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INCIDENT

Aircraft Type and Registration:	Yak-52, G-YOTS
No & Type of Engines:	1 Ivchenko Vedeneyev M-14P piston engine
Year of Manufacture:	1990
Date & Time (UTC):	31 October 2004 at 1300 hrs
Location:	Southend Airport, Essex
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Nose wheel tyre and propeller damaged
Commander's Licence:	Private Pilot's Licence
Commander's Age:	62 years
Commander's Flying Experience:	789 hours (of which 116 were on type) Last 90 days - 30 hours Last 28 days - 10 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot and further AAIB enquiries

History of the flight

The pilot, who was also the aircraft owner, took off from Southend Airport intending to practise aerobatics before landing at North Weald Airfield for re-fuelling and refreshments. The pilot flew a stall turn at 3,500 feet, which ended with the aircraft in a 70º dive. At this point the pilot became aware of a control restriction and checked that his passenger, who was qualified on type, was not applying pressure to the controls. The pilot closed the throttle and assessed that there was just sufficient control authority in the nose up sense to recover from the dive normally, albeit with considerable loss of height. The aircraft recovered to climbing flight below 1,000 feet agl and the pilot then applied power to gain height. He declared an emergency on Southend Tower frequency, stating that he had a control restriction and requesting an immediate landing at Southend. Runway 06 was in use with a light easterly surface wind but, as the aircraft was positioned 3 nm north east of the airport and considering the nature of the emergency, the pilot chose to make an

approach to Runway 24. A light aircraft which had been on finals for Runway 06 was instructed to go-around and, once it had commenced an early left turn, the YAK-52 pilot was cleared to land.

The pilot flew a steeper than normal approach but could not arrest the descent rate prior to landing. The aircraft touched down very heavily and bounced, though the subsequent touchdown seemed to observers to be much more controlled. The pilot reported that he re-gained control of the aircraft after the initial bounce. The aircraft suffered damage to the nose wheel and propeller tips, which left 4 two inch deep strike marks on the runway surface. Both occupants were wearing 5 point harnesses and were uninjured. The airport fire service, which had been alerted after the initial emergency call, accompanied the aircraft as it vacated the runway under its own power. The pilot was of the opinion that, had the aircraft impacted an unprepared surface, the crash may not have been survivable.

Aircraft examination

The aircraft was examined by a company specialising in the import, overhaul and repair of this type. A mobile telephone was found loose in the rear most section of the fuselage. The telephone exhibited considerable damage, which was consistent with it becoming trapped in the rear elevator quadrant. A ceconite barrier, fitted in the fuselage as a mandatory modification and designed to prevent the migration of loose articles rearwards, was found to be detached from approximately 60% of the frame to which it was bonded. The pilot later reported that he had been aware of the defective barrier for some time, but stated that the disbonded area was limited to a corner of the barrier which resulted in a small flap of approximately 1 inch square.

The loose article

The mobile telephone had been introduced into the aircraft two weeks before the flight described in this incident. The aircraft owner had taken a passenger for a flight but as the flight did not include aerobatics, the owner had not taken specific measures to ensure that no potential loose articles were taken into the cockpit. The owner of the telephone, who was not a pilot, had not realised that it had been lost inside the aircraft. The aircraft flew approximately 6 hours after that flight and before the flight during which the incident occurred; aerobatics were flown during this period, but not the type of manoeuvre which preceded the control restriction.

Previous occurrence

There have been a number of cases of a loose article causing a jam in the elevator control assembly of this type of aircraft. In a fatal accident involving Yak-52 G-YAKW (AAIB Bulletin October 2003), a screwdriver was found to have jammed the aft elevator quadrant, preventing the elevator from being moved beyond neutral in the up direction. In the accident to G-YAKW, the

elevator also became jammed during a stall turn manoeuvre, denying the pilot the necessary control to recover from the ensuing vertical dive. The construction of the aircraft was found to have contributed to the accident. Being originally designed for military purposes, the YAK-52 is stripped of most of the trim and bulkheads normally associated with civilian aircraft, exposing the flying controls to loose articles in both the cockpit and rear fuselage. Additionally the rearmost vertical fuselage frame, which is just to the rear of the elevator control quadrant, was found to be capable of receiving loose articles during vertical flight in such a manner as to 'offer them up' to the elevator quadrant as the elevator was moved. As a result of the accident investigation, the AAIB made Safety Recommendation 2003-71. This called for the Yak-52, and aircraft of a similar design, to be fitted with a method of preventing loose articles migrating to a position where they could jam or otherwise interfere with the operation of the flying controls.

Airworthiness action

In response to Safety Recommendation 2003-71 the CAA issued Mandatory Permit Directive (MPD) 2004-006. The MPD called for a barrier to be installed in the rear fuselage to close off the aft elevator quadrant from the cockpit area in order to prevent loose articles finding their way to the rear of the aeroplane and jamming the elevator control.

Although he was aware of some limited damage to the barrier fitted to G-YOTS, the pilot thought that a second barrier was also fitted further aft and so did not appreciate the significance or implication of the damage. The damage was first noted before the telephone was introduced into the aircraft and was visible through a clear view panel in the fuselage side designed for this purpose. His pre-flight check for loose articles in the aircraft rear was to slap the fuselage and listen and feel for vibrations which would indicate a loose article present within the fuselage. This is a common check taught to pilots of this aircraft type. A limited visual inspection of the rear fuselage interior towards the installed barrier is possible from the cockpit area, but is hindered by an electronics rack aft of the rear seat. The area behind the barrier is only accessible after removing an access panel which would not be practical for a pre-flight inspection and is instead incorporated into the maintenance schedule.

The investigation into the accident to G-YAKW identified a good awareness among YAK-52 operators of the loose article hazard on this type, but also highlighted the limitation of slapping the rear fuselage to identify loose articles. It was found that this method was only capable of detecting articles in the mid section of fuselage, as a handle prevented slapping the fuselage in the rearmost section adjacent to the elevator quadrant.

Analysis

The barrier in G-YOTS had been fitted by an approved agency which also conducts the required annual inspection and renewal of the barrier. To date, about 60 aircraft fitted with this barrier have been inspected by the agency, none of which have exhibited a similar defect. Enquiries were made of another maintenance company, which also reported no similar incidents. It was not possible to determine when the barrier became detached or what caused it, but the defect was present before the mobile telephone entered the aircraft. Nor was it possible to account for the discrepancy between the limited damage that existed before the flight as reported by the pilot and the more extensive damage found by the repair agency afterwards. The damage cannot be attributed to the phone striking the barrier, though if this happened repeatedly it may have aggravated any existing damage. With the barrier partially detached the telephone was able to migrate aft, though it is not known exactly when this happened. Once the telephone was behind the barrier, it would then be possible for it to become lodged in the elevator quadrant. The most likely scenario is that it fell onto the last bulkhead during the final vertical climb and was "scooped up" by the quadrant as the elevator was moved during the manoeuvre or recovery. The telephone then remained jammed between the quadrant and the aircraft structure until it was jarred free during the very hard initial touchdown and bounce, enabling the pilot to regain control for the subsequent landing.

Although the modification mandated by MPD 2004-006 had been carried out on G-YOTS, the barrier had become partially detached and this was known to the pilot. With the barrier in its damaged state the aircraft no longer fully complied with the MPD and should not therefore have been flown until the defect was rectified even if, as the pilot believed, the extent of the damage was negligible and that a second barrier was fitted.

This incident highlights the need for the utmost vigilance with regard to foreign objects, particularly in aircraft used for aerobatics and with control systems vulnerable to loose articles. The similarities between this incident and the fatal accident to G-YAKW serve to remind that a tragic outcome was narrowly avoided.

Conclusion

The incident was caused by a loose article, a mobile telephone, penetrating a defective barrier and jamming the elevator control system. The barrier was a mandatory airworthiness requirement and was intended to prevent such an occurrence.