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Medical Problems of Air Traffic Control : A Preliminary Study

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An Air Traffic Control Officer (ATCO) performs a difficult task which requires sustained attention for long periods of time. He is required to coordinate numerous activities related to flying and make immediate decisions after taking into consideration various variable factors. He is always burdened with the fear that if his decision goes wrong, the consequences could be serious. The importance of optimum performance in his duties by a controller is thus obvious.

Performance under such exacting job requirements can be affected by numerous factors, which may be physical, physiological or psychological. In Western countries considerable attention is being paid to the study of factors and stresses affecting the performance of the ATCOs. The main areas studied are workload, shift duties, fatigue, occupational stress, personality factors, attitude and aptitude, mental ill health, endocrine parameters, biochemical parameters, health hazards and morbidity rates. Crump[1] has presented an excellent review of the research carried out so far on measurements of stress in ATC duties and its effects. He has pointed out that the investigations to determine whether stress in ATCOs duties is any greater than other common occupations have shown little agreement, except in case of psychological stress which is greater in ATCOs. The controversy is due to different methodology, interpretation and the lack of universally acceptable parameters for measurement of stress. The investigations on physical work load and shift duties have not indicated any higher stress than in other occupations. One of the important findings of these studies, is the investigation into long term effects of ATC work, which has revealed increased susceptibility of ATCOs to Ischaemic heart disease. He concludes that the picture is still not clear and the increasing speed of aircraft and technical sophistication are going to increase ATC stress.

In this country the problems of ATCOs have not received as much attention. Being a developing

nation the facilities for flying are not modern at many centres. Thus the working conditions are not very comfortable all over, which adds to the stress. The need for studying the stresses in ATCOs cannot therefore, be over emphasised.

We have carried out preliminary study at HAL Airport, Bangalore, aimed at identifying the problem areas so that proper methodology for detailed studies on wider scale could be evolved.

ATC at HAL Airport

The HAL Airport, Bangalore is used by various groups of civil, military and private operators. The traffic load is moderate with about 30 take-offs and 30 landings a day inclusive of 5 take-offs at night. However, a very wide variety of aircraft and helicopters operate at this airfield from a single runway. They vary from the almost elementary trainers to most modern fighter-bombers and the large airliners. The nature of flying includes scheduled passenger flights, unscheduled cross country flights and local flying for training, range firing, experimental and production test flights. There are about 25 different types of aircraft operating here, with widely varying take-off and landing speeds, aerial performance, endurance, emergency procedures etc. Thus the ATCOs task at this airport is highly demanding. While many of the existing ATCOs have had their training at Central Establishment, Allahabad, now the training is imparted locally. A new entrant has to go through nearly 15 years of training experience to become a fullfledged ATCO. The ATC as well as control room of Approach Control Radar are located in air conditioned rooms, which are well provided.

Materials and Method

All the ATCOs, numbering 16, at the HAL Airport, Bangalore were the subjects for the present study. They held different designations such as Aerodrome officers, Assistant Aerodrome officers and Air Traffic Control officers. Each subject was administered the following questionnaires :

Questionnaire 'A' :

This was a comprehensive questionnaire designed to elicit information on the general biodata of the individual, the previous work experience, ATC training, the nature of the work environment, the stresses involved therein and his attitude towards the work etc.

Questionnaire 'B' :

The questionnaire formed an objective personality test intended to ascertain the subject's basic personality so that the influence of personality factors on the subject's response to questionnaire 'A' could be ascertained. The 16 PF test Form D[1] was used for this purpose.

Adequate rapport was established with the ATCOs by frequent visits to the ATC and discussions of their problems. Sufficient care was taken to explain to them the purpose of the study so that their response could be meaningful.

Results

The mean ageof the 16 subjects was found to be 51.3 years with the youngest being 43 and the oldest on the verge of retirement at 57. The model pre-ATC educational qualification was matriculation/ SSC. One of them had post graduate qualification and four others had intermediate college education. Similarly, 11 subjects had some Armed Forces back ground (one on deputation from IAF, and others being ex-servicemen). The group mean duration of ATC experience was 15.5 years.

Table-I shows the response pattern of subjects on questions pertaining to the equipments and work environment. By and large the ATCOs were satisfied with their equipment, its layout, efficiency etc., but were divided on the need for improving the aids. Distortion due to glass panels of the cabin, glare, noise and disturbance on RT, distraction while hearing an RT are among the problems elicited through these questions.

Table I

Frequency of responses to questions on equipment and work environment

n = 16

Sl. No.	Questionnaire statements in brief	No. of responses Yes	No
1	Need for improvement of aids	8	8
2	Lay out of equipment – satisfactory or not	15	1
3	Distortion of view while looking out through the glass panels of cabin	8	8
4	Illumination of cabin adequate	15	1
5	Illumination of instrument panel satisfactory	15	1
6	Excessive glare in cabin	8	8
7	RT communication system efficient	13	3
8	Any problems in interpreting the voice of different pilots	4	12
9	Difficulty of interpreting various accents used by aircrew	2	14
10	Any excessive noise and disturbance on RT	7	9
11	Feeling tired of listening to the RT	6	11
12	Frequently disturbed by telephone, intercom etc., while listening to the RT	10	6

Table - II shows further responses from the subjects pertaining to the work load and related stresses. The main finding in this section was that prolonged observation created some tiredness in the eye and night shifts were mere stressful, although the intensity of flying is very little during night. Moreover, most of the subjects had very little opportunity to meet the pilots whom they always conversed with through RT.

Table-III shows the incidence of the crucial personality factors among the subjects. The most striking feature that manifests itself from the table is the substantially higher incidence of motivation distortion (MD) score which is an indication of instability of personality. In motivation distortion scores, the subjects tend to exaggerate certain socially desired traits, as against the normal occurrence of the trait in the general population. A high MD score lessens the reliability of the other scores also. In mental capacity (factor B) most of the subjects were found either average or below average. Four subjects were lacking the ability to withstand stress (factor C).

Table II

Response patterns pertaning to work load and related stress

Questionnaire statement in brief	No. of responses Yes	No
(a) Hours of duty too long and exhaustive or not	7	9
(b) Ideal duration suggested*		
— 8 hrs	2	
— 6 hrs	8	
— 4 hrs	2	
Night duties more stressful	9	7
Tiredness of eyes after prolonged observation duties ?	10	6
Provided accommodation near place of work	16	0
Opportunity to meet the pilots personally, yes or very rare or no	1	15
History of any illness after joining ATC duty	7	9

*Four subjects had no suggestions.

Table III

16 PF Test : Crucial personality factors

n = 16

Factor	Moderate	Possession of factor: Significantly high	Significantly low
A Mixing nature	8	2	6
B Mental capacity	12	—	4
C Emotional stability	9	3	4
G Adherence to rules	8	7	1
M Imagination	12	3	1
O Guilt proneness	11	2	3
Q3 Self concept control	10	5	1
Q4 Tenseness	12	2	2
MD Personality Instability	7	9	—

Discussion

The scrutiny of questionnaire 'A' reveals that most of the ATCOs were appointed during the period of formation of the Aerodrome at HAL Bangalore at a time when the old generation aircraft were operating and simple equipment was used in ATC for controlling. They did not go through any standardised selection or training for the ATC duties. Subsequently, they have undergone the qualifying tests as per the DGCA Rules but are essentially a product of years of experience (15.5 years mean) in ATC work While a good number has coped up with the demands of controlling today's high speed sophisticated aircraft, a few did not and are being utilised appropriately. The majority has reached the peak of their career and are waiting peacefully to complete the remaining few years of service before retirement. This fact is clearly reflected in their attitude to the questionnaire study. Barring a few better educated and younger individuals the others have given vague non-committal replies reflecting their lack interest. It implies that the questionnaire for future studies should be designed to elicit more specific replies.

The questionnaire 'A' employed in this study elicited information besides the biodata, on the equipment, layout, environmental stresses etc. These things still pose a problem to our ATC operators unlike in advanced countries However, as far as HAL ATC tower is concerned, the facilities are by and large good, and being improved further. Layout and illumination in the cabin created no problem for the operators. Half the number of subjects complained of excessive glare due to sun rays in the morning and late afternoon. Constant exposure produced some fatigue in 11 out of 16 subjects. Ten subjects alluded it as generating from the eyes. Whether this fatigue was visuogenic one is a debatable point. Grandjean[7] reported that a negative attitude towards the job, workplace and management might well be a countributor to chronic fatigue. However, this factor could not be thoroughly gone into in this preliminary study. Many of the subjects reported distortion of view while looking out through the glass panes towards the ends of runway. It is understood that this problem was already under consideration by the management.

Noise in the cabin from others' talk, telephone ringing, and the intermittent noise from a nearby wind tunnel created some annoyance. Only two ATCOs reported inability to follow different accents, particularly of foreign pilots. The intensity of this problem can be minimised further if pilots strictly followed the phonetics of internationally accepted and standardised terminology. A substantial number of ATCO's reported frequent distortion of RT communication in case of certain aircraft. It is understood that since the RT equipment in use at the ATC and in aircraft, is of different origin some mismatching of characteristics is possible. RT problems could be regarded as a cause of stress to the ATCOs.

The ATC personnel are regularly exposed to high aircraft noise levels which can cause hearing-loss as well as annoyance Deshmukh et al[8] have studied the noise levels in ATC setup of IAF airfields and found hazardous noise levels only where the ATC towers are located close to the runway and are not provided with proper air conditioned cabin which cuts out the noise to some extent. They also observed that the ATC personnel, other than ATCOs, like crashbay crew and runway controller suffer much greater noise exposure. They have found the overall incidence of moderate to severe degree of noise induced hearing loss in 41.7% of the personnel, which was clearly related to the length of service in ATC, particularly at fighter bases.

Coming to the ATCOs at HAL Airport, they have not complained of the problem of aircraft noise since their tower is well away from the runway and the cabin is properly air conditioned.

As regards the stress due to workload and shift duties, most of the ATCOs considered that the existing eight hours of duty period is too long although the workload as such is moderate and not stressful. The model period of duty suggested was 6 hours with a break of half an hour after first

3 hours. Although the amount of flying at night is not much, many ATCOs considered night duties stressfull because of the difficulty of maintaining alertness throughout. There are, however, two important areas of stress revealed by the workers during the informal interviews.

(a) Often there are a variety of aircraft in circuit at the same time and make verying demands on ATC. They have widely varying aerial speeds, landing speeds, fuel limitations, emergency procedures etc. Some of them are engaged in experimental test flights The ATCO very often spends anxious moments before all the aircraft come down safely.

(b) The prevailing international fuel crisis, resulting in the higher cost of aviation fuel, has added a new dimension to the stress on ATCOs. When a number of aircraft ask for clearance to land at the same time, the ATCO today cannot readily ask some of them to orbit while the others are landing, since orbiting implies wastage of fuel. Captains of aircraft when asked to orbit, do not hesitate to convey their displeasure to the ATCO on RT.

The occupational stress of ATC work is considered hazardous to health in the long term, particularly affecting the cardio-vascular system with increasing age and obesity [10,11]. The ATCOs are more prone to hypertension, peptic ulcer and diabets mellitus[3]. In the present study three of the sixteen ATCOs gave history of illnesses which included hypertension in two cases and hyperacidity in one.

On the question of the proper age of retirement from ATC duties the ATCOs suggested various age limits between 35 and 60 years. The majority favoured retirement age beyond 50 years However, these personal views of the ATCOs are at wide variance with the requirement of optimum performance by the ATCOs. A large number of studies in USA on the influence of age and experience on performance of ATCOs have repeatedly demonstrated an inverse relationship between age and performance, which is not compensated by experience [2,12,15,16]. The decline of performance after 40 years is significant. The Federal Aviation Administration[6] has decided that the maximum age of entry should be 30 years In fact they have a very small proportion of ATCOs over 40 years of age and hardly any above 50 years. They consider that ATC is a young man's game and that the unique abilities required are age related

Against this background the scene at HAL ATC is disturbing. Of the 16 ATCOs, five are over 55 years and nine are over 50 years of age. The youngest ATCO is 43 years old. There are no young ATCOs whose performance ratings could be used for comparison The retirement age is 58 years which is high by standards accepted elsewhere particularly in the US.

Psychological Factors

From Table-III it is seen that a substantial number of subjects (9/16) showed high motivation distortion (MD) scores. High MD score is an indication of personality instability. In this fairly aged group this result was some what surprising. Four subjects showed low emotional stability signifying low stress tolerance. However, their questionnaire response did not show any specific pattern. Majority of subjects were of average mental capacity and four of them were well below the average No specificity of job could be correlated with these, since three of these subjects were doing different control duties and one was mainly an administrafive assistant to the Senior Aerodrome Officer. Karson[5] also did not find any relationship between personality factors and performance efficiency. This brings in the question, what should be the ideal mental calibre of an Air Traffic Controller ? In these cases no job proficiency rating from the superiors was obtained, since it was not within the ambit of this study. On the other important personality factors a more or less average profile was obtained with an odd deviation here and there. Karson and O'Dell[9] using the same 16 PF test found controllers 'Hard Headed' and 'Practical' in their approach to life and work than the general population. However, no such paltern emerged in our study.

The psychological factors involved in ATCOs study have not been fully understood, although a number of investigations have been carried out. Many of the reports relate to measurement of anxiety and mood states resulting from shift duties. They suggest greater anxiety levels in ATCOs after the shift, more so after night shift.

The use of attitude questionnaire is an indirect way of assessing potential areas of stress by identifying those factors which are more commonly disliked than others. Smith[14] reported that a major dislike was management's non responsive attitude towards problems and complaints by ATCOs. Other common dislikes were the work schedule, career plan deficiencies, annoyance with tasks not directly related to the control of Air Traffic. Frankfurt airport study by Singer et al[13] found administration as the most disliked factor where as stress related to the job was the 'least disliked'. Smith[14] also observed similar dislike of all categories of ATCOs towards the administration. In the present study many ATCOs have preferred to be non-committal about their attitude towards the management and administration, job prospects, shift arrangements etc. This may be explained by the fact that most of the subjects were in the evening of their career and probably this is the best part of their life It is therefore, natural for them not to come out with problems. But, their reluctance to state any-thing critical of the management was very clear. Some of them expressed the need for better pay as compared to other ground duty personnel, besides more comforts and facilities. One of the ATCOs with wide experience of working in various airfields was, however, more articulate and has given very elaborate, thoughtful replies. It is true that they are the views of one individual and therefore statistically insignificant. But some of the points raised by him are pertinent and have been corroborated by others during informal talks. They are as stated below :—

(a) The ATCOs are "bossed over" by pilots who fail to understand them or their duties.

(b) They are overlooked and taken for granted.

(c) In case of a mishap the usual tendency is to blame the ATCO.

(d) The duty schedules are irregular and prolonged.

(e) There is often a shortage of man power and who ever is available is not fully trained. Hence, the competent ones have to work more to fulfill commitments.

(f) The extraordinary job performed by ATCOs does not bring forth any rewards, either material or symbolic.

The main refrain from all is that ATC officers are a neglected, easily victimisable lot, whose grievances nobody gives an ear to hear. As stated already the ATCOs dislike for the management has also been observed by other workers in Western countries and is not peculair to the setup here.

The grievance aired by the individual may not be entirely substantiated scientifically, but the intensity of feeling cannot be ignored. It is a perennial question in such studies whether the frequency is important or the amplitude. The workers have opted for the latter without belittling the other, for, in a sensitive area like Air Traffic Control, and for that matter in any situation where human error might lead to serious consequence the magnitude of a single response could sometimes be more meaningful than a numerated average of many responses. In other words even a single avoidable accident is significant in terms of life, mission success and cost The findings should be appreciated with the above premise in mind. Our immediate concen should be to keep up the morale of the ATCOs in view of their role in promoting flight safety.

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