Aircraft Type and Registration:	Yak-18T, RA-44506
No & Type of Engines:	1 Ivchenko Vedeneyev M-14P piston engine
Year of Manufacture:	1980
Date & Time (UTC):	22 September 2002 at 1310 hrs
Location:	Sleap Aerodrome, Shropshire
Type of Flight:	Private
Persons on Board:	Crew - 1 Passengers - 1
Injuries:	Crew - None Passengers - None
Nature of Damage:	Damage to the left wing and landing gear
Commander's Licence:	Private Pilot's Licence, with IMC and night ratings
Commander's Age:	59 years
Commander's Flying Experience:	12,000 hours (of which 232 were on type) Last 90 days - 22 hours Last 28 days - 22 hours
Information Source:	Aircraft Accident Report Form submitted by the pilot

History of the flight

Following an uneventful flight from Yeovilton, the aircraft made a standard overhead join for the circuit at Sleap aerodrome. During the downwind leg the landing gear was lowered, with a 'down and locked' condition being confirmed by a green indicator light on the instrument panel, together with mechanical indicators on the wings. Touchdown was normal and, after completion of the landing roll, the pilot commenced a gentle turn to the right in order to vacate the runway. However, the left main landing gear collapsed, allowing the left wing tip to contact the ground, which caused the aircraft to swing to the left by around 150°. The pilot immediately shut down the engine and turned the fuel off. Neither occupant was injured and they were able to exit the aircraft via the doors.

Description of the landing gear system

The tricycle landing gear is operated by a pneumatic system powered by 'normal' and 'emergency' air bottles. The 'normal' bottle is charged by an engine-driven compressor, but the 'emergency' bottle can only be topped up on the ground. The main landing gear actuators, which are in the

retracted position when the landing gear is extended, incorporate an internal downlock mechanism. The nose landing gear actuator operates in the reverse sense, ie it extends to lower the gear, but is otherwise similar. The main landing gear lateral braces consist of a linkage with an 'over centre' action, to which are attached the indication microswitches.

In the absence of a suitable drawing of a main landing gear actuator, Figure 1 shows a part sectional drawing of the nose gear actuator, in which the downlock mechanism is displayed. The piston, acting under pneumatic pressure, pushes a ring containing ball bearings against a tapered ring on the actuator ram. This pushes the balls outwards so that when the piston/ball bearing sleeve assembly reaches the end of its travel, the balls lock behind the lip of a fixed tapered ring in the actuator cylinder. When the landing gear is retracted, air is ported to the opposite side of the piston, the initial movement of which is against a spring. This movement pulls the sleeve away from the tapered ring on the ram, which allows the balls to drop back inside the lip of the fixed tapered ring, thus removing the downlock.

The piston assembly, together with the spring, are held in position by a retaining nut threaded onto the spindle at the end of the actuating ram. A locking pin (not shown in Figure 1) prevents rotation of the nut.

Examination of the actuator

After disassembly of the failed landing gear actuator, it was immediately apparent that the retaining nut had come off the threaded spindle. The components of the actuator are shown in the photograph at Figure 2. Corrosion on the threads was seen (Figure 3) and, although the threads were visible, it was apparent that the thread crests had been stripped away. Following the failure of the threads, the loads would have been transferred to the locking pin, which then suffered a double shear failure. The three pieces of the pin produced as a result of this failure are also shown in Figure 3.

Following the release of the nut, the piston and sleeve assembly would have remained in the downlock position, but the actuator ram would have been unrestrained. Landing gear collapse would have occurred when the side brace was induced out of its over centre condition, perhaps by a runway surface irregularity.

Other information

The Russian maintenance schedule required that anti-corrosion treatment to be applied to the landing gear actuators at intervals of 100 flying hours. This took the form of injecting a 50:50 mixture of glycerine and isopropyl alcohol into the actuator cylinders. The United Kingdom organisation that

imported the aircraft, and who subsequently maintained it, recommended that the treatment should be applied every 50 flying hours.

Since arriving in the United Kingdom during the spring of 1999, RA-44506 had flown comparatively little. It is thus possible that, during recent years, considerable calendar time had elapsed between anti-corrosion treatments, leading to corrosion within the actuator. It should also be noted that pneumatic systems are prone to collect water, as a result of the compression process, with an associated risk of corrosion unless the system is drained after every flight.

Certification aspects

Although this aircraft has a Russian Certificate of Registration, it does not appear on the State Register of the State Civil Aviation Authority of the Russian Federation (SCAAR), which is recognised by the International Civil Aviation Organisation (ICAO). It is believed that the aircraft is entered on a domestic register that does not permit its use outside of Russia.

The same position applies to around 60 Russian registered light aircraft currently located in the United Kingdom. The Russian authorities have indicated that these aircraft have not been fully certificated in accordance with internationally recognised civil airworthiness standards and are therefore not eligible for flight outside of the State of Registry without the specific permission of the State in which they are to be operated.

In May 2002, the UK Civil Aviation Authority (CAA) decided that these aircraft did not comply with UK legislation and therefore required exemptions to fly within the UK. Such exemptions were initially for one month and were renewable, subject to certain restrictions, thus allowing owners to continue flying while they decided whether to seek UK registration.

Currently, the CAA will not grant further exemptions. Owners of these aircraft must now decide whether to:

- take their aircraft back to Russia
- make an application to the SCAAR for the issue of a full ICAO Certificate of Registration and a Certificate of Airworthiness
- make an application for the appropriate Type Certificate to be assessed by the CAA prior to the issue of a full UK Certificate of Airworthiness

At least one Yak-18 is known to be on the official Russian register, with a full ICAO Certificate of Airworthiness issued by the SCAAR. Therefore, the UK CAA has presumed that there must be a

Type Certificate already in existence, which supports this Certificate of Airworthiness. Under UK regulations, if an aircraft has a Type Certificate, then it will only be considered for the issue of a Certificate of Airworthiness, as opposed to a Permit-to-Fly.

Currently, the maintenance organisation responsible for RA-44506, and similar aircraft, carries out maintenance activity in accordance with the Russian maintenance schedule, using Russian engineers in their employ. The work is documented and forwarded to the factory in Russia, where a 'Certificate of Airworthiness', with a two year 'validity' is issued. Whilst this system may ensure that regular maintenance is achieved, the responsibility for the issue of any official Certificate of Airworthiness rests with the State of Registry's Civil Aviation Authority, in this case SCAAR.

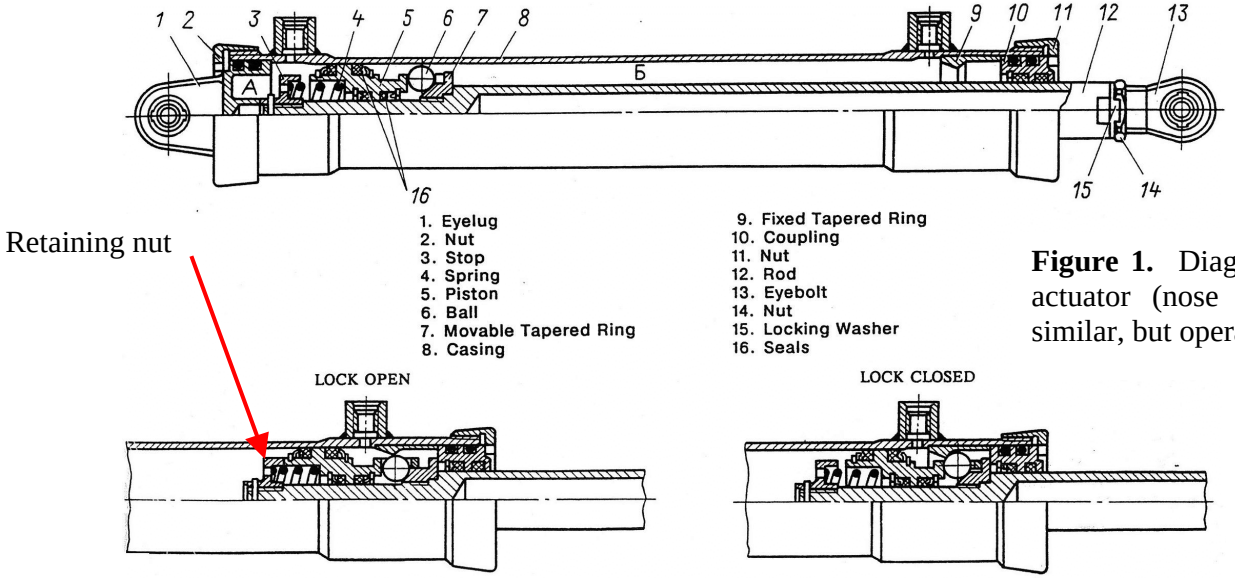

Figure 1. Diagram of landing gear actuator (nose unit shown, mains similar, but operate in reverse sense)

Figure 2. Actuator components

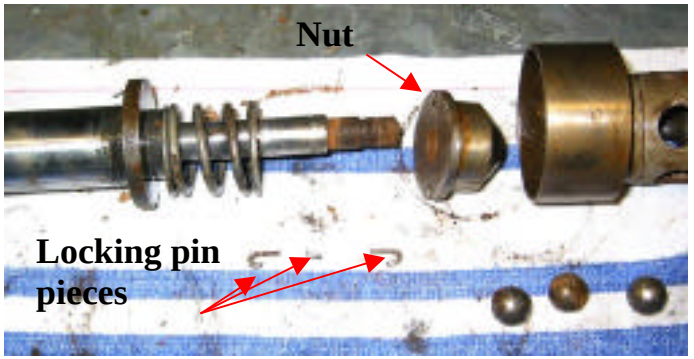

Figure 3. Part of downlock mechanism; note corroded threads on actuator ram spindle