CIVIL AVIATION AUTHORITY
OF NEW ZEALAND

AIRCRAFT ACCIDENT REPORT

CAA OCCURRENCE NUMBER 09/919

SKY ARROW 450T

ZK-SKA

LOSS OF PITCH CONTROL

NEAR INANGAHUA JUNCTION

15 MARCH 2009

Picture representitive of aircraft

Foreword

As a signatory to the Convention on International Civil Aviation 1944 ("the Chicago Convention") New Zealand has international obligations in respect of the investigation of accidents and incidents. Pursuant to Articles 26 and 37 of the Chicago Convention, the International Civil Aviation Organisation ("ICAO") issued Annex 13 to the Convention setting out International Standards and Recommended Practices in respect of the investigation of aircraft accidents and incidents.

New Zealand's international obligations are reflected in the Civil Aviation Act 1990 ("the Act") and the Transport Accident Investigation Commission Act 1990 ("the TAIC Act").

Section 72B(2)(d) and (e) of the Civil Aviation Act 1990 Act also provides:

> **72B Functions of Authority**
>
> (2) The Authority has the following functions:
>
> (d) To investigate and review civil aviation accidents and incidents in its capacity as the responsible safety and security authority, subject to the limitations set out in section 14(3) of the Transport Accident Investigation Commission Act 1990:
>
> (e) To notify the Transport Accident Investigation Commission in accordance with section 27 of this Act of accidents and incidents notified to the Authority:

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Glossary of Abbreviations

amsl	above mean sea level
CAA	Civil Aviation Authority
CAR	Civil Aviation Rule(s)
CPL(A)	Commercial Pilot Licence (Aeroplane)
E	east
ft	foot or feet
NZDT	New Zealand Daylight Time
S	south
UTC	Coordinated Universal Time

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AIRCRAFT ACCIDENT REPORT

CAA OCCURRENCE No. 09/919

Aircraft type, serial number and registration:	Iniziative Industriali Italiane S.p.A Sky Arrow 450T Serial Number 011 ZK-SKA
Number and type of engines:	One, Bombardier-Rotax Gmbh 912
Year of manufacture:	1993
Date and time of accident:	15 March 2009, 1050 hours[1] (approximately)
Location:	Inungahua Junction Latitude[2]: S 41° 50.1' Longitude: E 171° 53.8'
Type of flight:	Private
Persons on board:	Crew: 1
Injuries:	Crew: 1 (fatal)
Nature of damage:	Aircraft destroyed
Pilot-in-command's licence:	Commercial Pilot Licence (Aeroplane)
Pilot-in-command's age:	60 years
Pilot-in-command's total flying experience:	13,723 hours, 641 hours on type
Information sources:	Civil Aviation Authority Field Investigation
Investigator in Charge:	Mr J A Daley

[1] All times in this report are NZDT (UTC + 13 hours)

[2] WGS-84 co-ordinates

Synopsis

The Civil Aviation Authority (CAA) was notified of the accident at about midday on Sunday 15 March 2009. The Transport Accident Investigation Commission was in turn notified shortly thereafter, but declined to investigate. A CAA field investigation was commenced the following day.

The pilot was on a cross-country flight fom Westport to Murchison when he advised that he was in trouble. The microlight was observed in a steep descent from which it did not recover before striking the ground. The first person on the scene found the pilot deceased.

1. Factual information

1.1 History of the flight

1.1.1 The pilot of ZK-SKA and another aviation colleague, (both members of the local microlight club based at Westport) had decided to take part in a "fly in" with their respective aircraft at Murchison that weekend. The pilot and his colleague met at Westport Aerodrome on Sunday March 15 at about 1000 hours. The pilot was the sole occupant of his aircraft but his colleague had brought a passenger who had an interest in aviation. The pair pre flighted their aircraft and discussed which route they would fly to Murchison. The cloud base was approximately 2500 ft and, as they could see Denniston from Westport Aerodrome, they decided this was the route they would take.

1.1.2 At approximately 1030 hours the colleague watched as ZK-SKA departed Westport Aerodrome climbing to the north via Denniston. About five to ten minutes later, the colleague took off with his passenger and also tracked via Denniston.

1.1.3 During that phase of the flight, the pilot of ZK-SKA called his collegue on the radio and advised that the cloud was quite "claggy"over Denniston and suggested that they should head through the Buller Gorge as it would be clearer for flying. The colleague acknowledged the radio call and altered his course to track via the gorge which he entered at about 2000 ft.

1.1.4 At about 1050 hours and at a point half way through the Buller Gorge (near Berlins) the colleague heard a radio call which he recognised as being from the pilot of ZK-SKA saying "Nigel I'm in trouble". The colleague didn't quite register the call, realising it was his friend in ZK-SKA, he then heard a second call stating, "losing control, I'm going in at Whitecliffs". The colleague and his passenger noted that panic was evident in the voice of the pilot during the calls. As they were only two miles west of Whitecliffs farm when the last radio call was received they headed straight there looking for the aircraft on the ground.

1.1.5 Two men fishing at the intersection of the Buller and Mackley Rivers saw ZK-SKA cross the Mackley River about 150 metres upstream from where they were. One of the men estimated the height of the aircraft at about 200 to 300 ft. When the aircraft was over the Mackley River they heard the engine make a "spluttering noise". They then observed the aircraft to enter a steep descent, with what

appeared to be a vapour trail of whitish brown smoke coming from the rear fuselage near the cockpit. The aircraft continued in this steep descent banking towards the Buller River. The men then lost sight of the aircraft and about thirty seconds later saw it head out across the Buller River towards the back of Whitecliffs farm at the Meadows Road end. The aircraft flew across the Buller River and cleared the trees on the opposite bank by about 20 to 25 ft. It continued descending in a steep left turn and one of the fisherman described it as "heading down at about a 30 degree angle". The men lost sight of the aircraft again as it flew behind some trees then about four or five seconds later they heard "a big metallic bang".

1.1.6 A farmer also witnessed the accident. He stated that "the plane was going down too fast and too steep for a normal landing". When the aircraft struck terrain, and on seeing the the pilot being ejected from the aircraft he immeditely went to his assistance. He could not detect any signs of life so organised a call to emergency services and requested the assistance of other farm workers who had resuscitation skills. He noted another microlight circling overhead a couple of minutes after the accident.

1.1.7 The pilot's collegue and passenger following in the microlight arrived overhead Whitecliffs farm and saw the accident site and a quad bike heading for the wreckage. The pilot looked for a place to land and finding nowhere suitable returned to Westport Aerodrome and alerted emergency services on landing.

1.1.8 The accident occurred in daylight, at approximately 1050 hours, at Whitecliffs farm near Inangahua, at an elevation of approximately 110 ft amsl. Latitude S 41° 50.1', longitude E 171° 53.8'.

1.2 Injuries to persons

Injuries	*Crew*	*Passengers*	*Other*
Fatal	1	0	0
Serious	0	0	0
Minor/None	0	0	

1.3 Damage to aircraft

1.3.1 The aircraft was destroyed.

1.4 Other damage

1.4.1 Nil.

1.5 Personnel information

1.5.1 The pilot held a CPL(A) but had not renewed his Class 1 Medical Certificate since it had expired on 29 May 2001. He had approximately 13,723 hours total flight time, and had gained most of his flight experience as a professional topdressing pilot. He held a current Medical Certificate and a Declaration to Operate Microlight Aircraft that was issued on 24 April 2007 and expired on the 24 April 2009.

1.5.2 The pilot also held a Flight Radio Telephone Operator, Agricultural, Chemical and Category D Flight Instructor Ratings.

1.5.3 He was a member of the Recreational Aircraft Association of New Zealand (Inc) (RAANZ) and was a Senior Flight Instructor in Group B microlight aircraft. He had 641 hours flight experience on type. His last Senior Instructor Flight Test Assessment was completed on 8 March 2009.

1.5.4 The pilot had flown 10.6 hours (all in ZK-SKA) during the previous 90 days.

1.6 Aircraft information

1.6.1 Sky Arrow 450T, serial number 011 was manufactured in Italy by Iniziative Industriali Italiane S.p.A. in 1993 and registered as I-3296. The aircraft was imported to New Zealand and registered in 1996 as Microlight Class 2, ZK-SKA. The aircraft had two previous owners in New Zealand (the last being a business partnership) prior to being purchased by the pilot in 1999. The Italian aircraft manufacturer was declared bankrupt in May 2008.

1.6.2 The aircraft was powered by a Bombardier-Rotax Gmbh 912, 80 horsepower engine driving a Kiev three bladed propeller.

1.6.3 The aircraft had completed approximately 1,276 hours in service.

1.6.4 The pilot was the first owner to maintain an Aircraft Logbook for ZK-SKA and had utilised previous records. He had commenced recording in the logbook from 10 February 1998 at 235.0 hours with a signed statement “no records supplied from original owner times recorded on hobbs meter”.

1.6.5 The CAA did not require the maintenance of Aircraft Logbooks for Class 2 microlight aircraft until 1 July 2002 with the initiation of CAR 91 Amendment 7.

1.6.6 On 8 March 2009 ZK-SKA had received its annual “Microlight Inspection and Flight Permit Validation Application” and was due for its next inspection on 8 March 2010. The RAANZ inspector had completed all requirements on the aircraft inspection form as satisfactory.

1.6.7 The centre of gravity for the aircraft was determined by calculation to be within limits.

1.6.8 Pitch control for the aircraft is via sidesticks in the cockpit connected to a mixing unit behind the rear bulkhead. The control line is then via aluminium push/pull tubes which connect to a bellcrank at the rear of the fuselage transferring to a

vertical tube (elevator control arm) inside the tail fin to a control linkage attached to the elevator on the "T" tail. Refer to Figure 1 (item B).

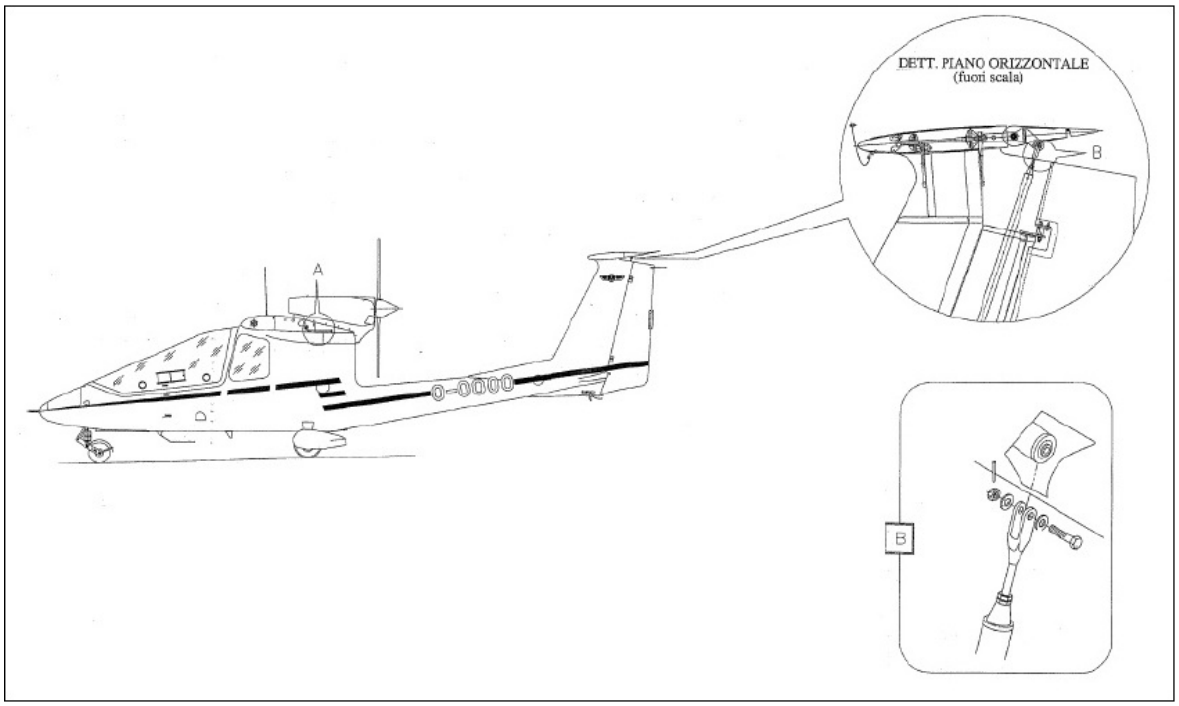

Figure 1: Elevator control linkage

1.7 Meteorological information

1.7.1 Weather was not a factor in this accident

1.8 Aids to navigation

1.8.1 Nil.

1.9 Communications

1.9.1 The pilot had communicated on three occasions, firstly after take off to advise the following aircraft that the weather was better in the Buller Gorge (refer para 1.1.3). Secondly where he stated "Nigel I'm in trouble' and finally "losing control, going in at Whitecliffs" (refer para 1.1.4).

1.10 Aerodrome information

1.10.1 Nil

1.11 Flight recorders

1.11.1 Nil

1.12 Wreckage and impact information

1.12.1 The accident, which was witnessed by the farmer on the quad bike, was in a southwesterly direction into one of the paddocks at Whitecliffs farm. The high speed and steep angle of the aircraft on impact resulted in a wreckage trail approximately 70 metres long. The engine and propeller and the pilot in his seat were arrested by a stock fence at the end of the paddock.

1.12.2 Due to the destructive nature of the impact, control integrity could not be determined at the accident site.

1.12.3 The aircraft's engine and key components of the elevator control system were removed from the site for specialist examination. This included the elevator control arm, which is positioned inside the tail fin, along with the end fittings, which were found separated in the accident wreckage.

1.13 Medical and pathological information

1.13.1 The post-mortem examination report stated that the pilot died of injuries consistent with a high-energy impact.

1.13.2 There was no indication of any pre-existing condition that could have resulted in incapacitation or affected the pilot's ability to fly the aircraft.

1.13.3 The result of toxilogical testing showed that there was no medicinal drugs in the blood. There was a trace of alcohol, a level of less than 5 milligrams per100 millilitres. The pathologist stated in his report that "trace levels of alcohol may be due to means other than deliberate ingestion".

1.14 Fire

1.14.1 Fire did not occur.

1.15 Survival aspects

1.15.1 Although the pilot was restrained by a full harness the impact forces were not survivable.

1.16 Tests and research

1.16.1 The aircraft engine was transported to a maintenance facility and a Rotax specialist conducted a detailed investigation. He stated that he could find no reason for the engine not to function normally.

1.16.2 The elevator control arm along with the associated end fittings were given to a metallurgist for detailed examination and testing.

1.16.3 It was found that the top end fitting which attaches to the elevator had failed at the threaded section from fatigue. The fatigue failure indicated a left/right cyclic loading. The fatigued area would not have been detected by visual inspection. Refer Figure 2 and 3.

Figure 2: Failed upper end fitting

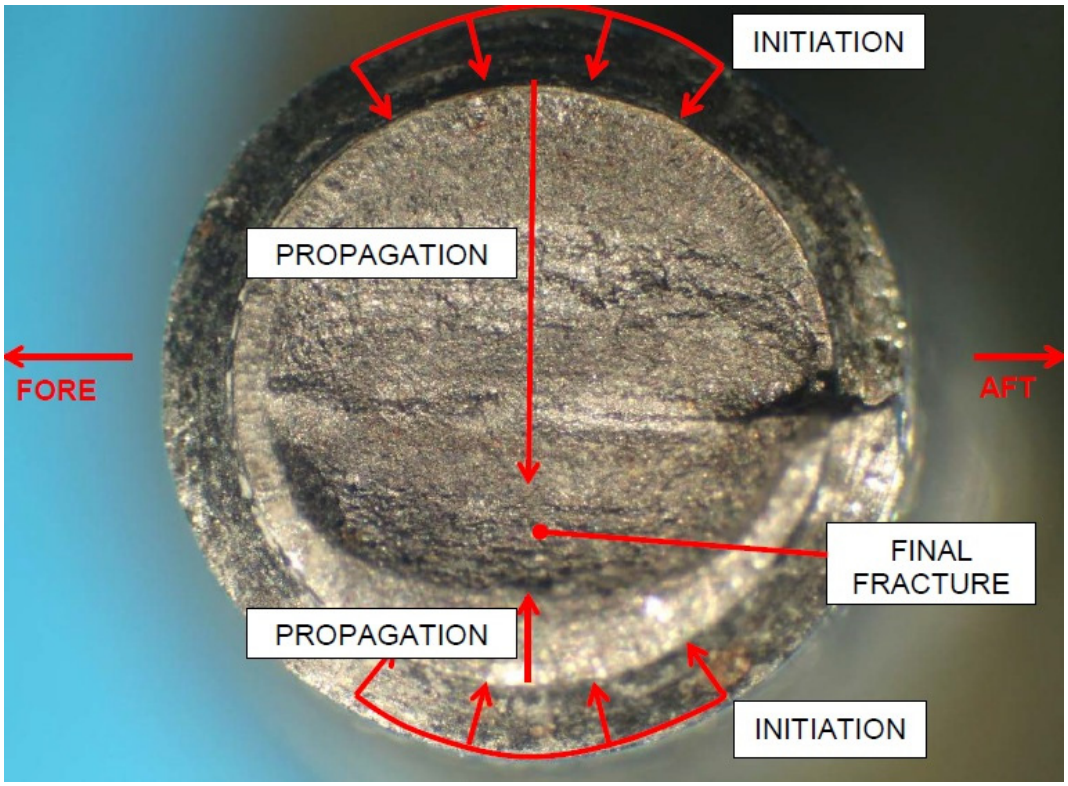

Figure 3: Upper end fitting fatigue failure

1.16.4 There were indications on the elevator lower surface adjacent to the end fitting attachment point where the broken end fitting had left impressions on the gel coat. Refer Figure 4.

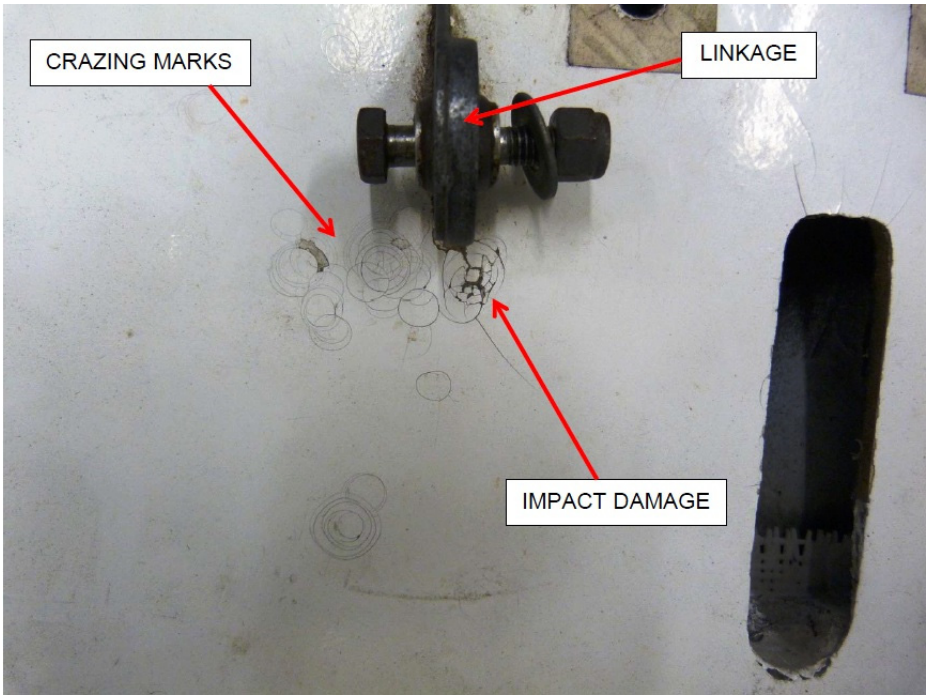

Figure 4: Damage to elevator lower surface

1.16.5 The metallurgical examination also showed that the bottom fitting on the elevator control arm was also subject to a partial fatgue failure with the crack propagating from the threaded section again. It was determined that the final failure of this component was a result of the accident impact. The fatigue cyclic failure mode was in a fore/aft direction. Refer figure 5.

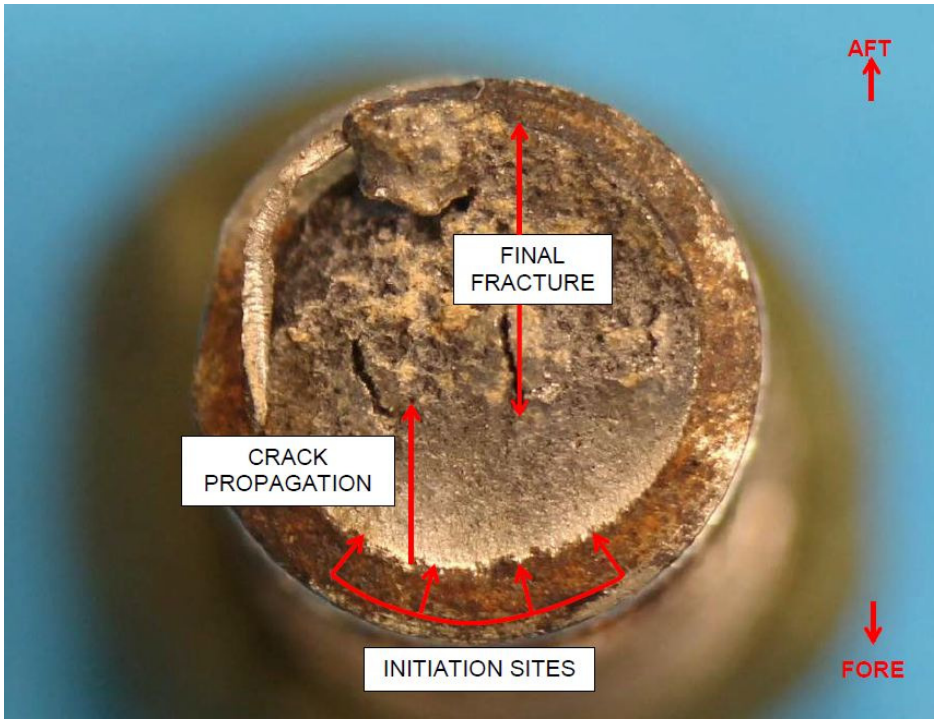

Figure 5: Lower end fitting fatigue failure

1.16.6 The investigation also found that the carbon steel used for the failed top and bottom fittings was of a different hardness, which may have indicated that the top fitting had been replaced at some stage.

1.17 Organisational and management information

1.17.1 Not applicable.

1.18 Additional information

1.18.1 The Italian manufacturer Iniziative Industriali Italiane S.p.A was declared bankrupt in May 2008. As a result there has been no communication with the company regarding the failed elevator control system components.

1.18.2 Communication with the ex-Australasian distributor of the aircraft has resulted in some information being supplied to the CAA. However specifications for the failed components were not available.

1.18.3 Communication was established with the previous owners of the aircraft to determine whether the top fitting had been changed or modified. Each advised that there was no replacement or modification of elevator control system parts while the aircraft was under their ownership.

1.19 Useful or effective investigation techniques

1.19.1 Not applicable.

2. Analysis

2.1 On 8 March 2009 ZK-SKA received its annual Microlight Aircraft Inspection and each detail of the inspection check sheet was marked as satisfactory. There were no unseviceabilities noted on the aircraft inspection form. The next inspection was dated on the form as 8 March 2010.

2.2 At approximately 1050 hours the following aircraft realized the pilot of ZK-SKA was calling him on the radio and said “Nigel, I’m in trouble” and then a short time later “Losing control, I’m going in at Whitecliffs”. The colleague noticed what seemed to be panic in the pilot’s voice. Whitecliffs farm is one of the flatter areas in the Buller Gorge with a topdressing strip, which the pilot would have been well familiar with.

2.3 With over 13,700 hours experience (primarily as as a professional topdressing pilot) and being a Senior Microlight Instructor, the pilot would have had the commensurate flight experience to cope with most in flight emergencies.

2.4 The pilot had lost primary pitch control of the aircraft due to the fatigue failure of the elevator control system. Control was now limited to roll(ailerons) and yaw(rudder). He may have had limited pitch control by the use of engine power and the electric trim system. The aircraft entered a steep high speed descent, the pilot would more than likely have closed the throttle to limit any further speed build up.

2.5 Both fishermen and the farmer all described the aircraft descending at a steep angle. The farmer also stated that the aircraft was too fast and too steep to complete a normal landing.

2.6 The destruction of the aircraft over the 70 metre wreckage trail indicated a steep angle, high speed high energy impact.

2.7 The farmer witnessed the accident and endeavoured to resuscitate the pilot. Unfortunately the injuries the pilot sustained were not survivable.

2.8 The fatigue fracture of the elevator control rod end fitting would not have been detected by a visual inspection, either during the aircraft's annual inspection on 8 March 2009 or the pilot's preflight on the day of the accident.

2.9 A detailed examination of the elevator and attachments could not determine what had initiated the various cyclic loadings which caused the fatigue failure of both top and bottom elevator control arm fittings.

3. Conclusions

3.1 The pilot was appropriately licensed, experienced and fit to carry out the flight.

3.2 The aircraft had received its annual Microlight Aircraft Inspection on 8 March 2009.

3.3 Due to fatigue failure of the elevator end fitting the pilot lost pitch control.

3.4 The fatigue fracture would not have been detected by visual inspection either during the RAANZ annual inspection of 8 March 2009 or the pilot's preflight inspection on the day of the accident.

3.5 Once elevator (pitch) control was lost the aircraft entered a steep dive with only aileron (roll) and rudder (yaw) control available.

3.6 The pilot endeavoured to land the aircraft at Whitecliffs Farm, an area well known to the pilot but the descent angle was too steep for a normal landing to be accomplished.

3.7 The aircraft struck the ground at high speed.

3.8 The accident was not survivable.

4. Safety actions

4.1 The CAA Manager Fixed Wing, Recreational and Adventure Aviation Unit organised an inspection of the two other Sky Arrow aircraft on the New Zealand register as soon as the cause of this accident was found. This involved non destructive testing of the elevator control components which had failed on ZK-SKA. No fatigue cracks were found in these aircraft.

4.2 The CAA Manager Fixed Wing, Recreational and Adventure Aviation Unit endeavoured to contact the Italian manufacturer regarding the specifications of the

steel used in the failed elevator control fittings. This was ineffective due to the organisation being declared bankrupt in 2008 and no response to communication.

4.3 The CAA Manager Fixed Wing, Recreational and Adventure Aviation Unit contacted key global aviation regulators to disseminate the findings of this investigation through their associated sport and recreational aircraft agencies.

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