Aircraft Accident Report

DESIGN DEFICIENCY : PROBABLE CAUSE OF FATAL AIRCRAFT ACCIDENT

P Tyagi

An aircraft accident is reported in which immediately after take off, with the pilot's left hand moving blindly to select flap switches, his overall sleeve inadvertently pulled up the HP cock handle causing the engine to flame out. The design deficiency of the aircraft and the events leading to the death of the pilot are highlighted.

Key words : Ergonomics, HP Cock Iskra, Aircraft Accident Investigation.

Design deficiencies in switches and levers have been a major factor in many aircraft accidents. Design of a lever by itself may not be faulty but its location in the cockpit especially in an area where blind hand movements are likely during flight can be potentially hazardous. This report is about an aircraft accident where such design deficiency was the probable primary cause.

The Accident

It was a fine morning with clear weather and good visibility. A pupil pilot was briefed for a solo low level navigational sortie in Iskra aircraft. He took off followed 10 sec later by his instructor as chase pilot. After lifting off uneventfully and as he started gaining height, the pupil, at an estimated height of 120 m AGL, about 1 min 5 sec after wheels roll, transmitted that his engine had flamed out. As a spontaneous response, he was asked to eject. However, since the safe ejection altitude had not been attained, he turned his aircraft to the left towards a nearby lake for a forced landing as per standard operational procedures. The canopy was manually jettisoned and was subsequently located about 1.8 km from

the first impact point. The aircraft touched down smoothly with the undercarriage up at the edge of the lake and covered a distance of 350 m on the lake surface before sinking in 6 m deep water. The lake bed was full of weeds from the bottom to about 30 cm below the water surface.

Having landed successfully , the pilot unstrapped himself, disconnected his oxygen tube and removed his KM-32 oxygen mask by unhooking the left side strap while still submerged in water. He then surfaced and with full flying clothing on, struggled unsuccessfully for 4 to 4 1/2 min to remain afloat in the weed filled water. The unpowered controlled glide of his aircraft, jettisoning of canopy, landing on the lake and his unsuccessful struggle for life were being watched by his instructor who had started circling above the lake in his aircraft. The dead body of the pupil pilot was recovered after 54 h. The aircraft was salvaged within 24 h.

The Investigation

The trainee pilot, who had a total flying experience of 115 h with about 35 h on type, had managed the emergency of engine flame out on take off with exceptional airmanship; but could not extricate himself from the weed filled waters despite knowing swimming and being unhurt from the crash forces. Death was due to drowning as confirmed by autopsy.

Detailed investigations on the intact aircraft and engine ruled out all probable aerodynamic and technical causes of flame out.The possibility of inadvertent movement of cockpit controls was looked into especially in view of the following evidence obtained from the intact cockpits:

The Higher Pressure fuel cock (HP cock) was up by 41 mm from the port shelf level with linkage intact.

The undercarriage lever was up and the flaps were fully retracted.

The throttle was fully back (idle).

Immediately after take-off, the pilot is required to take the following actions in sequence using his left hand:

Step 1. Select the undercarriage lever, situated in the left hand top corner of the front console, to up position.

Step 2. Wait 8 seconds for green signal, put the undercarriage lever to neutral position and lock it.

Step 3. Retract flaps.

Step 4. Move hand to throttle.

From the material evidence it was deduced that while the pilot had completed Steps 1 and 3, he had not completed Step 2. During the 8 sec wait after Step 1,the pilot's left hand had to move in the vicinity of the flap retraction push buttons as he had used these buttons to complete Step 3. These buttons are located in front of the HP cock handle which was found to have been moved up by 41 mm. This evidence strongly suggested the possibility of

inadvertent movement of the HP cock handle leading to engine flame out.

The HP cock is used in normal circumstances to starve the engine of fuel while switching it off. In Iskra, the HP cock control is a T-shaped handle placed lengthwise on the left hand panel parallel to the seat. The three push button switches for selection of flaps are located in front and to the left of the HP cock handle. The operation of flap switches is carried out by the feel of fingers while the pilot is looking forward during take off.

Sitting height being 96 cm, the lowermost seat position had been selected by the pilot for this sortie. The elbow space for a tall individual becomes crammed due to the oxygen tube which comes out of the regulator about 24 cm behind the HP cock handle. About 10 cm of space is available for side to side movement of elbow between the left edge of the seat and the oxygen regulator fixed on the left wall of the cockpit. In a crammed cockpit layout the proximal end of the T handle of the HP cock thus presents itself in line with the moving left hand while operating the flap push buttons. The difference between the pilot's wrist circumference and the circumference of the overall sleeve as worn on the day of the accident was found to be 4.5 cm (enough to slide on the T handle). Gloves were not recovered from the crash site. Even if worn the wrist end of the glove normally does not cover the sleeve end of the overall. Thus, there was strong possibility of the sleeve having slided over the T handle of the HP cock while the left hand was blindly operating the flap push buttons.

The linkage of HP cock was intac and the airframe did not show any evid ence of upward transmission of vertica forces. Thus, the possibility of the H cock movement having been due to impac forces on landing was ruled out. Groun trials showed that engine flame ou occurred when the HP cock handle wa moved up by about 30 to 38 mm. Cockpi trials were carried out on the groun using pilots with sitting heights abov 95th percentile fully strapped and wit full flying clothing including gloves The seat was selected to the lowermos position. They moved the left hand t simulate take off phase of flying. I was found that the HP cock handle coul be entangled with the overall sleeve whenever the hand was brought abruptl either to the throttle quadrant or t the undercarriage lever. An opinion survey among experienced pilots had already revealed that many of them were aware of this possibility and at least one pilot had in the past experienced inadvertent entanglement of the sleeve with the HP cock handle.

Conclusion

The most probable cause of the accident was inadvertent operation of HP cock by entanglement with the left hand overall sleeve while the pilot was carrying out post take off actions. The requirement for suitable modifications to provide a safety guard for the HP cock handle, when in fully down position, was recommended by the Court of Inquiry. Use of Mae West while flying and provision of rope ladder and other floatation gear in the SAR helicopters were also recommended since the only forced landing area for take off emergencies was close to the lake.