

## Unexplained Human Factors in Aircraft Accidents

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*Human factor accidents (Pilot factor) account for 20% of the total accidents and 40-45% of Cat I/fatal accidents are due to pilot factor alone which is of a serious concern to the Indian Air Force. Two accidents involving MiG aircraft are discussed to illustrate certain unexplained human factors related to support services, selection/training of aircrew and role of supervisors. In addition, well recognised human factors as cause factors are discussed. Few recommendations are made to minimise incidence of pilot factor accidents.*

*Key words : Pilot factor, category I accidents, master green, qualified flying instructor, air traffic control, duty air traffic control officer, standing operating procedures.*

The incidence of pilot factor (PF) accidents in the IAF is well comparable with Air Forces of other countries. 40% to 50% of category one (Cat I) fatal accidents are caused due to pilot factors alone. In MiG variants, out of total 66 accidents in the IAF during 1981-86, 36% (24) of the total and 38% (18) of Cat I were due to pilot factors as the primary or contributory cause. The rate of such accidents per 10,000 hours of flying effort in MiG Series is 1.02 for total and 0.76 for Cat I accidents<sup>1</sup>

The causes which lead to human factor accidents have been broadly identified. Inexperience, faulty judgements, faulty techniques and negligence are traceable as the obvious factors by which the aircrew often fail directly. Failures due to technical reasons create situations wherein aircrew are required to react in a trained manner to overcome the emergency. Cockpit designs and some of the Human Engineering constraints may also create situations which may impair the prompt realisation of an emergency till it becomes too late. The end result of all factors however culminates into a scenario wherein the aircrew plays important terminal part either in managing the situation to safety or mismanaging it to a disaster. Why do a few experienced, above average fliers considered competent for task, handle them incorrectly with sad consequence? Two case reports of fatal aircraft (ac) accidents

involving human factors are selected to illustrate our stand.

### Case Report No 1

KSD, 37 years, an experienced, Master Green rated Qualified Flying Instructor (MG-QFI-A2), above average pilot in Medical Category A1 G1 (fully fit) was a detachment/Senior Flight Commander of Fighter Squadron at a forward base. He had 2964 hrs of total flying including 1088 hrs on MiG variants and 303 hrs on the type. While ferrying the Trishul (T-96) aircraft in a formation of 2 aircraft with full load of 9260 kgs (Maximum permissible 9870 kgs), he had a shallow take off approximately 270 M from Arrestor Barrier, much beyond the expected take off point (i.e., near middle marker). Aircraft hit the barrier, banked to the left and crashed on the over run area. Aircraft went into flames and disintegrated after hitting the ground one minute after take off. The live ammunition exploded. The Pilot did not eject and was killed on the spot.

During the take off roll with reheat, the pilot probably decided to attempt dry take off for some emergency (possibly the nozzle light going off) and continued rolling. He neither gave a call to the Air Traffic Control (ATC) about his intention, nor attempted to eject while closing on to the arrestor barrier. This was an error of judgement since a normal course under these circumstances is to abandon take off. In this case, Duty Air Traffic Control Officer (DATCO) also failed to take a positive action. Moreover fatigue as a contributory cause is quite likely since the pilot had supervised all the aircraft ferrying including administrative commitments during winding up operation from the base. Infact, the ground crew and equipment were ready to be airlifted in an AN-12 and waiting for his take off.

### Case Report No 2

VSB, a 37 years old pilot with 1977 hours of flying and 760 hours on the type including 100



hours of night flying was a Master Green 'B' rated, average plus and QFI professionally. He had flown 2 sorties in MiG-23 BN (Vijay) aircraft during the day after the senior duty officer's duty previous night. Same evening, he planned a low level navigation phase of dummy night strike training sortie with four aircraft. The pilot took off at 2008 hours, preceded by 3 aircraft at 2 minute intervals. After take off, he failed to sweep back the wings to 45 from 16 as per Standard Operating Procedure (SOP) resulting in his failure to cover the 1st leg distance even with excess power. However, he stuck to the calculated time and changed over to 2nd leg. Even in 2nd leg, he failed to realise the power/speed incompatibility which he corrected probably in the last phase of 2nd leg or during the turn on to the 3rd leg. His subsequent flight was unsettled. He was flying between 50 M to 250 M, probably coping with trim changes as the critical altitude recovery system (BOV mechanism) was set at 50 M and activated manual override by forward pressure for avoiding undue disturbance due to warning if any, when flying below 50 M. He flew into the ground at 3rd leg beginning.

Aircrew inattention to warning system in the cockpit, his pre-occupation with unsettled flight in 2nd leg of navigation and manual override of warning system for incorrect BOV setting at 50 M against SOP/Briefing are the acts of omission/commission. These do not commensurate with his flying experience, total as well as on the type. Further, with such an unsettled flight profile, any head movements for changing the RT channel probably could have initiated coriolis phenomenon. This is considered a most likely contributing cause of the accident.

### Discussion

These two cases have some common points. Both aircrew were experienced and MG rated QFIs. They had sufficient experience on the aircraft type. Both cases have shown error of judgement, wrong decisions followed by acts of commission/over confidence and probable sense of complacency leading to fatal accidents. The human factors which are relevant in the causation of these accidents are discussed.

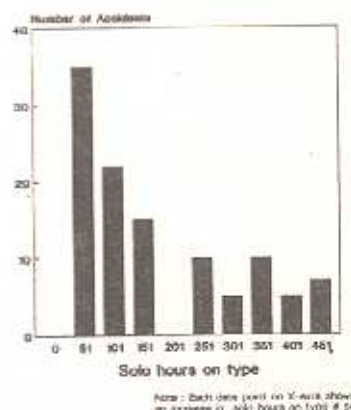
(a) Experience : Review of aircraft accidents data in IAF vis-a-vis flying experience shows that there are wide variations in the distribution pattern of aircraft accidents. (Table-I).

Table - I Total Flying Experience and Human Factors Accidents (%)

Experience (hrs)	Fighter	Transport
0 - 200	30.1	24.9
200 - 400	22.1	9.0
400 - 600	10.1	9.0
600 - 800	5.4	13.6
800 - 1000	8.1	4.6
1000 and above	24.2	38.7

This indicates that high total flying experience does not imply any appreciable decline in accident rate. On the type-experience is considered more significant than total flying experience<sup>2</sup>. The rate of such accidents should normally decrease with increase in experience on the type. However, there is slight increase after 300 hrs experience which could be due to over confidence/complacency or may be lack of supervision at this stage (Figure 1).

Fig.1 Pilot factor accidents vs on type experience



(b) Faulty Technique accounts for 20% of the human factor accidents on the whole<sup>3</sup>. Both pilots were experienced but they committed errors probably following improper/incorrect emergency procedures. This could be attributed to : (i) attitudinal deficiencies, (ii) over confidence (sense of complacency), (iii) fatigue and (iv) professional incompetence.



(c) Overconfidence is a personality trait. This may come up when the pilot has acquired sufficient skill on the aircraft type.

(d) Attention Failure is responsible for nearly 1/3 of the fatal accidents, wherein pilots fly into the ground during a range firing/low level strike exercise. Such failures are attributed to situations like pilot's preoccupation with problems not related with flying. Too many commitments related to Squadron detachments out Station may add up to such situations. Also factors like fatigue, hurry and undue emotional arousal may be implicated in causing attention failure.

(e) Fatigue is a major contributory factor which sets in slowly and cumulative fatigue over days may pose a serious problem. Various physiological or psychological changes produced due to fatigue are lowered alertness through increased sensory threshold, poor coordination, judgement, reaction and decrement in performance.

(f) Wrong Decision : Decision making during emergency particularly against a time schedule and lack of various inputs or failure of automation in an emergency is a difficult task. Overconfidence/overkeenness may compound the situation further, because pilot may take the aircraft beyond the permissible aerodynamic limit with little opportunity to recover once out of control.

(g) Role of Support Services : Following aspects need special interactions and be given sufficient thought :

(i) Expectancy/anticipation and assumptions are normal and natural to the reactions of any aircrew or ATC controller. But during heavy traffic situations, there is a danger to perceive what is expected consequence based on previous training/experience.

(ii) During heavy traffic situation, DATCO is forced to make certain performance assumptions of the aircraft<sup>4</sup>.

(h) Aircrew Selection and Training aspect : A comprehensive selection and training programme for aircrew has already been

introduced in the IAF, based on various recommendations of DA Laffontaine Committee Survey report. The salient points are given below :

(i) Selection/abinitio training should devise methods and monitor the pilot's susceptibilities/capabilities and modify his reaction to emotional shock. Identify the demotivated pilots and factors causing lack of motivation. If need be, weed them out before they add more harm to self or the aircraft.

(ii) Training of aircrew, use of caution stage by stage.

(iii) Development of self discipline to overcome ego, overmotivation and misplaced emphasis on concept of mission accomplishment.

(iv) Supervisors must be active to the life change units in pilots and provide suitable environment for safe flying. The leader is likely to react according to his temperament and experience, hence he should make efforts to condition himself to be an advisory but authoritative guide and should not suffer from emotional shock. Pilots with emotional disturbance must not be allowed to fly. They should be introduced to flying in a graduated manner.

### **Conclusion and Recommendations**

It is concluded that experienced aircrew involved in these two accidents did not follow the correct emergency procedures based on their training and vast flying experience. On the basis of the limited human factors data available in these two cases, it was not possible to pin point the exact cause of the accidents and the observed deviation of the pilots' reactions from the ones expected of them remains intriguing. Thorough analysis of human factors in all aircraft accidents must be undertaken. This is necessary to pin point the cause of such accidents.

An indepth study is recommended for collection of aircrew data which should help in laying down norms of selection and training of aircrew in areas like pilot's workload and his reactions during emergency.

Also there is a definite need to improve supervisory role and minimise such accidents through mature leadership, meticulous planning and proper interaction at all levels.

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