Original Article

Aeromedical Aspects of Flying Over Snow Bound Airfield and Helipads

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There is an increasing operational flying commitment over the Western Himalayan ranges, requiring the pilot to fly under adverse conditions. The helicopters operate from bases at Srinagar, Leh, Thoise and Base camp to cover the entire Western Himalayan ranges. The experience is novel and is imposing problems which were earlier unknown to our pilots.In addition there was an unprecedented snow-fall last year when the entire valley was under the snow for over three months. Operating from such airfields and helipads imposed a variety of problems in each phase of flying. Most of these problems were perceptual in nature, and had not been encountered previously. A few perceptual illusions have been described which are new to the literature of Aviation Medicine. This paper elucidates main problems encountered.

Key words :*Aeromedical Problems, Snow Bound Terrain, Illusions, Psychological Problems, Glare, Poor Depth Perception.*

With the intense operational flying undertaken over the Western Himalayan ranges, there are times when some of the important tasks are to be carried out under adverse conditions. These range from operating close to the international border which is difficult to identify, the line of actual control which is not well marked, a rapidly altering terrain scenario from a lush green to a totally snow bound and contrast-less features impose further problems. The snow piles up on the runway and the helipads to give a totally alien perspective to the pilots. The temperature at some of the helipads drops to as low as -55 degree Celsius. The blizzard and the wind chill effects make the chances of survival remote in case of a crash landing. The weather is highly unpredictable. At times, flying operations may be required to be undertaken under such adverse conditions.

There was an unprecedented snow fall in the winter of 1991 when the entire Kashmir valley remained under snow for over three months. It was a new experience when many problems were faced which were not encountered previously. This paper highlights various problems of aeromedical concern encountered while flying over snow bound airfields and helipads during that period.

Material and Methods

Following the first sortie after the snow fall, the pilots were interviewed at Srinagar airfield to evaluate whether they felt that there were any aeromedical issues at stake. The problems so described were discussed with pilots flying subsequent sorties and based on it, an elaborate questionnaire was prepared. It included the biodata of the pilot and his experience of flying. The frequency of occurrence of various matters of aeromedical concerns and the grades of such problems were contained in the questionnaire on a self rating scale. The frequency offered were "never, occasionally, frequently and always" and the grades of such problems ranged from 0 (No problem) to 9 when such problem resulted into an accident. In addition there were options to put forth any problem which was otherwise not covered by the questionnaire. Only the fully operational first pilots were included in the study.

Before answering the questionnaire, the pilots were briefed about the aim and the scope of the study. Finally the author visited most of the snow bound helipads which were stated to be difficult, to assess at the first hand the difficulties and to seek clarification if any. This was undertaken to identify any new problem which was not mentioned in response to the questionnaire, and collect some objective and photographic evidence.

Result and Discussion

Sixty eight questionnaires that were answered by the pilots, were subsequently analysed. Of the 68, eight were the Mi-17 crew, 4 Boeing pilots of Indian Airlines and the rest all were Cheetah helicopter crew of the Air Force (18) and of Army aviation (38). Age of the subjects is given in Table I, alongwith their flying experience.

approach to Srinagar airfield was considered important and has been included.

Some of the problems which were common to all the phases of flying include glare from the surroundings and faulty depth perception over the snow. Glare has been ever present in the snow bound area[1]. At times the glare is severe enough to cause snow blindness. In the present study, the glare has been stated mostly during the taxi/hover and landing phases, when some of the pilots

Table I : Age and Experience of the Pilots (n=64)*

	Age	Experience in Hrs			No. of landings
		total	on type	over snow	
Min-max	25-43	150-2800	48-2400	13-1600	32-4000
Mean (sd)	31.6 ± 6.8	1075 ± 73	770 ± 58	386 ± 34	726 ± 32

* Indian air lines pilot not included

Analysis of various data were made as per the experience of the pilots ie. 50 hrs, 50 to 200 hrs, 200 to 500 hrs and >500 hrs, but there was no significant difference in the various groups as far as the answers to the questionnaires were concerned. Hence for the sake of simplicity all the helicopter crew were analysed in a single group and the Indian Airlines pilots were left out as their number was too small and their kind of operation was different. One of their observations during

avoided putting on their Cortino visors which perhaps is not suitable for flying as it cuts off the much needed visual cues due to its low transparency. Three of the pilots have rated the glare to an order of 7 which is, just short of causing an aircraft accident or an incident. Glare in the cruise phase, though persistent, did not cause much concern. Poor depth perception on the other hand , was evident in all phases of flying. In the taxi/hover phase one was not sure of

Table II : Problems Common to all Phases of Flying (n=64)
N - never, O - occasionally, F - frequently, A - always

Phase freq.	Hover				Take-Off				Cruise				Landing			
	N	O	F	A	N	O	F	A	N	O	F	A	N	O	F	A
a. Glare																
n=	1	23	30	10	9	34	14	7	11	34	10	9	1	32	30	1*
Grade	0	3	5	4	0	3	6	6	0	2	6	5	0	5	6	6
b. Poor depth perception																
n =	15	33	15	1	10	32	22	0	15	36	13	0	7	20	30	7
Grade	0	4	6	5	0	4	3	0	0	3	3	0	0	4	5	5

n = No of pilots reporting the said problem
grade : Grade of the problem on a self rated scale of 0 to 9

his height above the surface. During the cruise, the altimeter assisted well in supporting the visual cues but during approach/landing there were all sorts of problems like an odd pilot flaring out too high or too low. In addition, the weather also played a role in faulty estimation of horizontal distance when the slightest of haze led to gross over estimation whereas a clear weather caused under estimation of the distance. The features of glare and poor depth perceptions are shown in Table II.

Pilots showed concern during taxi and hover for inadequate clearance from the edge of the piled-up snow and there was a fear of collision with adjacent structures. There was considerable strain on the pilots at the time of hover as the fresh and loose snow was blown up reducing the outside visibility. Under such conditions, it was difficult to judge the height above the ground; one could only guess the rate of spot turn, and a slow drift of the helicopter was imperceptible. In the narrow valleys, there was an occasional illusion of nose down/going down during take off due to high mountains, making the horizon to appear higher than its actual position. This feeling reduced with more experience over the terrain. No problem was persistent enough to be graded in always category. Other problems encountered during this phase of flying are shown in Table III.

Problems during cruise have been minimal. An illusion of bank has been perceived in level flight mostly over the sloping terrain. The illusion was compounded with lack of pilots' faith in the air driven Gyro instruments[2]. Arctic-white-out has been reported very often in this study as well as in the past[1].Even though there have been clear instructions to avoid entering cloud, pilots often found themselves in the cloud as they failed to differentiate the approaching patch of the cloud from that on the distant horizon. Such conditions were mostly reported by the Mi-17 crew while undertaking drop sorties in Siachen area.

Problems during approach/landing and flare out were reported by a large number of pilots. Three of the four Indian Airlines pilots reported of an illusion of 'snow blocked' runway just beyond the middle marker while approaching overhead at a particular angle. At such times, weather conditions were poor and the surface temperature was -0.2 deg Celsius. The illusion was so real that they could not differentiate between the snow on the runway with the rest of the surface. It was possibly the effect of reflection from the thin layer of melted water on the surface of the runway. The illusion disappeared while flying out of the particular bracket angle.

Pilots operating in the Siachen Glacier reported defective perception of ground speed under shadow/overcast conditions while approaching for landing. At times, they also failed to perceive the slope in and around the helipads even though the helipad markers were laid out.

Table III : Problems during taxi/hover (n=64)

Problems	Never n	n	occasionally grade (Mean ± SD)	n	frequently grade (Mean ± SD)
Poor Clearance	14	32	2.6± 1.3	18	5.± 1.3
Fear of collision	33	18	3.5 ± 1.0	15	4.9 ± 1.2
Maintaining Hover	21	32	3 ± 1.4	13	5.3 ± 1.3
Perception of altered speed	20	38	3 ± 1.3	6	4.8 ± 2.8
Illusion	22	29	3.1 ± 1.5	13	5.9 ± 0.8

n = No of pilots reporting

Over the sloping undershoot and overshoot, pilots tend to attain transition much above or below the helipad respectively, and at the last moment had to undertake evasive corrective actions. The men and the material are too close to the table top helipads, and any error on the part of aircrew could lead to a disaster.

The answers on questions pertaining to flying clothing showed that 47 of 64 pilots found that the protection afforded by the flying boots, the gloves and the visors inadequate for operations in such area. The cold resulted in leg pains and that the sensory inputs from the rudders, cyclic and collective were often faulty. There was numbness over the feet and the hands and the feel at the finger tips were altered. Only few pilots indicated of forgetfulness, lethargy, sleepiness and light headache at Thoise, and at the base camp. Flying fatigue was possible among Mi-17 aircrew as they flew 8 to 10 sorties of 40 to 50 min each on a clear weather day. Indigestion, flatulence, loss of appetite and mild epistaxis were common among the ground crew. There was also a problem of bleeding per anum and constipation which could be attributed to the loss of appetite and low roughage in the diet.Any one blowing his nose for minor cold was not surprised to see a blood stain. In general there were certain psychological problems as well which included mood changes, irritability, argumentative behaviour and mild depression.Such effects have been noticed in some of the other studies also[3]. No pilot has reported sick with such problems possibly for fear of being declared unfit for flying.

Conclusion

The paper has highlighted problems of aeromedical interest which may compromise flight safety. This initial study could form a basis for an indepth study of air operations in snow bound high altitude terrain.

References

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