

## AN EPISODE OF DISORIENTATION IN FLIGHT (A CASE REPORT)

By

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### Introduction

In modern aviation Spatial Disorientation is considered as one of the major factors affecting flight safety. Nuttal<sup>3</sup> reported that about 5% of the pilots experience serious disorientation with complete loss of aircraft control. Nuttal and Sanford<sup>4</sup> (1956) in a study of over two years period in USAF in Europe found that about 4% of all major accidents and 14% of all fatal accidents were due to spatial disorientation. RAF<sup>1</sup> between 1957 and 1961 found that 2% of all major accidents and 14% of all fatal accidents were considered to be due to disorientation. Ruffel Smith<sup>5</sup> blamed disorientation under instrument flight condition as being probably the most common cause of fatal accidents in RAF not due primarily to mechanical failure. No such analysis is available at present to indicate the incidence of spatial disorientation with the Indian Air Force.

These above mentioned figures pertain to pilots who are presumed to be normal in health.

In 1968 I had reported a case of Spatial Disorientation in a Jet Fighter Pilot<sup>2</sup> which was proved to be due to a pathology in the vestibular system. That case presented considerable difficulties in determining the aetiology and diagnosis. It was emphasized that every case of disorientation deserved a

thorough and complete investigation before it can be assumed that there are no transient pathological reasons for such episode or episodes.

It has now become a practice that all aircrew who had an episode of disorientation during flying are referred to I.A.M. for investigation. The following is the case report of a Fighter pilot who had an episode of disorientation during night flying, while taking part in an exercise. The case report offers some points of interest.

### Brief history (Pilot's Report)

I was one of the pilots manning night O.R.P. for an exercise. We took over O.R.P. duties in the evening. I was the first to go for scramble after a few hours of duty in O.R.P. My initial vector was 180 and height 3 kms. Visibility on the airfield reported at that time was 3 kms. I got airborne and turned left on to 180 and started climbing. By about 1 km. height I contacted control. He asked me to climb to 3 kms. and maintain course. He also enquired about the visibility. By that time I was passing through 2 kms. and I told him that I could barely see the lights on ground and that I was flying under I.M.C. I levelled out at 3 kms. He reported the target at 120 kms. 10 O'clock and asked me to descend to 2 kms. and maintain course. By the time the target

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was at 70 kms. away, the controller gave me some frequent changes of course to the right and left by as many as 60 degrees. At one stage he asked me to do a hard turn. I told him I was under I.M.C. He then asked me to maintain 45 degrees of bank. As the target approached closer he said that the target's height was 900 mtrs. and I told him that I would not descend then and that I would descend after having turned behind the target. He acknowledged and later asked me to turn right on to 350. I did so and commenced a gentle descent. I was reluctant to descend below 1.5 kms. because in this area it was very dark below me; the few lights looked through the dust haze were no different from the stars above. I don't think I descended below 1.5 kms. and was completely on instruments. After the turn I switched on my radar to transmit. In this aircraft the radar sight was unserviceable in that when I put the switch to transmit, the light came on which was quite bright and disturbing. Now the controller started reporting the target ahead of me and started manoeuvring to position me behind him. I was taking off my eyes from the instruments to pick up the target on the scope. The controller asked me to reduce speed since I was closing in rapidly. He asked me if I could pick him up visually (when I had told him that I was flying under I.M.C.). He then asked me to break away. Some time at this stage I found myself disorientated. I immediately opened 100% R.P.M. and engaged auto pilot and started climbing. I transmitted to the control that I was disorientated and that I was calling off the exercise. I had a strong feeling that I was inverted. I could monitor the instruments properly. I know that I was climbing on a course of 360 and the radio compass was reading 060. I had my auto pilot on. I continued climbing on instruments and tried to reason within myself to get rid of the feeling that I was flying inverted but

it was no use; the feeling would not go. By now I had been on course 360 for quite some time with radio compass still reading 060. I then asked control for direction. He reported my location 20 kms. away. I then turned on to the homing and started descending, wanting to make contact with ground to orientate myself. At about 1.5 kms. I levelled out and saw the runway lights (goose necks). Instantaneously I got rid of the feeling of being inverted and was orientated. I changed over channel and asked A.T.C. to put on the runway lights. I immediately rejoined circuit and landed. The landing was no problem. After landing, I reported the whole experience in my report.

#### Personal History

Age: 30 years. Married—August 1968. One child—(son) 3/12 years. Education—Ex. N.D.A. Non-vegetarian. Smoking—Occasional. Alcohol: moderate—social weekends.

#### Flying

Training Flying	..	200 hours
Jet Flying	..	1100 hours
Night Flying in the aircraft involved	..	42 hours
Actual cloud flying	..	29.5 hours

Awards: Commendation by AOC-in-C, Western Air Command and C.A.S. for 1965 operations.

#### Personal Medical History

The pilot had a motorcycle accident in 1961 and fractured left patella. There was no disability.

He had occasional blockage of the nose noticed since flying jet aircraft, especially high altitude flights. He had no difficulty in clearing the ears except once when he had to climb up and descend at a decreased rate. Very occasionally he had to do Valsalva—otherwise he can carry out descents without any trouble. Occasionally he used nose drops (phenox) and Vicks Inhaler.

#### Present Episode

On 3rd June 1970, whilst flying on night O.R.P. duties, as part of exercise the pilot got disoriented and had a feeling that he was "flying inverted". He was aware of the fact that it was an illusion; he was able to read his instruments. The feeling that he was inverted persisted for some time till he saw the runway lights. Immediately he "got rid" of the feeling of being inverted and was oriented. He carried out an uneventful landing.

The flight was on a dark night with a dust haze. The visibility on the airfield was 3 kilometers. He was flying under I.M.C. The incident report does not state the exact stage of the flying when the disorientation occurred. It is stated that sometime at the stage of his breaking away he found himself disorientated. A detailed interrogation on the precise manoeuvre when the disorientation occurred was not useful as he had forgotten. It appeared that he was carrying out a climbing starboard turn when he had disorientation.

Though he stated that he was on I.M.C. perusal of the incident report and interview revealed that he was combining instrument flying with vision outside the cockpit, at least at some stages of the flight.

Other factors of importance are that even though the Met. report indicated

weather conditions within his rating minimum, he has never had an opportunity to fly under such adverse weather conditions before.

The sortie was undertaken after a stand-down for 4½ hours. He had a feeling that the Controller was not following his flight with ease. Due to the unserviceability of his radar, a bright light came on the dial which disturbed him.

In spite of the feeling of being inverted he was able to read his instruments, take corrective action in time and make a perfectly safe landing.

He appeared a conscientious flyer and was honest and accurate in his statements. He voluntarily gave all the relevant points connected with himself and his episode.

He is considered an above average pilot by his Squadron Commander and he has had an accident/incident free flying career so far.

#### Family history

Nil contributory.

#### Past History of similar Episodes

In September, 1965, he took part in operations with Pakistan and did fifty-five operational sorties. Immediately after the operations, whenever he climbed over 20,000 ft. he "felt uncomfortable". He could not elaborate on that. He had the same uncomfortable feeling in quite a few sorties but not regularly in every sortie. In one cloud flying sortie, he felt "very, very uncomfortable" and broke cloud. He stated that he "did not like being in the cloud." This happened especially in early sorties with

single aircraft. These feelings lasted during October/November 1965. He went on 45 days leave, returned and resumed flying and found that he had no further problems. While proceeding on leave (December 1965) after a long drive (during day) from 1000 hrs. till 1800 hrs. when he was on a descending and winding road, near Muradabad, he felt that the road was turning—not fast, but in a gentle way. He stopped the car and as he got out of the car the feeling disappeared.

In July 1967 he got conversion to the present type. No such experience was noticed except in one sortie, at a height above 11 kilometers, he felt "uncomfortable" and once he commenced let-down he was alright. His interpretation was that it was "due to boredom" as he was alone in the sky and had nothing to do. On questioning, he stated that even in the earlier types the uncomfortable feeling he had was only when he was alone and these feelings never occurred when he was with a formation.

At no time he had any difficulty or imbalance on the ground.

At the time of 3rd June episode, he had no feeling of unsteadiness or imbalance, at any time on the ground preceding or after that.

He had no other complaints, excepting history of diarrhoea 15 days prior to this flight and on one previous occasion.

History of passing a round worm once in N.D.A. in 1958.

#### Clinical examination by Unit Medical Officer

No abnormality was detected in cardiovascular and central nervous systems. E.N.T.

was found to be within normal limits. Vestibular function tests clinically were within normal limits.

The officer was permitted to resume flying duties after a dual night flying sortie for 40 minutes on 10th January 1970 with the Flight Commander, though he resumed his solo day flying on 8th June 1970. He carried total day flying of 15 hrs. 25 mts. after the episode. He has not flown solo at night.

#### Examination at the Institute of Aviation Medicine

General examination—N.A.D.

Eye examination—including perimetry, refraction and fundoscopy—N.A.D.

Cardiovascular examination—CNS examination—N.A.D.

#### E.N.T. Examination—Clinically ears N.A.D.

Vestibular function tests—No spontaneous nystagmus. No Rombergism.

Self balancing test—N.A.D.

He can do tandem walking with eyes closed.

Caloric tests—within normal limits.

Barany's rotation tests—within normal limits.

Hallpike's positional tests—N.A.D.

X-Ray of the paranasal sinuses—N.A.D.

Blood—Haemoglobin: 16 gms. %

T L C : 6700 per cm.

D L C : Within normal limits.

Audiometry examination carried out on 26th June and 3rd July 1970—N.A.D.

Examination of the nose revealed slight DNS to the left (noted at the first examination—22nd April 1957).

Airways are satisfactory.

Throat: Nil significant.

### Discussion

The investigations did not reveal any imbalance in the vestibular system. No abnormality in any other system that could account for the episode, could be detected. Careful questioning and the perusal of the reports on him and his personality make up has indicated a possibility of a psychological/psychiatric aetiology. Therefore, he was subjected to a psychiatric evaluation, which did not reveal any overt psychiatric disorder. His motivation towards flying is good and so is his confidence in flying.

It would appear that the most probable cause of episode in this pilot is physiological disorientation, aggravated by psychological stress. In this present episode, there is evidence that he was under stress due to various factors such as prolonged ORP duties, prolonged stand-down before the scramble and the low visibility conditions under which the flight was carried out.

The pilot's feeling that he had never flown in such low visibility conditions previously seems to have made him anxious even before he scrambled. It, therefore, appears reasonable to surmise that he had a heightened state of cortical arousal even at the time of scramble, which was further aggravated by his unsuccessful attempt to establish contact with the enemy aircraft and he had to break off the contact as directed by the controller. It is most probable that this episode occurred during this break off. There is sufficient evidence, including his admission that he has combined the external visual cues while flying on instruments. The combination of these has led to this episode of disorientation. Though he felt that he was having that feeling for a period of 7 to 8 minutes, it is quite likely that he had a disorientation in time due to the increased cortical arousal phenomenon.

It is also possible that his movement of the head towards the right shoulder and downwards during a climbing turn, when he looked for the runway lights, could have produced a coriolis. There is no means of establishing this at this stage. Another possibility is that he could have confused the lights on the ground, seen through the dust haze, as stars in the sky or misinterpreted an occasional star in the sky as a light on the ground.

The pilot is very intelligent—is able to understand and discuss the problem of disorientation rationally, though he had certain doubts as to the mechanism and details. He has a tendency of introspection and to analyse his own physiological functioning of the body. He has been given explanations, reassurance and indoctrination.

He gave an overall impression that he is conscious of his E.N.T. to a greater extent than what is seen normally. This aspect has been discussed thoroughly with him and he has been suitably advised.

There is no indication to alter the flying status of this officer. As he has not carried out solo flying at night for some time, it is recommended that he should be given a dual flying sortie at night prior to his commencing his solo flying at night. He can immediately resume his solo day flying.

### Conclusion

The description of the exact manoeuvre which caused him disorientation has been omitted both in the pilot's and Squadron Medical Officer's reports. By the time the pilot reported to I.A.M., he has forgotten the details. This aspect has to be taken note of by the Squadron Medical Officers.

The Pilot's reports and the interview has revealed that the Controllers are probably not fully aware of disorientation in flight. It may be worthwhile to indoctrinate them into aspects of disorientation which may help them in giving course corrections to the pilots.

#### Acknowledgement

I wish to acknowledge my gratitude to Group Captain J. H. F. Manekshaw, Officer Commanding, Institute of Aviation Medicine, for encouraging me to present this case.

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