involving the travelling public.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

## About this report

Decisions regarding whether to conduct an investigation, and the scope of an investigation, are based on many factors, including the level of safety benefit likely to be obtained from an investigation. For this occurrence, a limited-scope, fact-gathering investigation was conducted in order to produce a short summary report, and allow for greater industry awareness of potential safety issues and possible safety actions.