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Aircraft Type and Registration:	Socata TB 9, EI-FLY
No. and Type of Engines:	1 Lycoming O-320-D2A Piston Engine
Aircraft Serial Number:	186
Year of Manufacture:	1981
Date and Time (UTC):	3 January 1999 at 14.05 hours
Location:	Lucan Golf Club, Co. Dublin
Type of Flight:	Private
Persons on Board:	Crew - 2 Passenger - 1
Injuries:	Crew - Serious, Passenger - Serious
Nature of Damage:	Beyond Economic Repair
Commanders Licence:	Private Pilot's Licence (Aeroplanes)
Commanders Age:	57 years
Commanders Flying Experience:	160 hours Last 90 days - 6 hours 10' Last 28 days - 2 hours 15' Last 24 hours-1 hour 15'
Information Source:	ATC Watch Manager, Dublin Airport. AAIU Field Investigation

History of the Flight

On Sunday 3rd January 1999, two members of a private flying group decided to take their aircraft on a routine flight in order to build up hours required for the renewal of their PPL licences. The aircraft was based at Weston Aerodrome which was also the point of departure.

The following narrative contains extracts from the post accident statements of the two pilots. In addition to the pilots on board, to be referred to as Pilot A and Pilot B, the son of Pilot A occupied the rear passenger seat. Prior to take-off, at 1300 hours, the aircraft was refuelled following an earlier flight, the weather forecast was obtained and found to be suitable for the expected duration of the flight (1-2 hours) and a pre-flight check was carried out by Pilot A.

After take-off Pilot A handed over control to Pilot B who flew the aircraft to the Trim area where he carried out some general handling practice. Both pilots agreed that the aircraft handled well for the duration of the flight and that there were no technical problems with the aircraft. After one hour they returned to Weston where Pilot A carried out three uneventful touch and go circuits on Runway 25. He then handed over control to Pilot B who, in turn, wanted to practice some circuits from the right hand seat.

Pilot B's initial two circuits were also uneventful. On his third and final circuit he recalls that he selected ½ flap on Base leg, and, while initially overshooting the centre line on turning final for Runway 25, he regained the centre line by the Spa Hotel at 500 AGL and selected ¾ flap and 70 kt. Thereafter, his descent was normal and he recalls seeing about 65 kt airspeed as he flew over the airfield perimeter hedge, after which he cut the engine power to land. His next recollection was that they were just about to hit the ground.....they impacted the runway.....he heard a cracking noise from the front of the aircraft, then a bang. Pilot A, who was observing the approach, recalls that there was a sharp drop in the nose attitude after the power was cut, he called to Pilot B to watch his nose and then took control of the aircraft. He could not recall whether this taking of control was before or after the nose-wheel impacted the tarmac surface of the runway.

The events that followed only lasted a matter of seconds before the crash. On impacting the runway the aircraft bounced back into the air - this was confirmed by witnesses on the ground and from pilots in a following aircraft lined up to land on Runway 25. Pilot A immediately applied full power and, while attempting to maintain the aircraft on the runway heading, it slewed off more than 90° to the left, not gaining more than 30' or 40' in height, towards the airfield perimeter and the main Lucan to Celbridge road. The port wing clipped the trees on both sides of this road before it struck the ground inside the adjacent golf club. The aircraft then cartwheeled as the engine and port wing were torn from their mounts. The main fuselage and starboard wing of the aircraft finally came to a stop inverted on the 15th fairway, some 100 yards from the main road. The occupants were trapped upside down in the cabin area, with aviation fuel (Avgas 100 LL) dripping from the remaining wing tank onto the pilots. There was no post crash fire. An aircraft in the Weston circuit raised the alarm. A local club helicopter was quickly on the scene with a fire extinguisher but no attempt of rescue was made, due to the presence of aviation fuel in and around the aircraft, until the arrival of a Dublin Fire Brigade (DFB) ambulance crew followed by DFB fire tenders shortly thereafter.

Injuries

All three occupants of EI-FLY received serious injuries which necessitated hospitalisation for more that 48 hours. The son of Pilot A was quickly removed from the rear of the cabin by ambulance personnel. The two pilots, however, were firmly trapped in their seats and over 1 ¾ hours elapsed before they were freed and removed to hospital by Fire Service personnel. In addition to personal injuries the two pilots were subjected to prolonged dripping of Avgas 100 LL aviation fuel on their persons which caused chemical burns on the affected parts of their bodies.

At the height of the rescue there were approximately 30 fire-fighters and ambulance crew present, laying down foam and ensuring that the aircraft was safe. One of the first ambulance men on the scene entered through the rear of the cockpit in order to ascertain the physical status of the pilots, whether they were alive and breathing properly etc. He was dressed in his regulation ambulance attire, dark blue trousers, shirt and pullover. After some time in the cockpit, he noticed a stinging sensation on his left leg which was subsequently diagnosed as the same chemical burns as suffered by the pilots. He too became a victim of this accident and was hospitalised that evening.

Meteorological Conditions

An aftercast was provided by the Irish Meteorological Service at Shannon Airport. The synoptic situation at 1400 hours on 3 January 1999 showed that the Lucan area lay in a fresh southwesterly airstream, ahead of a warm front west of the general area which was moving east - northeastwards at approximately 25-30 knots.

At 1400 hours the weather was good with a visibility of 10 Km and scattered cloud base of 1500-1700 feet AMSL; the surface wind was estimated at 220/15kt G25kt and the temperature was 5° C with a dew point of 2° C; the QNH was 998 hPA.

Engineering Investigation

Post crash investigation showed the following:

(a) Flaps

The port wing, complete with undercarriage strut and wheel, was torn from the aircraft on the aircraft's final impact with the ground. The deflection of the port wing flap when measured at the inboard end was 7cm.

The deflection of the starboard wing flap attached to the aircraft measured at the same point was 7.7 cm. This would normally equate to a reading of just less than half flap on the flap position indicator in the cockpit.

The length of the electrical actuator screw jack on EI-FLY measured from the face of the actuator body to the centre of the eye end was 8cm.

Subsequent tests on a similar serviceable aircraft showed that on extension of 8 cm of the screw jack corresponded to a flap deflection of 15 cm.

At this flap deflection the flap indicator was reading almost full flap.

It is unlikely that the screw jack could have moved in or out on aircraft impact with the ground. It is also probable that the flap body and shaft became distorted when the port wing tore off at final aircraft impact with the ground.

It is concluded therefore that the flap position prior to any impact was between ¾ and full deflection.

(b) Wheels & Tyres

Both nose wheel and port wheel had freedom of movement when examined on site. The starboard wheel was locked and only free to move when the gater bolts holding the gater to the undercarriage strut were loosened.

The starboard tyre had a flat spot at its uppermost point which would correspond to the ground contact point with the aircraft righted. The nose tyre also had a flat spot but less severe than the starboard wheel tyre.

The fact that the starboard tyre was locked with the wheel in the above position would indicate that the tyre came in contact with a hard abrasive surface whilst the tyre was stationary.

(c) Rudder System (*Annex A*)

(i) The left rudder pedals are connected through a tubular cross rod with a single bellcrank at the centre of the cross tube. This bellcrank is connected by a series of rods and bellcranks to the rudder.

(ii) The opposite deflection of the rudder is achieved through a rod connected to the Pilot A's right pedal, through the nose wheel turning mechanism to the Pilot B's left pedal which pushes this pedal in the opposite direction, thus turning the cross tube in the opposite direction and deflecting the rudder accordingly

Examination of the forward connecting rods to the nose wheel steering mechanism shows considerable damage to the forward bulkhead where the right hand rod protrudes through a slot in the bulkhead. The slot was expanded and elongated in the upward and downward direction as a result of the rod being forced against the bulkhead. Only slight damage was caused to the corresponding left hand slot.

The connecting lever arm which connects the rods to the nose wheel steering mechanism was also found broken at the right hand end.

The rudder deflection as found was hard over to the right at an angle of 46.8°. It remained in this position because of compression of the rigid control rod due to the rearwards movement of the forward bulkhead at final aircraft impact.

It cannot be said with certainty whether some or all of this damage was caused as a result of the first impact with the ground on the runway or the second and final impact with the ground in the golf course.

Analysis

1. Pilot A recalled that after applying full power he attempted to fly the aircraft straight ahead, i.e. in the direction of the runway. However, the aircraft was already in a sharp left hand turn....."he could not straighten out the turn by pressing hard on the right rudder.....the rudder pedals would not work..... nothing happened".

   Comment: If for whatever reason, the linkage through the nose wheel steering was prevented from moving freely, then movement of the rudder would likewise be restricted or obstructed completely.

   Two scenarios were considered:

   (i) If the connecting lever broke (*Annex B*) at the aircraft's first impact with the ground, then it would be impossible to apply right rudder in the conventional manner. Left rudder only would be possible in this case, by pushing on the left pedal.

   (ii) The rudder system was intact following the first impact but the movement of the rods was severely restricted due to distortion. As a result no movement of the rudder would be possible. If the aircraft had left rudder on at time of impact it is possible that the rod system remained in that position following the first impact with the ground.

2. As part of the investigation a flight test was carried out in an aircraft of a similar type to the accident aircraft. This was to determine the reaction of the aircraft to the application of full power at various flap settings. In each case the aircraft nose tended to yaw up and to the left, thus confirming Pilot A's recollection of events and adding to the uncontrollable left turn.

Conclusions

1. The pilots were properly licensed and qualified for the flight.

2. The pilots were medically fit for the flight.

3. The aircraft had a valid certificate of airworthiness issued by the Irish Aviation Authority.

4. There is no evidence of any technical malfunction of the aircraft prior to the crash.

5. The practice of non-instructor qualified pilots flying from the right-hand seat is unsafe and should be discouraged.

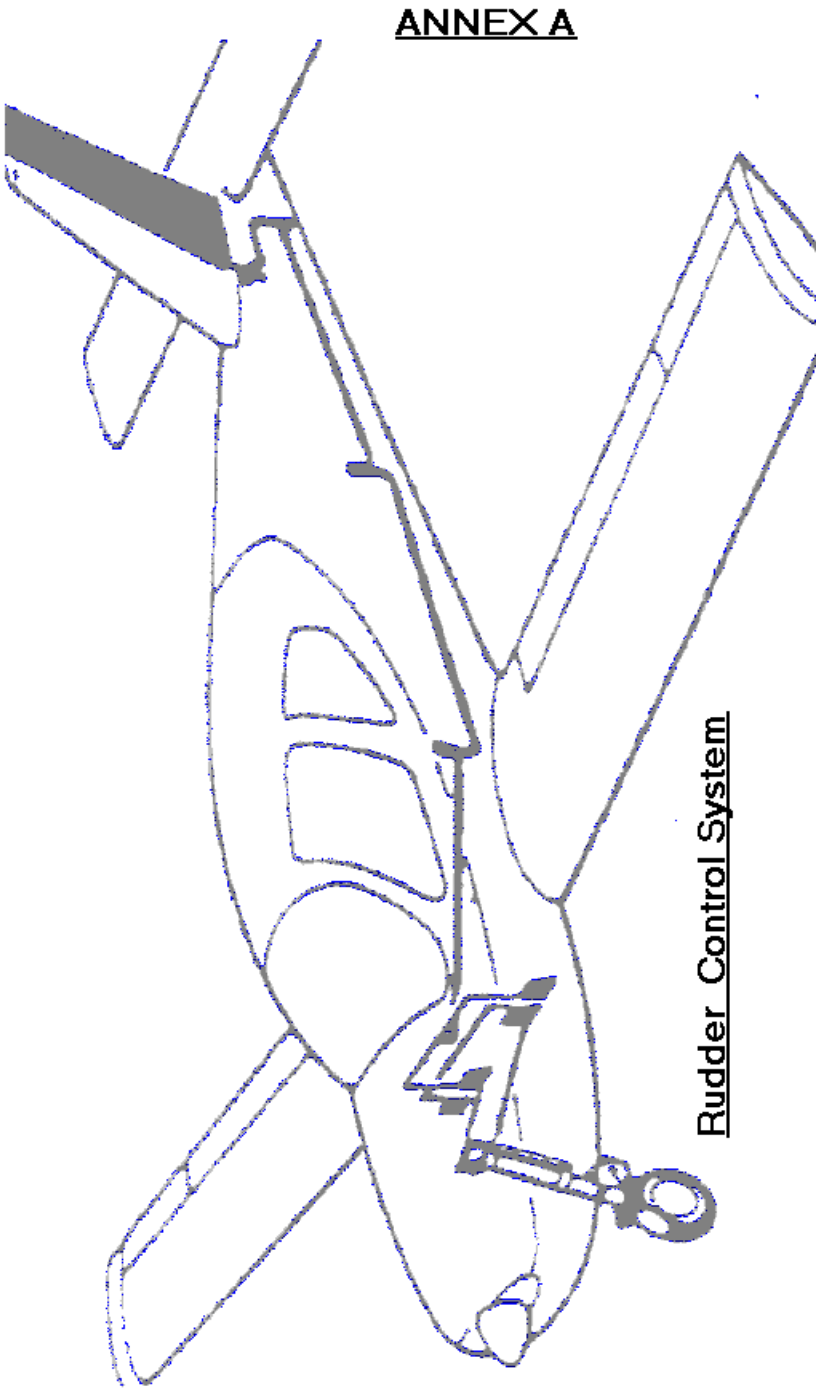
6. An ambulance crewman, assisting in the upturned cockpit, suffered chemical burns to his leg as a result of the prolonged extraction of the two pilots. He was lightly clothed.

This accident serves as a timely reminder to all Fire Services managers to advise their personnel to approach any aircraft crash, however large or small, with utmost caution, fully utilising their personal protective clothing and equipment so as to prevent any injuries to rescuers.

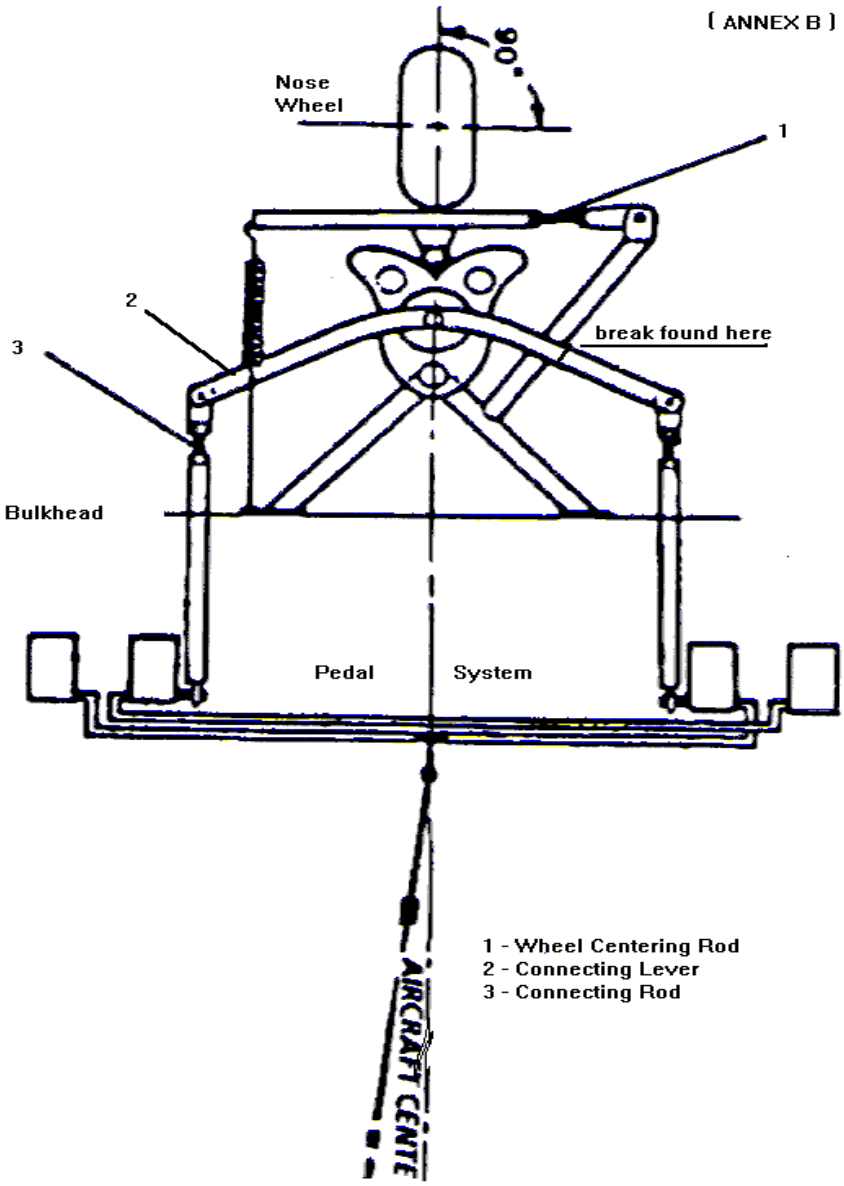
7. The first ground impact of the aircraft on Runway 25 was of such severity that directional control of the aircraft was lost, causing the aircraft to crash in the nearby golf course.

Note: This report sustains no recommendations

ANNEX A



ANNEX B



YAW CONTROL