Role, Work Perception & Stress in a High Reliability Work Environment

Omer Bin Sayeed & Satish Chandra Kumar

An empirical study of work attitude, role efficacy and stress experienced in a high reliability professional group was undertaken using a sample of 52 Indian Air Traffic Controllers (ATC) working in the Mumbai Airport. Results showed that ATCs experienced role stress with regard to inter-role distance, role isolation, resource inadequacy, role erosion and role stagnation. ATCs maintained high confrontation or problem solving skills in their role followed by helping relationship, perceived integration with the job and managing well their inter-role linkages. Results further showed significant relationships between work attitude and role efficacy dimensions. Regression analysis within respective canonical variable sets revealed role stress being a significant predictor of attitude towards supervisors and management, while role efficacy dimensions (role making, role centering and role linking) showed significant explanatory power equally strongly with respect to attitude towards work, working conditions, co-workers, supervisors, and management.

Omer Bin Sayeed is Professor of Organizational Behaviour/ HRM in National Institute of Industrial Engineering, Mumbai 400087 Email: omersayeed@gmail.com. ***S.Kumar*** is Reader in the Department of Applied Psychology, Mumbai University, Mumbai- 400 098.

Air Traffic Controllers (ATCs)

Air Traffic Control is basically a ground-based system dedicated to the safe, orderly traffic control and expeditious flow of air traffic. The Air Traffic Controllers (ATCs) who man the system are well trained professionals. They work under extremely demanding conditions for the safety of more than one aircraft at any given time. Safety is maintained through a system of airways and separation standards and the air traffic controllers provide continuous instructions to the pilot through the medium of Voice Radio Telephony (VRT) from the moment of start off to the final taxiing of the plane into the parking slot.

The Air Traffic Control System in India is divided into five units, namely, (a) Surface Movement Control (b) Control Tower (c) Approach Tower (d) Area Control Center (e) Flight Information Center. These units function in coordination with each other in

order to ensure the objectives of safety and expeditiousness. The Air Traffic Controller (ATC) is a trained professional, a quick thinking man who does not have the privilege to stall. His job calls for a great deal of control and quick decision-making. All his instruction to the pilot are recorded continuously on tape and any instructional delays are traceable to replay. Hence, the ATCs are under continuous scrutiny and function to standards of pin-point accuracy with a traffic load over which they have no control. An incorrect decision on his part can mean a loss of human lives and millions of rupees as he, at any point of time, is responsible for more than one aircraft. Adding to the pressure is the almost intolerable requirement that the ATCs must retain an outward calm revealing no feelings of pressure or anxiety to the pilots. Simultaneously, they have to maintain an optimum tension level to ensure mental alertness. These two requirements – contradictory in terms of human nature – are exhausting mentally and in the long run takes a toll on the ATCs' mental and physical health (Crump 1979). Perhaps, due to these reasons such professions which require higher levels of mental alertness, continuous monitoring at the personal level and extremely higher levels of risk (likely human and financial losses) involved in making decisions are generally termed as high reliability professions. Since ATCs jobs involved all the three criteria mentioned above, it is but right to characterize their occupational domain of work as a high reliability profession.

In 1993, the Government of India announced the 'Open Sky Policy' in civil aviation. As a result of this liberalization policy there has been an advent of private airline companies. This has resulted in increased number of flights and consequently increased air traffic. Such a situation directly translates into higher amount of work pressure and workload for the ATCs. Mumbai (previously known as Bombay) India's commercial capital has a Flight Information Region (FIR) stretching to 1.2 lakhs square kilometers, making it the biggest FIR in South Asia, yet it operates with a single runway. Technically, Mumbai has two runways, but they cannot be used simultaneously because they intersect each other in the middle. Being the busiest Airport in the country Mumbai handles more than 320 flight movements per day (i.e., 24 hours) in addition to 100 flights, which over fly. Besides regular flights, the ATCs at Mumbai also have to handle helicopter movement from Juhu and the Oil Rigs at Mumbai High and also the Naval helicopters. This adds tremendously to their workload, as managing helicopter movement is very time consuming job.

Review of Literature

Given the highly demanding conditions under which the ATCs work and the absolute nature of the decisions they must take, most studies in the West on this group have focused on the stressors associated with their jobs (Grandjean 1968, Grandjean & Wotzka 1971, Krol 1971, Repetti 1993). The primary short term but uncontrollable stressors for ATCs is their burgeoning workload. It is easy to observe that there is a direct predictable relationship between the

workload of a pilot and ATCs' i.e., as the workload of pilots increases the work of ATCs also increases. ATCs who perceived workload to be high reported more health complaints. Their moods turned increasingly negative and less positive (Repetti 1993). Alexander (1980) reported that ATCs who suffered from burnout rapidly retired from work for medical reasons and is also accompanied by loss of initiative to enter into active work later. Grandjean and Wotzka's (1971) study indicated that ATCs felt nervous, tense, irritated in difficult situations, were anxious, trembling has increased perspiration, pulse rate and heart ache and suffered from sleeplessness and chronic fatigue. Urine samples of ATCs also indicated increase in Catecholamine after work as compared with subjects who performed normal office work. Dell'Erba, Pancheri and Intreccialagli (1988) found that stress among ATCs increased after night shift. Average cortisol, prolactin, testosterone and thyrotropin–stimulating hormone values increased after night shift. Anxiety scores also increased after the night, but they were not correlated either with work load or hormone values. Folkard and Condon (1987) documented ATCs' night shift paralysis, which was largely caused by 4 factors that appear to influence the night workers' deprivation of sleep or sleepiness: these were the time of night, the number of consecutive night shifts, the requirement to work both morning and night shift starting on the same day and individual differences in the flexibility of sleeping habits.

A stress related study conducted by Repetti (1993) demonstrated that increases in job stressors are associated with same day deterioration in physical and psychological well-being. There is also evidence of direct spillover on parent-child interaction. ATCs tended to be more behaviourally and emotionally withdrawn during their interaction with their children at home. There was also evidence of direct spill over of negative feelings associated with distressing social experiences at work to expression of anger and greater use of discipline during interactions with a child later in a day. In line with the above findings Repetti (1994) also noted that negative social climate at work was associated with a father's tendency to describe his interaction with a child as having a less positive and a more negative emotional tone.

An organizational climate that they perceived as uncaring, unconcerned for its people, uncommunicative and unreceptive is all responsible for negative consequences at the workplace.

Singer and Rutensranz (1971) reported that high dissatisfaction among ATCs is due to office administration, pay and working conditions. Bowers (1983) studied the reasons why 11,500 unionized ATCs walked off their jobs in August, 1981. He found that ATCs managers held and acted on the classic theory of X values and beliefs which created a sizeable generation gap between the manager's attitudes and those of their counter-authoritarian subordinates, thereby paving the way for the strike. ATCs individually believed that an organizational cli-

mate that they perceived as uncaring, unconcerned for its people, uncommunicative and unreceptive is all responsible for negative consequences at the workplace. Shouksmith and Burrough (1988) reported that both Canadian and NewZealand ATCs perceived problems of supervision, physical job conditions, work organization and variability in task load as major occupational stresses.

In comparison with the Western authors' attempt to investigate the characteristics of high reliability organizations such as ATCs work environment, nuclear energy generation plants etc., virtually very little work is done on ATCs in India. Kumar, Kulkarni and Sayeed (1998) provided some exploratory data on the experiences of stressors, strains and the coping strategies used by ATCs in their work environment. The study revealed that the salient stressors generally experienced by ATCs were lack of housing and welfare facilities, low monetary incentive, maintenance problems of equipment, transfers, shift duties and owning responsibility for traveling people. Disturbance in Circadian rhythm, sleep disturbance, tensions were the major strains experienced. The coping strategies followed by ATCs included (1) analyzing the situation logically, (2) developing a positive attitude and (3) applying coping strategies such as relaxation techniques.

In view of the above, the present study is undertaken to understand the intrinsic quality of role perceptions (viz. perceived role efficacy) of ATCs and the level of role related stresses experienced by them. In addition, their attitude towards their demanding professional work in a high reliability context, wherein work related dimensions such as attitude toward work, working conditions, coworkers, supervisors and management all have critical influences to play in his working life. Hence, more specifically, the objectives of the present study are:

- To investigate the multivariate relationship between role stresses and the work attitude facets.
- To study the multivariate relationship between role efficacy dimensions and work attitude facets.

Sample

The sample of study consisted of 52 (or 34%) of 150 ATCs working in the Mumbai Airport. The respondents' ages ranged from 25 to 55 years with a mean of 34.7 years. They had experience from 1 to 30 years with mean years of experience being 10.7. The 42 (or 81%) of respondents had Bachelor of Engineering degrees whereas 10 respondents (or 19%) had Master of Science degrees to their credit.

Organizational Role Stress (ORS) Scale

The ORS scale (Pareek 1983) was used to measure organizational role stress which consisted of 50 items and specifically defined 10 dimensions of role stresses likely to arise in a work context, namely, inter-role distance, role stagnation, role expectation conflict, role erosion, role overload, role isolation, personal inadequacy, self-role distance, role am-

biguity and resource inadequacy. The items are rated on a 5-point semantic anchors ranging from 0 to 4. Since the items are tested in a variety of work environments (Pareek 1997) they were found to be appropriate in ATCs work environment as well.

Role Efficacy Scale

The Role Efficacy Scale (Pareek 1993) consisting of 20 triad items measuring individual's potential effectiveness in his immediate role was used. Combining two items together 20 triad items allowed to score role efficacy for 10 dimensions, namely, Role centrality, integration, proactivity, creativity, helping relations, inter-role linkages, superordination, influence, growth and confrontation. These dimensions are further combined to obtain three major dimensions of role efficacy, namely, Role Centering, Role Making, Role Linking. The corrected item-total correlations and Alpha reliabilities were found to be satisfactory (Sen 1982, Sayeed 1985).

Employee Work Perception Measure

Hafeez and Subbaraya's (1988) Work Perception Questionnaire was used, which consists of 15 triad items specifically dealing with employees' attitude towards work, working conditions, management, co-workers, and total organization. The minimum and maximum obtainable scores for the scale is 15 and 45. Higher scores indicated positive attitude towards each of the above dimensions.

Results

Table 1 reports descriptive statistics of work attitude, role stress and role efficacy dimensions. It can be seen that higher scores were obtained with respect to attitude towards supervisors followed by attitude towards management and work. Attitude towards working conditions and co-workers were relatively poor. Amongst role stress factors, ATCs experienced highest role stress with regard to Inter-role distance, role isolation, resource inadequacy role erosion and role stagnation. On the other hand ATCs experienced lowest role stress on personal inadequacy, role ambiguity and role expectation conflict. With regard to one's potential effectiveness in ATC's role it was noted that they seem to have high role confrontation (problem solving) skill followed by helping relationship, perceived integration with the job they are doing and perceived inter-role linkages. There were several inadequate aspects of the role perceived by ATCs that yielded lower scores on role pro-activity, role influence and role centrality.

ATCs experienced highest role stress with regard to Inter-role distance, role isolation, resource inadequacy role erosion and role stagnation.

Table 2 reports canonical correlation between work attitude measures and role stress dimensions. The reported statistics included canonical correlations, Wilks' Lambda and F ratio testing significance of the canonical correlation. In addition, correlation with work attitude

Table 1: Descriptive Statistics of Personal Correlates, Employee Attitude towards Work, Role Stress & Role Efficacy among AIR Traffic Controllers.

Variable	Mean	SD	Variable	Mean	SD	Variable	Mean	SD
Attitude towards work	6.94	1.33	Inter Role Distance	9.15	5.17	Centrality	2.05	1.09
Attitude towards working Condition	3.80	0.76	Role Stagnation	8.25	4.76	Integration	2.75	1.03
Attitude towards Coworkers	4.73	1.10	Role Expectation Conflict	6.51	4.65	Proactivity	1.71	1.01
Attitude towards Supervisors	8.35	2.23	Role Erosion	8.53	4.43	Creativity	2.15	1.07
Attitude towards Management	6.96	1.76	Role Overload	7.21	5.13	Interrole Linkage	2.73	1.27
Total work Attitude	30.75	4.68	Role Isolation	9.09	4.62	Helping Relationship	3.02	1.04
			Personal Inadequacy	3.84	3.70	Super ordination	2.25	1.15
			Self Role distance	6.29	4.18	Influence	1.59	1.29
			Role Ambiguity	4.78	4.47	Growth	2.17	1.02
			Resource Inadequacy	9.11	4.32	Confron-tation	3.48	1.04
			Total Role Stress	72.61	31.97	Role Making Total	10.09	2.54
						Role Centering Total	5.83	2.32
						Role Linking Total	8.00	2.37
						Role Efficacy Total	23.92	5.38

measures and role stress dimensions with their respective canonical variables have also been reported to highlight the degree of contribution of both the measures to canonical function.

It can be observed that amongst work attitude measures, attitude towards management, supervisors and co-workers contributed maximum. As expected all the role stress dimensions have shown correlations with the respective canonical variable of which role overload, role isolation, role stagnation and inter-role distance showed very high canonical loadings (correlation with the canonical variable), whereas personal in-

Table: 2 Canonical Correlations between Work Attitude & Role Stress

Root#	Canonical R	Wilks Lambda	F	P
1	0.66	0.27	1.33	NS
Dependent Variable	Correlation with Canonical Variables	Independent Variable		Correlation with Canonical Variables
Attitude towards work	0.39	Inter-role distance		- 0.58
Working Conditions	0.25	Role Stagnation		- 0.76
Coworkers	0.66	Role Expectation Conflict		- 0.50
Supervisors	0.73	Role Erosion		- 0.48
Management	0.84	Role Overload		- 0.78
		Role Isolation		- 0.77
		Personal Inadequacy		- 0.00
		Self Role distance		- 0.31
		Role Ambiguity		- 0.36
		Resource Inadequacy		- 0.37
Redundancy (%)	16.55	Redundancy (%)		29.55

adequacy showed zero relationship. The redundancy statistics showed 16.55 and 29.55 per cent of variance with regard to work attitude measures and role stress dimensions respectively.

Table 3 presents regression results using work attitude dimensions as dependent variables and role stress dimensions as independent variables. This table being an extension of canonical correlations provides details about specific contribution of role stress variables to work attitude dimensions in the form of Beta weight and goodness of fit statistics (R-square in percentage form).

As observed in the canonical correlation results, the sign of all the regression coefficients were negative indicating similar trend of relationship between role stress variables and work attitude measures. Out of 5 R-squares obtained 2 were found to be statistically significant explaining 35.66 Percent and 32.82 percent of variance in attitude towards supervisors and management respectively. Amongst significant regression results, role overload tended to relate negatively with attitude towards management. In addition, personal adequacy as one of the role stress variable showed positive relationship with attitude towards coworkers.

Table 4 depicts canonical correlation findings using work attitude dimensions as dependent variable (First Set) and Role efficacy dimensions such as role making, role centering, and role linking as independent variables (Second Set). Canonical correlations with significance statistics, correlations with canonical variable and redundancy percentage (variance explained) for each set of the variables are presented in the table

It can be observed that the canonical correlation indicative of goodness of fit between the sets of variable was as high as .64, significant well beyond the .01 level

Table: 3 Regression Analysis between Role Stress and Work Attitude

Dependent Variable	Independent Variable										
	IRD	RS	REC	RE	RO	RI	PI	SRD	RA	RI	R^2(%)
Attitude towards work	-.15	-.14	.05	.01	.17	-.37	.00	-.10	.21	.01	16.01
Attitude towardsworking conditions	.18	-.31	.14	-.16	-.22	.25	.06	-.19	-.11	.24	11.69
Attitude towards Coworkers	-.09	-.18	-.12	-.27	-.26	.19	.38*	.04	.00	-.03	30.18
Attitude towards Supervisors	.13	-.39	-.19	-.04	-.13	-.27	-.09	.24	.09	.15	32.82*
Attitude towards Management	-.12	.07	.00	-.20	-.53**	-.23	-.03	.14	-.04	.32	35.66*

*** p<.001; ** p<.01; * p<.05 n = 52

IRD	-	Inter-role distance	RS
	-	Role Stagnation	REC
	-	Role Expectation Conflict	RE
	-	Role Erosion	RO
	-	Role Overload	RI
	-	Role Isolation	PI
	-	Personal Inadequacy	SRD
	-	Self Role distance	RA
	-	Role Ambiguity	RI
	-	Resource Inadequacy	

Table 4: Canonical Correlations between Work Attitude and Role Efficacy

Root#	Canonical R	Wilks Lambda	F	P
	0.64	0.44	2.74	0.001

Dependent Variable	Correlation with Canonical Variables	Independent Variable	Correlation with Canonical Variables
Attitude towards work	0.66	Role Making	0.78
Working Conditions	0.55		
Coworkers	0.55	Role Centering	0.77
Supervisors	0.55		
Management	0.62	Role Linkage	0.54
Redundancy (%)	14.30	Redundancy (%)	49.91

of confidence. As against the findings of role stress variables indicating negative relationships, all the three role efficacy dimensions and work attitude measures positively contributed to respective canonical functions. The correlations for work attitude were found to be ranging from .55 to .66 and for role efficacy dimensions it was from .54 to .78. The redundancy percentages for respective sets of variables were 14.3 and 49.91.

Table 5 reports multiple regression analysis (as an extension of Table 4) between work attitude measures and role efficacy dimensions referred to above. These findings supplemented the findings of canonical correlation in that against each dependent variable, namely, work attitude dimensions, role efficacy dimensions as independent variables are regressed which yielded specific contribution made by the role efficacy dimensions.

Table 5 : Regression Analysis between Role Efficacy and Work Attitude dimensions

Dependent Variable	Independent Variable			
	RM	RC	RL	R^2(%)
Attitude towards work	0.22	0.29*	0.06	18.43*
Working Conditions	0.34*	0.30*	- 0.27	19.08**
Coworkers	0.15	0.16	0.21	15.29*
Supervisors	0.02	0.30*	0.20	17.80*
Management	0.33*	0.05	0.18	20.69**

It is interesting to note that all the R-squares were found to be significant, explaining percentages of variance that ranged from 15.29 for attitude towards coworker to 20.69 for attitude towards management. In addition, Role Centering and Role Making Behaviours taken together received the highest number of positive and significant regression coefficients compared with Role Linking Behaviour, which was not at all significant. It could also be noted that both the role efficacy factors taken together contributed to four work attitude dimensions selectively and the exception was attitude towards coworker, which was not at all contributed by any of the role efficacy factors.

Discussion

Air Traffic Controllers are one of the professional groups of high reliability organization which have to be taken seriously due to two reasons, namely, (1) as a professional group which experience job stresses in a natural stressful work environment, (2) as a group whose jobs place extreme demand on individuals to be extremely efficient in their performance. Zeier (1994) argues that this professional group if not taken seriously by management and policy makers of aviation industry the consequences can be serious both in terms of human lives and compensation to passengers along with damage to the aircrafts and national property.

The findings obtained showed that ATCs seem to maintain poor attitudes towards working conditions and co-workers besides showing their stress level as high.

Work attitude plays a very important role in a work environment exacting higher standard of performance. It is expected that in such an environment individuals bring out their best through positive attitudes towards work and various aspects of the organization provided that organization equally cares for them. The findings obtained showed that ATCs seem to maintain poor attitudes towards working conditions and co-workers besides showing their stress level as high. In a similar line of research, Kumar, Kulkarni and Sayeed (1998) documented that salient stressors experienced by ATC's in India are lack of housing and welfare facilities, low monetary incentive, maintenance problems of equipment etc. Modern navigational aids and sophisticated computers and other facilities which are easily available in Western countries are either not available or they are not in good working conditions in the Indian Airports. Lack of welfare and recreational facilities also add to poor work attitude. These findings are fully supported in the present study when we have noted that one of the stress causing factors sharply perceived by the ATCs is the resource inadequacy compared with personal inadequacy least recognized as a stress inducing factor.

In India ATCs come under civil aviation and in the last few years they have been agitating for poor facilities, working conditions and low wages. The wage agreement between government and ATCs taking very long time to settle also showed unconcerned and unsympathetic attitude of management. It is possible that due to lack of ATCs cooperation, team spirit and trust caused by above conditions, management could have developed negative attitude towards them resulting in myriad work-related problems in the work environment. Bowers (1983) has shown that managers who acted on the Theory X values and beliefs contributed more to striking at the workplace than those managers who acted on the theory Y values and beliefs. If organizational climate is perceived as uncaring, unconcerned for people, uncommunicative and unreceptive it is more likely to lead to greater stress among ATCs. The role efficacy of ATCs, evaluating the perceptions of their roles across 10 dimensions showed greater influence in predicting or enhancing work attitude. In this connection, Role Making and Role Centering (global dimensions) as compared with Role Linking were found to be strongly influencing positive work attitude of ATCs. It is interesting to note that when role occupants go beyond what is expected from the role and perform jobs with self-induced role behaviour, it is more likely to increase positive work attitude as individuals will have better focus on problem solving behaviour of their own, colleagues, superiors and subordinates.

Further, the results revealed that the highest role stress experienced by ATCs were inter-role distance, role isolation, resource inadequacy, role erosion and role stagnation. The reason for these stresses could be due to the fact that their role in aviation industry is not considered as important as that of other roles. As a professional group they always remained in the background, whereas pilots and

other professional groups within the aviation industry enjoyed greater importance. Feeling of isolation, perception of inadequate resources at their disposal and continued erosion of their roles are caused by lower salary and perks as compared to aircraft engineers and pilots whose jobs require social interaction with colleagues, seniors and management as well. For the ATCs fewer promotional opportunities, poor infra-structural facilities and also lack of coordination between various agencies at the airport seemingly contributed to discontentment and poor sense of well being at the work place. In addition, it is also observed that role stress played an important role in work attitude. As role stress increases both attitude towards supervisors and management become unfavorable. Role overload was found to be negatively related to attitude towards management. With the increased workload without corresponding increase in value addition in ATCs' job profile, their perceptions towards management have shown negative overtones. It is obvious that there is increased stress created by both the work elements and organizational settings. Mohler (1983) documented that ATC's heavy traffic volume increases their physiological and psychological stress, which has an adverse impact on both physical and mental health of ATCs. Another stressor, which was positively related with attitude towards coworkers, was personal inadequacy. As personal inadequacy increases attitude towards coworkers become less amicable, perhaps indicating a phenomenon that people with lesser self-esteem are more likely to be insecure and therefore they tend to relate with their coworkers less effectively. In all probability, this gives rise to a sense of indifference and lower degree of involvement in organization where they perform under stressful condition.

Feeling of isolation, perception of inadequate resources at their disposal and continued erosion of their roles are caused by lower salary and perks as compared to aircraft engineers and pilots.

It was also shown that role efficacy enhances work attitude in some respects. ATCs had high confrontation skills, followed by helping relationship, integration with the job and perceived inter-role linkages. In comparison with positive aspects mentioned above, the poor aspect of their role was pro-activity, which indicated that they were performing more of the reactive functions of their roles and fulfilling other's expectations rather than performing proactive functions in their roles. They cannot initiate any action on their own because of the nature of work which demanded that everything has to be performed in a structured way and as per certain prescribed norms. They also felt that they have least influence and hold less central role compared with pilots and other functionaries.

Implications

As the ATC's role is very important demanding high performance reliability, they have to be potentially effective in their roles, which can reduce their role stress and enhances their work attitude

simultaneously. Some of the practical implications drawn from the present study include conducting counseling programmes for ATCs, which could be both personal and work related counseling. Provision of relaxation training, being a part of stress management training programme such as yoga can also play a very important role.

Some of the practical implications drawn from the present study include conducting counseling programmes for ATCs, which could be both personal and work related counseling.

More specifically a significant aspect of stress that needs to be asserted as a likely suggestion for improvement is that the optimal level experiences of any type of stressors tend to facilitate the functioning of the individual and beyond certain limit, which may be different for different people, stressors tend to deteriorate performance level directly. However, with the repetitive experiences of stressors performance levels of the individuals undergo a significant and positive change giving him more latitude for enhancing the adaptation level. It is therefore, worth exploring whether with the improved role efficacy or managing role more professionally the stress level could be managed? As suggested by our study, management may like to look at the stressful work environment and help ATCs to manage their roles by inculcating some of the suggested qualities of role efficacy so that their roles benefit from managing their role through the role efficacy paradigm. But what is really required is the change of mindset at the level of management to consider the occupation activities of the ATCs as a high reliability profession compared with other types of professional categories, wherein mental alertness is undoubtedly required, but not necessarily the premium placed by the ATCs on the type of risks inherently involved in their job profiles. On a larger scale enhancing role efficacy of various professional groups of aviation industry as part of an OD intervention programme could also be taken up as suggested for various professional groups of Indian Railways (Pestonjee and Pandey, 1996).

References

Alexander, R.J. (1980), "Burning out versus Punching Out", *Journal of Human Stress*, 69 (1):37-41

Bowers, D.G. (1983), "What Would Make 11,500 People Quit Their Jobs?", *Organizational Dynamics*, 11 (3): 5-19

Crump, J.H (1979), "Review of Stress in Air Traffic Control: Its Measurement and Effects", *Aviation Space and environmental Medicine,* 50, 243-48

Dell'Erba, G., Pancheri, P & Intreccialagli, B. (1988), "Hormonal Assessment and Workload Correlates in Traffic Controllers at the End of Night Shift: The Stress Perspective", *New Trends in Experimental and Clinical Psychiatry,* 4 (4):197-212

Folkard, S., & Condon, R (1987), "Night Shift Paralysis in Air Traffic Control Officers", *Ergonomics,* 30(9):1353-63.

Grandjean, E (1968), "Fatigue: Its Physiological and Psychological significance", *Ergonomics,* 11: 427-36.

Grandjean, E & Wotzka, G (1971), "Fatigue and Stress in Air Traffic Controllers", *Ergonomics,* 14: 159 – 65.

Hafeez, A & Subbaraya, S.V.(1994), "Workers' Attitude Questionnaire", in U.Pareek & T.V. Rao, Handbook of Psychological and Social Instruments, Baroda, Samasthi Publications

Krol, V. (1971), "Variations in ATCs' Workload as a Function of Variation in Cockpit Workload", *Ergonomics,* 14 (5): 585-90.

Kumar, S, Kulkarni, R & Sayeed, O.B. (1998), "Stress, Strain and Coping Styles among Air Traffic Controllers", *Productivity,* 39 (1): 113-18

Mohler, S.R (1983), "The Human Element in Air Traffic Control: Aeromedical Aspects, Problems and Prescriptions", *Aviation, Space and Environmental Medicine,* 54 (6): 511-16

Pareek, U (1983), "Organizational Role Stress", in Goodstein, B.L and Pfeiffer, J.W. (Eds), The 12th Annual for HRD facilitators

Pareek, U. (1993), Making organizational Roles Effective, New Delhi: Tata McGraw-hill Book Company

Pareek, U. (1997), Handbook of Instruments for HRD and Training, New Delhi, Tata-Mcgraw-hill.

Pestonjee, D.M & Pandey, A (1996), "Enhancing Role Efficacy: An OD Intervention", *Vikalpa,* 21 (2): 43-52.

Repetti, R.L. (1993), "Short Term Effect of Occupational Stressors on Daily Mood and Health Complaints", *Health Psychology,* 12 (2): 125-31.

Repetti, R.L. (1994), "Short Term and Long Term Processes Linking Job Stressors to Father-Child Interaction", *Social Development,* 3 (1): 1-15.

Sayeed, O.B. (1985), "Job Stress and Role Making Behaviour", *Managerial Psychology,* 6 (1&2):35-57.

Sen, P.C. (1982), A Study of Personal and Organizational Correlates of Role Stress and Coping Strategies in Some Public Sector Banks", Unpublished Doctoral Dissertation in Management, Gujarat University.

Shouksmith, G & Burrough, S. (1988), "Job Stress Factors for New Zealand and Canadian Air Traffic Controllers", *Applied Psychology – An International Review,* 37 (3): 263-70

Singer, R. & Rutensranz, J (1971), "Attitude of ATCs' at Frankfurt Airport towards Work and the Working Environment", *Ergonomics,* 14 (5): 633-39.

Zeier, H (1994), "Workload and Psycho-physiological Stress Reactions in Air Traffic Controllers", *Ergonomics,* 37 (3): 525-39.