DATA SUMMARY

LOCATION

Date and time	**Saturday, 10 March 2001; 17:15 hours**
Site	**Vicinity Aerod. of Casarrubios del Monte (Toledo)**

AIRCRAFT

Registration	**RA44543**
Type and model	**SUKHOI Su-26**
Operator	**N/A**

Engines

Type and model	**M-14PF**
Number	**1**

CREW

Pilot in command

Age	**31 years**
Licence	**Private aircraft pilot**
Total flight hours	**2,300 hours**
Flight hours on the type	**N/A**

INJURIES

	Fatal	Serious	Minor/None
Crew			**1**
Passengers			
Third persons			

DAMAGES

Aircraft	**Destroyed**
Third parties	**None**

FLIGHT DATA

Operation	**General aviation – Non commercial – Private**
Phase of flight	**Manoeuvering – Acrobatics**

1. FACTUAL INFORMATION

1.1. History of the flight

On 10 March 2001, the Sukhoi Su-26 aircraft, registration RA44543, was executing aerobatic manoeuvres over the Aerodrome of Casarrubios del Monte (Toledo). During the execution of a manoeuvre, the aircraft suddenly became uncontrollable and the pilot had to bail out by parachute moments before the aircraft crashed into the ground.

The aircraft, registered in the Russian Federation, was the property of a citizen of the United Kingdom and was in Spain for the formalisation of sale to a Spanish citizen. In the accident flight, the pilot, who held a Private Aircraft Pilot's Licence issued by the Spanish authorities, took off shortly before 17:00 h local time from the Aerodrome of Casarrubios del Monte in order to perform a flight to test the state of the aircraft. The flight was carried out in the circuit of the aerodrome.

During the flight, when the aircraft was at 2,000 feet executing an aerobatic manoeuvre called a climbing snap roll, the pilot realised on reaching the three-quarter point of the left turn that he had lost control of the rudder. He managed momentarily to recover control, but the aircraft then became totally unmanageable and at a height of 800 feet AGL he decided to abandon the aircraft, baling out by parachute at a height of approximately 600 feet.

The pilot suffered minor injuries and the aircraft was destroyed.

1.2. Injuries to persons

Injuries	Fatal	Serious	Minor/None
Crew			1
Passengers			
Other			

1.3. Damage to aircraft

The aircraft was destroyed by the impact with the ground.

1.4. Other damage

None.

1.5. Personnel information

Age:	32 years
Nationality:	Spanish
Qualification:	Private aircraft pilot
Flying licence:	
— Date of issue:	28-12-1992
— Date of expiry:	12-06-2002
Medical certificate:	
— Date of expiry:	29-06-2002
Flying hours:	
— Total:	2,300 hours
— Type:	1,100 hours

At the moment of the accident, the pilot held a licence from the State of Registration.

1.6. Aircraft information

The aircraft was in the process of being purchased by a Spanish citizen from a British exporter. The presence of the aircraft in Spanish territory was unknown to the Spanish Civil Aviation Authorities.

The aircraft was purchased, according to its proprietor, from the National Aero Club of Russia. Subsequently, a maintenance centre in Lithuania fitted it with a 400 HP engine, a three-blade propeller, a new paint finish, avionics and a smoke system. The aircraft was then transported from that country to Spain.

1.6.1. *Identification*

Make:	Sukhoi
Model:	Su-26
Serial n°:	04-03
Year of manufacture:	Unknown
Registration:	RA44543
MTOW:	Unknown

The aircraft's operational time was recorded as 44 hours, with an age of 10 years.

The aircraft had no log book.

1.6.2. *Certificate of airworthiness*

Number:	26/00.08- MΠ-217
Technical use:	Aerobatics
Date of renewal:	15-08-2000
Date of expiry:	15-08-2002

1.6.3. *Maintenance log*

It has not been possible to obtain maintenance records.

1.6.4. *Engine*

Make:	Vedeneyev
Model:	M-14 PF

The engine had no maintenance records.

1.6.5. *Propeller*

Data unknown.

1.7. Meteorological information

Not relevant to the investigation.

1.8. Communications

The pilot communicated with the aerodrome director by radio, reporting that something had broken.

1.9. Wreckage and impact information

The aircraft crashed to the north of the aerodrome, in the area allocated to aerobatic manoeuvres. The impact with the ground was very violent, with the wreckage appearing concentrated, with two-thirds of its length below ground level. The angle of impact was very high and with a turning component around the aircraft's transversal axis which caused the tail to tip over. The wings were spread out on the ground, with the lower surface upwards. The cockpit canopy was lying 200 m from the main wreckage.

Inspection of the wreckage revealed that the rudder control cable was loose at the cockpit end. The adjustment tensor and the joint between sections were bent.

The aircraft's rudder control cable, engine and tail were recovered for subsequent inspection.

1.10. Survival aspects

When the pilot lost control of the aircraft, he found himself forced to use the automatic-opening parachute included in the aircraft's equipment.

He bailed out at 600 feet AGL, with the risk of being struck by the aircraft. At the moment he jumped, one of the metal ends of the harness struck him in the mouth, breaking a tooth and splitting his lip.

The parachute drop lasted some 5 seconds, and on landing the pilot was dragged 200 m along the ground.

1.11. Tests and research

1.11.1. *Inspection of the aircraft*

The general condition of the wreckage made it impossible to locate the plate bearing the aircraft's serial number.

The aircraft's tail structure was still intact after the impact. The movement of the rudder did not interfere with that of the elevator, and vice versa. The elevator is controlled by an articulated bar mechanism; on the bar closest to the control surfaces, marks and deformations were found caused by the cable located among the wreckage.

On observing the size of the tail, its measurements were checked and were found to be greater than those specified by the manufacturer.

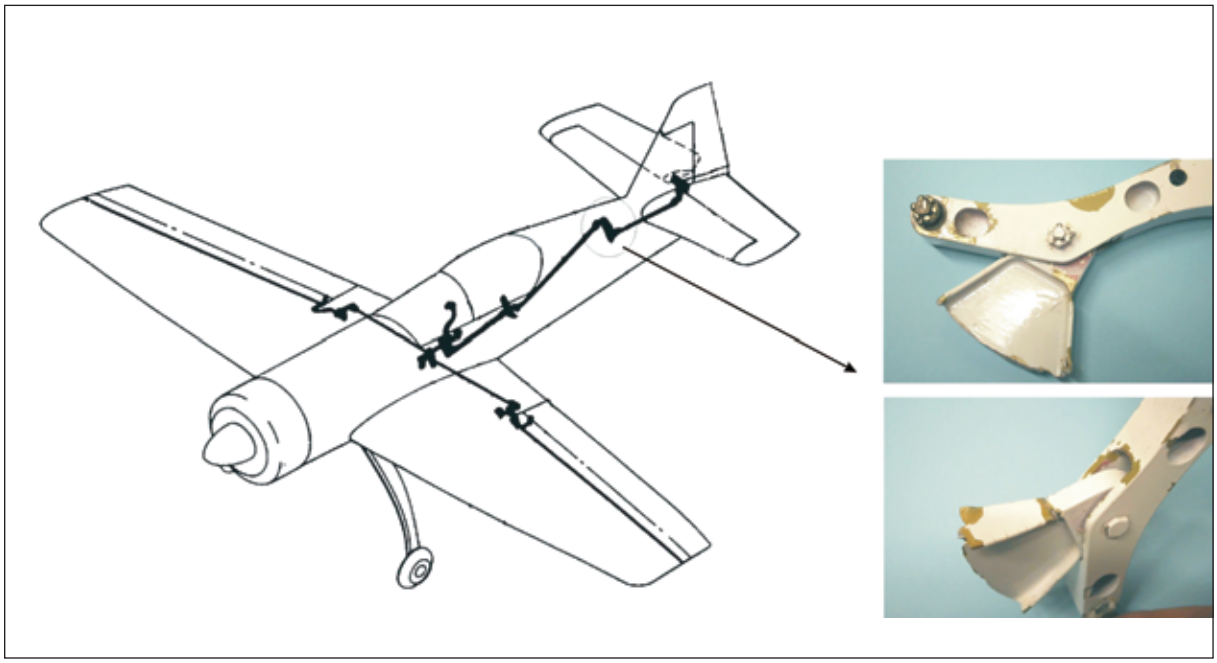

Figure 1. Situation of and damage to the elevator mechanism

1.11.2. *Inspection of the tensor*

The rudder control cable had different types of fixture at each end: the rudder end was coupled to a terminal with an orifice of the eye terminal type. At the other end there was a tensor joining two terminals; one of them had lost the cable and its shape and appearance were different from the other.

The components of the tensor were studied to determine the characteristics of the terminals fastened to it. The terminal that lost the control cable displayed a step 9 mm from the end of the orifice, caused by defective machining, which prevented the cable from penetrating to the end of its housing. Moreover, during the fitting of the cable to the terminal, it was not tightened sufficiently, as is demonstrated by the small dimensions of the traces made in the inner walls of the orifice. The outer crushing of the terminal had no effect on the inner part of the orifice.

At the other terminal of the tensor, the cable had been inserted to the end of the orifice, and the tightening between the two elements reduced its cross-section by around 20%, in such a way that the fixture would cause the breakage of the cable before it broke away from its housing.

Moreover, it has been established with the manufacturer of the aircraft (Sukhoi Design Bureau) that the tensor terminal is not identified as a part manufactured by Sukhoi.

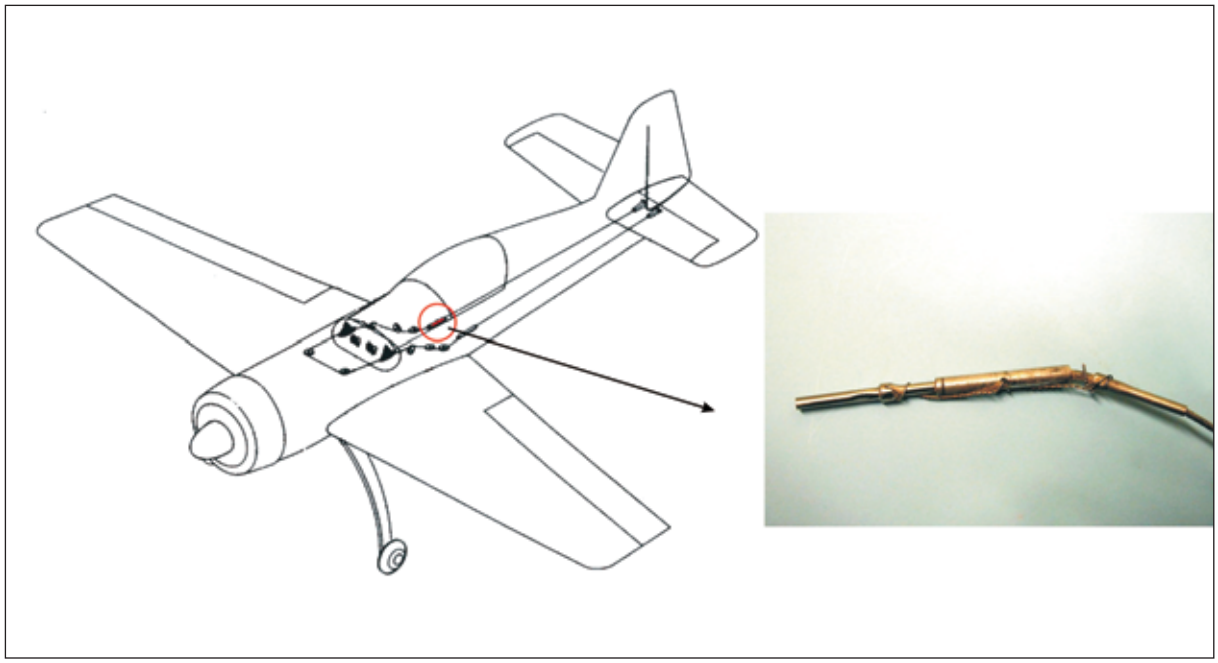

Figure 2. Situation and condition of the control cable tensor at the rudder end

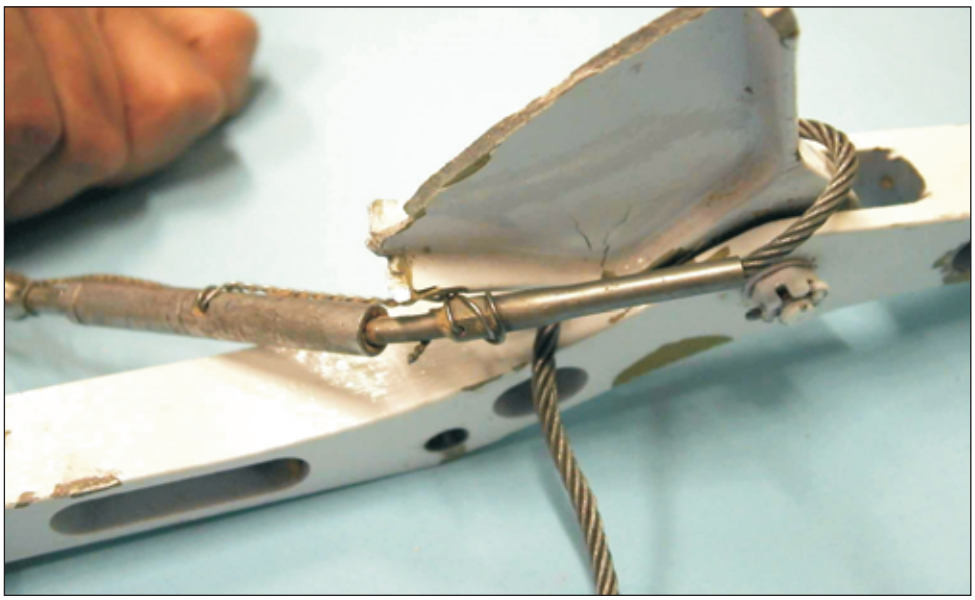

Figure 3. Lock of the elevator

1.11.3. *Considerations on maintenance*

According to the aircraft's owner, after purchase it was delivered to a maintenance centre in Lithuania. This centre carried out the works referred to in section 1.6. However, there is no record of the works done on the aircraft in that country, except for the pain-

ting work done in a different centre. It has been ascertained that the said centre did not hold authorisations in Lithuania, nor from the Russian Federation as the state of manufacture and registration, to conduct works on this type of aircraft.

1.12. Additional information

1.12.1. *Aerobatic flights in Spain by aircraft with foreign registration*

The crashed aircraft held a certificate of airworthiness from its State of Registration, issued in compliance with the International Civil Aviation Convention. However, the «Dirección General de Aviación Civil» of Spain, in an internal circular of May 1999, reported the conditions stipulated by Spanish legislation (Law 48/1960 of 21 July on Aerial Navigation) applying to the use of foreign-registered aircraft in Spanish territory, and specifically the exclusion of aerobatics as «harmless transit».

This circular subjects the performance of aerobatics to the grant of a special authorisation, a requirement that was not fulfilled by aircraft RA44543 at the time of the event

Consequently, it can also be considered applicable in this case the Safety Recommendation REC 40/02, issued in relation with an accident suffered on 25 June 1997 by the SUKHOI 26M aircraft, registration RA01295, in Barberà del Valles (Barcelona) (CIAIAC Reference A-033/1997), which stated as follows:

> *«It is recommended that the DGAC inform, through the official channels of general dissemination, and through the appropriate administrative provisions, in the most complete and precise manner possible, on the conditions that apply to the use of aircraft with foreign registration on national territory in cases of general aviation activities of a private nature.»*

2. CONCLUSIONS

The Sukhoi Su-26 aircraft had arrived in Spain from Lithuania, where it had been subjected to a series of modifications affecting the engine, propeller, avionics, tail, etc. In the course of its first familiarisation flight in Spain, during the execution of an aerobatic manoeuvre, it suffered the breakage of one of the tensors of the rudder control system, which, on moving towards the tail, jammed an element of the elevator control system, preventing it from moving.

It has been determined that the separation of the cable from one of the two terminals of the tensor was due to a manufacturing defect of the terminal and incorrect assembly between the cable and the tensor.

Taking into account the modification of the size of the tail that was observed, it can be considered that the manipulation of the tensor, being the element transmitting the movement to the rudder, was related to those works. However, it has not been possible to confirm this point with any certainty.

The investigations carried out to discover the procedure by which the maintenance and modification works on the aircraft were carried out has revealed that they were performed in a centre which did not hold the corresponding authorisation under the regulations of the aircraft's State of Registration.