

Case Report

In-flight emergency with disorientation

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ABSTRACT

Large proportion of fatal aircraft accidents are caused by spatial disorientation, especially Type I or unrecognized SD. A case wherein spatial disorientation compounded an in-flight emergency is presented. In a dark night phase practice interception (PI) sortie, immediately after take-off, aircraft crashed at about 3.5 km from the runway-end. During take-off, emergency in the form of trim runaway causing an excessive pitch-up attitude occurred along with the somatogravic illusion leading to an over correction for the climb and subsequent fatal crash. Analysis and implications of such an event are discussed.

IJASM 2002; 46(1): 88-91

KEY WORDS: In-flight emergency, Disorientation

Large proportions of fatal aircraft accidents are due to the lack of appreciation of one's position in reference to the earth's surface, namely spatial disorientation. Type I or unrecognized SD, wherein pilot is completely unaware that he or she is disoriented, constitutes 88% of orientation error accidents. Occurrence of an in-flight emergency during conditions that are conducive for SD compounds the situation. A case of Type I spatial disorientation during in-flight emergency at the crucial stage of take off is discussed.

Brief Narrative

On 17 Sep 2001, at a base in western sector, a young pilot was authorized to lead a 2 aircraft practice interception sortie during dark night

phase. He got airborne at 2000 hrs and the aircraft was seen climbing with after burner on. After 3 minutes, a big flash was seen on the take-off heading. The aircraft crashed approximately 3.5 km away from the runway-end. There were neither any RT calls nor was there any attempt to eject. The pilot died in the crash.

Personal History

The 27 year old pilot belonged to a service family background. His father was a retired Wg Cdr (Tpt Pilot). He passed out from NDA in Dec 95

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and was commissioned in Dec 96. He got married in Dec 2000 and was leading a happy married life. He was an extrovert and displayed lot of enthusiasm in Sqn activities. There was no significant life change event after his wedding. He was on leave for 02 weeks in June. He used to drink and smoke occasionally. There was no history of drug abuse.

Medical History

He was in Med Cat AjG, On that day, during pre-flight medical examination, he was found fit for flying. There was no history of major illnesses or injuries or hospitalization.

Flying History

He was a fully ops pilot with an instrument rating of white. He was assessed as "Average". His flying hours are placed in Table 1.

Table 1. Flying hours.

	Solo	Night	F	
Total	453:30	39:50	Sim	Act
On type	329:10	28:00	15:30	16:45

His last night sortie was three days prior to the accident. There was no break in flying. In Feb 2000, he was involved in a HE (A) incident wherein during a taxi check, he throttled back late and engaged the Arrestor Barrier. His ops status was removed and he had to complete a new syllabus thereafter. As per the Blue Book and PPRB his flying skills had been fluctuating and he had remained an average pilot throughout.

Environmental Factors

It was a dark night phase sortie. Metar showed visibility of 6 km, fine weather with calm

surface wind, clear sky without any clouds and temperature was 31.6 °C. The visual reference available over runway in the dark night phase was relatively less.

Preflight Factors

This was his first sortie of that day. The previous two days were non-flying days. He had slept adequately and taken pre-flight meals. There was no alcohol consumption on that day.

Crash Kinematics & Wreckage Distribution

As the SARPP film was not available, the material evidence was lacking and data was drawn from a mathematical model and wreckage. The aircraft appears to have impacted at approximately 10-15° angles with high speed (700 kmph) and high engine RPM. The crater was conical in shape with a base diameter of 10m and a depth of 5m. A furrow was attached to the crater at 6 O'clock position. All of the wreckage lay ahead of the crater. The vertical declarative forces were calculated to be 26G. These forces were less due to a shallow angle and the disintegration was mainly due to the post impact explosion.

Injuries

As a result of the post impact explosion, the body of the pilot was disintegrated into small pieces and thrown ahead of the crater.

Safety Equipment & Ejection Seat

Perusal of flying clothing card confirmed that the pilot was wearing appropriate flying clothing of correct size and fitment. Barring a few of the fragmented parts, nothing could be retrieved.

Ejection seat had not fired and the primary cartridge was still intact. Due to the impact forces, the seat had sheared-off and disintegrated.

Physiological Factors G-related problems

As the SARPP film was not available, the exact magnitude of +Gz forces could not be ascertained. However, given the sortie profile, the G forces experienced would not have been more than +2-3Gz which was well within human tolerance.

Hypoxia and Hyperventilation

No emergency was reported by pilot. There was no evidence suggestive of hyperventilation in AFTR.

In-flight Incapacitation

Pilot was fully in control of aircraft till it crashed, and impact angle was only 10 degrees.

Spatial Disorientation

There was a strong possibility of SD and the details are discussed subsequently.

In-flight Emergency

There was a trim runway in the pitch-up direction causing an excessive pitch-up attitude as per the material evidence from the wreckage.

Discussion

Somatogravic illusion is a form of spatial disorientation wherein a false sensation of body tilt occurs as a result of perceiving the direction of the resultant graviton-inertial force as vertical. It is

caused by stimulation of the otolith organs and results in a falsely perceived tilt of one's body with respect to vertical. It usually occurs shortly after take-off when full power has been applied pushing the pilot back in his seat. When this backward vector is combined with the downward vector of gravity, the pilot perceives a backward tilt as if he were climbing. If the pilot dives his aircraft to correct for the perceived climb, a full power shallow angle crash within few miles of the departure-end of the runway has been known to occur. These kind of fatal accidents due to SD are common the world over especially when the horizon is obscured as in dark night phase with little visual reference & also among pilots with poor proficiency in instrument flying and poor flying experience.

In the present case, the following facts correlate:

- Dark night phase sortie
- Relatively featureless terrain
- Pilot with poor flying experience
- Poor IF proficiency
- Take-off with after burner on
- Crash immediately after take-off
- Shallow angle and high speed crash
- Crater was relatively shallow
- Wreckage distribution ahead of crater
- No RT call from the pilot
- No attempt to eject out

Full control of aircraft till crash

At the critical stage of take-off, an in-flight emergency i.e. trim runaway in pitch-up direction occurred resulting in an excessive pitch-up attitude of the aircraft. This was compounded by the false sensation of pitch-up attitude caused by the somatogravic illusion. In all probability the pilot was misguided by the 'seat of the pants' sensation and he overcorrected for the climb. As the height was just 250 m, the aircraft speed was high (700 kmph) and it was a dark night phase, aircraft crashed within few seconds.

Conclusion

This accident illustrates the disastrous effects of SD especially when it coincides with an in-flight emergency at a critical stage of flight. It also reiterates the need for the awareness of SD and correct implementation of preventive measures by all aircrew especially those with less experience.