INTERNATIONAL CIVIL AVIATION ORGANIZATION
ASIA AND PACIFIC OFFICE

DRAFT ATSEP HUMAN FACTORS GUIDANCE MATERIAL

Advanced Edition - September 2022

AMENDMENTS

The issue of amendments is announced, when an amendment has been agreed by a meeting of the ICAO Asia/Pacific CNS/SG. The space below is provided to keep a record of such amendment.

RECORD OF AMENDMENTS

Amendment Number	Date	Amended by	Comments
0.0			
0.1			

PREFACE

This publication is the most important deliverable of the Ad-hoc work group being established in April 2021 in response to the conclusion of Thirty First Meeting of Asia/Pacific Air Navigation Planning and Implementation Regional Work Group (APANPIRG/31) in December 2020 for the **Preparation of APAC Regional ATSEP Human Factor Guidance Material**. It aims at providing guidance to States, Air Navigation Service Providers and their key taskforce 'ATSEP' on improving the human performance by addressing the key stress factors through effective countermeasures as proposed in the document.

With the extensive series of group discussions and deliberations, the Ad-hoc work group has prepared **Stress Factor Mapping Document (SFMD)** which focuses on grouping of the stress factors listed in IFATSEA study report- "**Factors adding stress and fatigue to ATSEP**" provided in **Appendix R** to the **CNS SG/24 Report** into key issues then mapping those key issues with the suitable countermeasures listed in the IFATSEA study report. This guidance material has been developed based on the SFMD and counter measures to be taken.

A working team was established to formulate the structure and develop the contents of the guidance material, and IFATSEA has volunteered to take lead on coordinating and consolidating inputs from members of the working team. The team has successfully completed the task of drafting the Regional guidance material within the targeted time and has presented the Regional ATSEP human factor guidance material in the Twenty-Sixth Meeting of Communication, Navigation and Surveillance Sub-group of ICAO in September 2022 for review and adoption.

This guidance material have the clear description of all the guidelines for the actions to be taken and the self-evaluation checklists for the ATSEP/ANSPs to evaluate themselves. Also, the best practices that can be adopted and the long-term benefits to the ANSPs on addressing the human factors of ATSEP will be discussed in the document. Work group welcomes all ATSEP, ATSEP representatives and ANSPs for interactions and collaborations from all the regions not restricted to APAC region for their valuable feedback and review of the document for further improvement and adoption by the states.

The support from ICAO APAC Office and contributions from the following volunteer State/Administration and industry partner in preparing the guidance material is acknowledged and highly appreciated:

1. Air Traffic Management Bureau (ATMB), China
2. Airports Authority of India
3. Civil Aviation Authority of Singapore
4. Civil Aviation Authority of Thailand (CAAT) and Aeronautical Radio of Thailand LTD.(AEROTHAI)
5. Directorate General of Civil Aviation, Indonesia and Indonesian Aviation Electronics and Electrical Technician Association (IAEETA)
6. Hong Kong Civil Aviation Department, Hong Kong China
7. Japan Civil Aviation Bureau and Koukuu Hoan Shisetsu Shinraisei Center (KSC)
8. Korea Airport Corporation (KAC) and Incheon International Airport Corporation (IIAC)

TABLE OF CONTENTS

ACRONYMS AND ABBREVIATIONS xvii
1. INTRODUCTION 1
1.1. Purpose 1
1.2. Background 1
1.3. Concept 2
1.3.1. Mutual benefits for ANSP and ATSEP 3
1.3.2. Pareto rule 3
1.3.3. CANSO Standard of Excellence in Human Performance Management 3
1.3.4. Organizational resilience 4
1.3.4.1. Preventative control: defensive and consistent 4
1.3.4.2. Mindful action: defensive and flexible 4
1.3.4.3. Performance optimization: progressive and consistent 5
1.3.4.4. Adaptive innovation: progressive and flexible 5
1.3.5. Mapping of resilience levels and process maturity levels 6
1.3.6. Evaluation method 6
1.4. Safety Role of ATSEP 6
1.4.1. Activities. 8
1.4.1.1. Operational activities. 8
1.4.1.2. Maintenance activities. 9
1.4.1.3. Installation activities. 9
1.4.2. Unique characteristics of ATSEP working environment. 9
1.5. Outcomes and Endorsements 9
1.6. Arrangements of this document 9
1.7. Document History and Management 10
1.8. Copies 10
1.9. Changes to this document 10
1.10. Editing Conventions 10
1.11. ATSEP human factors guidance material - Request for Change Form. 11
1.12. Amendment Record. 11
2. REFERENCE DOCUMENTS 13
3. PEOPLE RESOURCING 15
3.1. Introduction 15
3.2. Benefits to ANSP through strategic people resourcing 15
3.3. Benefits to ATSEP through strategic people resourcing 15
3.4. Actions to be taken by ANSP 15

3.5. Actions to be taken by ATSEP 16
3.6. Most influential Counter measures 16
3.7. Human factors issues addressed 16
3.7.1. Directly addressed factors that are adding stress and fatigue due to over workload and lack of human resources 16
3.7.2. Indirectly addressed factors that are adding stress and fatigue due to over workload and lack of human resources. 17
3.7.3. Additional factors addressed, that are aggravating stress and fatigue when the workload is more, and human resources are less. 18
3.8. Self-evaluation checklist 18
3.8.1. Self-evaluation check list for ANSP. 18
3.8.2. Self-evaluation check list for ATSEP. 19
3.9. Resilience and cost benefits 20
4. JOB, ROLE AND SKILLS ANALYSIS AND COMPETENCY MODELLING 21
4.1. Introduction 21
4.2. Benefits to ANSP through Job, role and skills analysis and competency modelling 21
4.3. Benefits to ATSEP through Job, role and skills analysis and competency modelling 21
4.4. Actions to be taken by ANSP 21
4.5. Actions to be taken by ATSEP 22
4.6. Most influential Counter measures 22
4.7. Human factors issues addressed 22
4.7.1. Directly addressed factors that are adding stress and fatigue due to job, role and skills analysis and competency modelling. 22
4.7.2. Indirectly addressed factors that are adding stress and fatigue due to job, role and skills analysis and competency modelling. 23
4.8. Self-evaluation checklist 24
4.8.1. Self-evaluation check list for ANSP. 24
4.8.2. Self-evaluation check list for ATSEP. 25
4.9. Resilience and cost benefits 26
5. KNOWLEDGE MANAGEMENT, TALENT MANAGEMENT, LEARNING AND DEVELOPMENT 27
5.1. Introduction 27
5.2. Benefits to ANSP through KM, TM, L&D 27
5.3. Benefits to ATSEP through KM, TM, L&D 27
5.4. Actions to be taken by ANSP 28
5.5. Actions to be taken by ATSEP 28
5.6. Most influential Counter measures 29
5.7. Human factors issues addressed 29
5.7.1. Directly addressed factors that are adding stress and fatigue due to improper tools, procedures and shared knowledge and practices. 29

5.7.2. Indirectly addressed factors that are adding stress and fatigue due to improper tools, procedures and shared knowledge and practices. 30
5.8. Self-evaluation checklist 31
5.8.1. Self-evaluation check list for ANSP. 31
5.8.2. Self-evaluation check list for ATSEP. 32
5.9. Resilience and cost benefits 33
5.10. Other counter measures to be considered 33
5.11. Relevant Appendix 33
6. INDUCTION OF NEW SYSTEMS AND MAINTENANCE PHILOSOPHY 34
6.1. Introduction 34
6.2. Benefits to ANSP 34
6.3. Benefits to ATSEP 34
6.4. Actions to be taken by ANSP 34
6.5. Actions to be taken by ATSEP 35
6.6. Most influential Counter measures 35
6.7. Human factors issues addressed 36
6.7.1. Directly addressed. 36
6.7.2. Indirectly addressed. 36
6.8. Self-evaluation checklist 38
6.8.1. Self-evaluation check list for ANSP. 38
6.8.2. Self-evaluation check list for ATSEP. 39
6.9. Resilience and cost benefits 39
6.10. Other counter measures to be considered 40
7. WORK ENVIRONMENT, WELL-BEING, PERFORMANCE, AND REWARD 41
7.1. Introduction 41
7.2. Benefits to ANSP 41
7.3. Benefits to ATSEP through 41
7.4. Actions to be taken by ANSP 42
7.5. Actions to be taken by ATSEP 42
7.6. Most influential Counter measures 42
7.7. Human factors issues addressed 42
7.7.1. Directly addressed factors. 42
7.7.2. Indirectly addressed factors. 44
7.8. Self-evaluation checklist 45
7.8.1. Self-evaluation check list for ANSP. 45
7.8.2. Self-evaluation check list for ATSEP. 46
7.9. Resilience and cost benefits 47
7.10. Relevant Appendix 47

8. MOTIVATION, COMMITMENT, AND ENGAGEMENT 48
8.1. Introduction 48
8.2. Benefits to ANSP 48
8.3. Benefits to ATSEP 48
8.4. Actions to be taken by ANSP 48
8.5. Actions to be taken by ATSEP 49
8.6. Most influential counter measures 49
8.7. Human factors issues addressed 49
8.7.1. Collectively addressed factors. 49
8.8. Resilience and cost benefits 50
8.9. Other counter measures to consider 50
9. BEHAVIOURAL AND ROLE SPECIFIC COMPETENCIES 52
9.1. Introduction 52
9.2. Benefits to ANSP 52
9.3. Benefits to ATSEP 52
9.4. Actions to be taken by ANSP 52
9.5. Actions to be taken by ATSEP 52
9.6. Most influential Counter measures 52
9.7. Human factors issues addressed 52
9.7.1. Directly addressed factors. 52
9.7.2. Indirectly addressed factors. 53
9.8. Resilience and cost benefits 54
9.9. Other countermeasures to consider 54
10. SAFETY CULTURE PROMOTION 55
10.1. Introduction 55
10.2. Benefits to ANSP through 55
10.3. Benefits to ATSEP through 55
10.4. Actions to be taken by ANSP 55
10.5. Actions to be taken by ATSEP 56
10.6. Most influential Counter measures 56
10.7. Human factors issues addressed 56
10.7.1. Directly addressed factors. 56
10.8. Resilience and cost benefits 57
10.9. Other counter measures to consider 57
APPENDIX 1 STRESS FACTOR MAPPING 59
1.1. Introduction 59
1.2. Description 63
APPENDIX 2 STRESS FACTORS 64

2.1. Introduction 64
2.1.1. Table 1 – Lack of Knowledge, Skills and Competency. 64
2.1.2. Table 2 – Lack of proper workload distribution. 65
2.1.3. Table 3 – Lack of proper procedures, information, tools and practices. 66
2.1.4. Table 4 – Duty duration, cycles of shifts and extended work hours. 67
2.1.5. Table 5 – Continued stress, fatigue, and pressure. 67
2.1.6. Table 6 – Lack of knowledge sharing, leadership and team work. 68
2.1.7. Table 7 – HRM policies. 69
2.1.8. Table 8 – Lack of workplace facilities and environment. 70
2.1.9. Most significant issues. 71
APPENDIX 3 COUNTER MEASURES 72
3.1. Introduction 72
APPENDIX 4 ATSEP DUTY TIME LIMITATION 74
4.1. Introduction 74
4.2. Definitions 74
4.3. Background 74
4.4. Best Shift duty pattern 76
4.5. Guidelines for best shift duty pattern 81
4.5.1. Guideline 1-Successive night shifts. 81
4.5.2. Guideline 2 - Rest period between night shifts. 81
4.5.3. Guideline 3-Coherent blocked free time at the weekends. 82
4.5.4. Guideline 4-Number of free days. 82
4.5.5. Guideline 5-Shift rotation pattern. 82
4.5.6. Guideline 6-Early shift. 82
4.5.7. Guideline 7-Night shift length. 83
4.5.8. Guideline 8-Concentration of working hours restriction. 83
4.5.9. Guideline 9 - Notification of rosters. 83
4.5.10. Guideline 10 - Rest in Night Shift / Single Shift. 83
4.5.11. . Guideline 11 - Emergency Duty. 84
4.6. References 84
APPENDIX 5 MEASURES DURING PANDEMIC 85
5.1. Introduction 85
5.2. Backdrop of the Paranoia: Fear psychosis behind Covid- 19 85
5.3. The Mitigation measures to be taken during Pandemic 86
5.4. The future course of Action 86
5.5. References 87
APPENDIX 6 PROGRESSIVE TRAINING 88

6.1. Introduction 88
6.2. Background of ATSEP training 88
6.3. The Roadblocks to complete adoption of the Docs 9868 & Doc 10057 90
6.4. How can these roadblocks be addressed 90
6.5. References 90
APPENDIX 7 STRESS MANAGEMENT 91
7.1. Introduction 91
7.1.1. Process of stress – Three stages 91
7.1.1.1. Alarm reaction. 91
7.1.1.2. Resistance stage. 91
7.1.1.3. Exhaustion stage. 91
7.1.2. Causes of stress at working situations. 91
7.1.2.1. Stressors in the working environment. 92
7.1.3. Consequences of stress. 92
7.1.4. Symptoms of Stress. 92
7.2. Stress Management 93
7.2.1. Human Nature and Individual Differences. 93
7.2.1.1. Human Nature. 93
7.2.1.1.1. Biological Models. 93
7.2.1.1.2. Goal-based models. 94
7.2.1.2. Individual Differences. 94
7.2.1.2.1. Extraversion. 94
7.2.1.2.2. Neuroticism. 94
7.2.1.2.3. Agreeableness. 95
7.2.1.2.4. Conscientiousness. 95
7.2.1.2.5. Openness to experience. 95
7.2.2. Relations Between Personality and Coping. 95
7.2.3. Benefits of active stress management. 96
7.2.4. Steps involved in the minimization of the stress. 96
7.2.4.1. Identify the sources of stress in your life. 96
7.2.4.2. Address the unhealthy coping strategies. 96
7.2.4.3. Managing predictable stressors. 96
7.2.4.3.1. Avoid unnecessary stress. 96
7.2.4.3.2. Alter the situation. 96
7.2.4.3.3. Adapt the stressor. 97
7.2.4.3.4. Accept the things you can't change. 97

7.2.4.4. Manage time and schedules. 97
7.2.5. Assistance under stressful situation. 97
7.2.6. Effects of shocking and stressful situation 97
7.3. References 98
8. SAFETY CULTURE 99
8.1. Introduction 99
8.1.1. Safety Importance in Aviation. 99
8.1.2. Safety: The Foremost Strategic Objective of ICAO. 99
8.1.3. Safety Work Culture. 99
8.1.4. Safety Culture and Safety Performance. 100
8.1.4.1. Quality safety culture entails considerate safety behaviour. 100
8.1.4.2. ATSEP perform even when not under safety supervision. 100
8.2. Safety Culture Development and Benefits. 101
8.2.1. Developing A Positive Safety Culture. 101
8.2.2. Safety Culture as Safety Enabler of Safety Management. 101
8.2.3. Safety Work Culture benefits. 101
8.2.3.1. Safety work culture benefits to ANSPs in case of adoption in ATSEP domain. 102
8.2.4. Benefits of Safety Management. 102
8.2.5. Safety Culture Enablers and Disablers. 102
8.3. Safety Reporting and Just Culture. 106
8.3.1. Safety Culture and its influence on Safety Reporting. 106
8.3.2. Safety Reporting 106
8.3.2.1. Why should we report? 106
8.3.2.2. What to write and what to avoid?. 107
8.3.3. Just Culture. 108
8.3.3.1. Definition. 108
8.3.3.2. What Just Culture is. 108
8.3.3.3. What Just Culture is Not. 108
8.3.4. No one-way Street. 109
8.3.5. Safety Culture and Cultural Diversity. 109
8.4. Challenges and Addressing the Roadblocks. 109
8.4.1. Loss of Upper Management Support. 109
8.4.2. Lack of Safety Accountability. 110
8.4.3. Lack of leadership commitment. 110
8.4.4. Lack of resources for safety success. 110

8.4.5. Ageing workforce. 111
8.4.6. Rise in the recruitment of young and less experienced ATSEPs. 111
8.4.7. Loss of safety-related data. 111
8.4.8. Safety Feedback problems. 111
8.4.9. Safety culture and organizational change. 112
8.4.10. Economic unpredictability. 112
8.5. Monitoring and Measuring Safety Culture Effectiveness 112
8.5.1. Safety Culture Assessment. 112
8.6. References. 112

LIST OF FIGURES

Figure 1: Working environment of ATSEP 7
Figure 2 Plot is between “Maximum Hours in a Single Shift duty for an ATSEP” vs “Break duration during the shift” (in hours) 75
Figure 3 Plot is between “Total Watch Hour in a day” vs “Maximum Hours in a Single Shift duty for an ATSEP” 75
Figure 4 Plot is between “Total work hour in a week for ATSEP” vs “Number of Rest Days in a week” 76
Figure 5 Impact on ATSEP Job Performance 76
Figure 6 Shift work with ATSEP performance and safety 80
Figure 7 ATSEP scope of work 88
Figure 8 Phases of training 89
Figure 9 ATSEP training path 89
Figure 10 Quantifying safety behaviour 100
Figure 11 Benefits of safety management 102

LIST OF TABLES

Table 1: Mapping of process maturity levels and resilience.....6
Table 2: Request for change form.....11
Table 3: List of references.....13
Table 4 Consequences of stress.....92

ACRONYMS AND ABBREVIATIONS

ACC	Area Control Centre
AME	Aircraft Maintenance Engineer
ANSP	Air Navigation Service Provider
APP	Approach Control
ATC	Air Traffic Controller
ATCO	Air Traffic Control Officer
ATSEP	Air Traffic Safety Electronics Association
CBTA	Competency Based training and Assessment
CM	Corrective Maintenance
CNS/ ATM	Communication, Navigation and Surveillance /Air Traffic Management
EST	Eastern Time Zone
EU	European union
FIR	Flight Information Region
FOCA	Federal Office of Civil Aviation
FPL	Flight Plan
HR	Human Resources
HRM	Human Resource Management
ICAO	International Civil Aviation Organisation
ILS	Instrument Landing System
KSA	Knowledge, Skill and Attitude
KSC	Knowledge, Skill and Competency
L1	Lowest One
NOTAM	Notice to Airmen
OEM	Original Equipment Manufacturer
OFC	Optical Fibre Communication
PM	Preventative Maintenance
PPE	Personal Protective Equipment
RADAR	Radio Detection and Ranging
RWY	Runway
SCN	Suprachiasmatic Nucleus
SFMD	Stress Factor Mapping Document
SOP	Standard Operating Procedure
SSP	State safety Plan
STSB	Swiss Transportation Safety Investigation Board
SWIM	System Wide Information Management
UPS	Uninterruptible Power Supply
VHF	Very High Frequency
VVIP	Very Very Important Person

1. INTRODUCTION

1.1. Purpose

To cope up with the new technologies and safety levels, ANSPs need to match modernization plans with human performance management of their key workforce i.e. ATSEP. To ensure the required level of human performance to assure safety, it is essential to understand the factors adding stress and fatigue in the present scenario.

On understanding the factors and their effective counter measures, ANSPs can plan a human performance management system that can assure continues performance improvement w.r.t ATSEP.

The purpose of this guidance material is to list the factors that add stress, fatigue, and affect their job performance in their working environment (roles, responsibilities, deployment, duty pattern, requirement of knowledge, skills, attitude, competency, training, and resources) and address the factors through process improvisation of human performance management system.

This guidance material presents the significant human performance management system that can address the factors effectively by reaching different levels of maturity. Also gives self-evaluation means for the ANSP to measure the levels of maturity of those process.

Post Covid-19 pandemic, it is meaningful to prepare the organization for higher levels of resilience to bounce back as well as to progress forward. This guidance material also correlates the human performance management process maturity levels with that of resilience levels.

So, this guidance material on ATSEP human factors, links the human factors that add stress, fatigue and affect the job performance, key human resource management process through which they are addressed, and resilience and cost benefits that can be achieved through those process improvisation.

1.2. Background

Initially at the global level, the human factors issues were considered to be significant for flight crew operations, then considered to affect the performance of air traffic controllers, and later it was focused on the performance of aircraft maintenance personnel. In the present technology centric air-ground CNS/ATM systems, ATSEP role in the safety chain is crucial to seal all the holes in the last layer of defence. However, human factors of ATSEP are not being addressed or focused in the manner as it is done on the performance of Pilots, AME, ATCOs, MET, ASO and Flight Dispatchers.

The stressful working environment of ATSEP can lead to errors, lapses, latent or error causing conditions that brings the invisible windows of opportunity for unsafe acts, or even fatal accidents. Given the unique nature of the job performance with zero tolerance for error and with the requirements of high levels of technical skills, there was a need for defining uniform standards on the roles, responsibilities, deployment, duty pattern, requirement of knowledge, skills, attitude, competency, training, resources and rewards with regards to ATSEP who are playing vital role in the safety chain

The International Federation of Air Traffic Safety Electronics Association (IFATSEA) emphasized the importance to study the human factor issues of ATSEP on their working environment, abilities, limitations and on other characteristics for evaluating their job and

safety performance CNS / SG 23 at Bangkok. The meeting considered that establishment of a small working group would be necessary to support such study.

Further, IFATSEA has conducted a global study on human factors of ATSEP to understand the abilities and limitations of Air Traffic Safety Electronics Personal (ATSEP) in their working environment. This global study assessed the present level ANSPs maturity levels in terms of human performance management pertaining to ATSEP. The study found that the human performance management maturity levels of ANSPs w.r.t ATSEP are in the exceedingly early stages and there are scopes for improvement.

Based on the study, a report on human factors of ATSEP was presented in CNS SG/24 through web conference, and the meeting has forwarded the draft conclusion for adoption in APANPIRG 31. Consequent upon adoption in APANPIRG 31 and ICAO APAC has issued a state letter for the APAC states for encouraging them to consider the study recommendations for the implementation proactively and come forward to join the small work group for preparation of Regional ATSEP human factor guidance material.

The Ad-hoc work group of experts from Eight (8) member states (China, Hong Kong China, India, Indonesia, Japan, Republic of Korea, Singapore, and Thailand) and IFATSEA was established in April 2021 in response to the Conclusion APANPIRG/31/15-Addressing Human Factor Issues of ATSEP recommended by CNS SG/24 meeting for finding the left-out gaps and for preparing the regional ATSEP human factor guidance material.

Under the leadership of IFATSEA, the Ad-hoc work group has thoroughly discussed the factors that add Stress and Fatigue to ATSEP and deliberated on the effective counter measures to address those human factors and ANSPs' resilience through counter measures in the subsequent meetings. Based on this a Stress Factor Mapping Document (SFMD) was prepared.

Furthermore, the Ad-hoc group has deliberated on long term benefits to ANSP and ATSEP community on addressing the human factors, best practices to be adopted by the states to achieve highest level of resilience, and human performance process maturity levels. Deliberations on priority actions to be taken by ATSEP and ANSP during pandemic like Covid-19 were also carried out. Consequently, the Ad-hoc group has worked on finalizing the structure and drafting of various modules of Regional ATSEP human factor guidance material.

Apart from the periodical meeting held by work group during June 2021 to June 2022, IFATSEA has conducted Global Webinar on Human Performance on 12th November 2021 to deliberate the ATSEP human performance and organizational resilience. IFATSEA has also arranged series of mastermind sessions involving volunteers from the work group on deliberating the issues that affect the human performance and solutions to ensure the highest level of performance.

Consequently, the Ad-hoc workgroup has presented and submitted the draft Regional ATSEP guidance material to the Twenty-Sixth Meeting of the Communications, Navigation and Surveillance Sub-group of APANPIRG CNS SG/26 scheduled during 5th-9th September 2022.

1.3. Concept

Systems approach was adopted to arrive at solutions through improvisation of existing human resource management process so that these improvisation address not only the factors listed but also the similar factors that may arise in future.

1.3.1. Mutual benefits for ANSP and ATSEP

On each measure suggested, the mutual benefits to ANSP and ATSEP are analysed. At the end of each measure, resilience, and cost benefits to ANSP are listed.

Actions to be taken by ANSP and ATSEP to achieve the mutual benefits are listed along with the self-evaluation check lists of ANSP and ATSEP. Self-evaluation checklists for ANSP is designed to evaluate their human performance process maturity levels as well as the organizational resilience level. Self-evaluation checklists are proposed for ANSP and ATSEP based on the above principle for five chapters. The self-evaluation checklists are kept simple for encouraging the ANSPs for the evaluation and improvement.

1.3.2. Pareto rule

Out of all the counter measures, the guidance material has emphasized only the counter measures that are most influential and related to the process that are very essential for any ANSP to improve upon their organizational resilience. This way by following Pareto rule, 20% of the most influential counter measures that can address over 80% of the factors that affect the job performance and add stress and fatigue to ATSEP are highlighted.

This guidance material scientifically address the challenges for human performance management and aims to provide best practices to be adopted by the states to build resilient ANSPs through ATSEP those who ensure final defences in the safety chain.

However, the stress factor mapping document (SFMD), entire factors, countermeasures are given in the appendix 1, 2, & 3.

1.3.3. CANSO Standard of Excellence in Human Performance Management

This guidance material has adopted the *CANSO Standard of Excellence in Human Performance Management* model for evaluating the levels of maturities for the self-evaluation of ANSP. The maturity levels are given below for ready reference.

- Level A – Informal Arrangements - Human performance management processes and/or requirements have not been agreed at the organization level – they are either not routinely undertaken or depend on the individual assigned the task.
- Level B – Defined - Human performance management processes and/or requirements are defined but not yet fully implemented, documented, or consistently applied.
- Level C – Managed - Human performance management processes and/or requirements meet the required regulatory standards and comply with relevant ICAO Annexes. Human performance management processes and/or requirements are formally documented and consistently applied.
- Level D – Assured - Evidence is available to provide confidence that human performance management processes and/or requirements are being applied appropriately and are delivering positive, measured results.
- Level E – Optimized - Human performance management processes and/or requirements set international best practice, focusing on innovation and improvement. The effectiveness of the human performance management improvement actions is measured and evaluated against defined improvement criteria.

1.3.4. Organizational resilience

This guidance material has adopted the organizational resilience concepts through human performance for evaluating the levels of resilience for the self-evaluation of ANSP. Brief information on different resilience levels are given below for ready reference.

1.3.4.1. Preventative control: defensive and consistent

Preventative control. Organizational Resilience is achieved by means of risk management, physical barriers, redundancy (spare capacity), systems back-ups and standardized procedures, which protect the organization from threats and allow it to 'bounce back' from disruptions to restore a stable state. i.e., defensive + consistent.

Society expects organizations and critical infrastructures to be safe, secure and dependable, and that industry, government, regulators and service-deliverers have appropriate and continually improving capabilities to ensure this.

The ultimate goal of regulation is to produce fail-safe system designs. Defences, barriers, safeguards and back-ups occupy a key position in this approach.

Systems have multiple defensive layers: some are engineered, others rely on people, and yet others depend on procedures and administrative controls.

Organization at its best have the following positive signs

- Known problems are solved using proven techniques
- Standard ways to do things are perfected by fine tuning
- Redundancy through design and diversification has a stabilising effect
- Disturbances are quickly counteracted by planned responses

1.3.4.2. Mindful action: defensive and flexible

Mindful action. Organizational Resilience is produced by people, who notice and react to threats and respond effectively to unfamiliar or challenging situations. i.e. Defensive + flexible.

To be resilient is to be prepared for adversity, which requires "improvement in overall capability, i.e. a generalized capacity to investigate, to learn, and to act, without knowing in advance what one will be called to act upon".

Rather than relying on static controls and reactive responses, Organizational Resilience also requires resources that can be activated, combined, and recombined in new situations, as challenges arise. An important contribution of this stream of work is that people are not regarded purely as sources of error but provide a positive contribution towards resilience.

Thus, the focus of resilience thinking shifted to the need for a culture that facilitated noticing and containing problems Some organizations, despite operating in complex and dynamic environments, face many opportunities for failure in their daily operations but almost never experience an operating failure or disruption.

Organization at its best have the following positive signs

- People are wary about what could go wrong
- Opportunities and problems are noticed, understood and addressed quickly

- People exercise judgement, discretion, and imagination when faced with challenges
- People are empowered to act when they recognize a problem

1.3.4.3. Performance optimization: progressive and consistent

Performance optimization: progressive and consistent. Performance optimization. Organizational Resilience is formed by continually improving, refining and extending existing competencies, enhancing ways of working and exploiting current technologies to serve present customers and markets i.e. progressive + consistent.

Driven by globalization, the need for downward pressure on costs and the aim of improvements in shareholder value, many organizations have focused on the need to plan, organize for and realize efficiency gain and increase productivity.

Performance optimization involves learning to do existing things better, delivering goals and meeting the needs of the public, the media, regulators and the government, who all demand that products and services be delivered that 'work right this time, next time and every time'.

Typically, optimizing involves process enhancement, including the refinement, extension and exploitation of existing assets and competencies, technologies, and paradigms.

Organization at its best have the following positive signs

- Performance improvement – 'do what we do better'
- Known solutions are implemented quickly – even by edict
- A clear sense of direction, goals, roles and responsibilities
- A strong individual leader who people can relate to

1.3.4.4. Adaptive innovation: progressive and flexible

Adaptive innovation: progressive and flexible. Adaptive innovation. Organizational Resilience is created through creating, inventing and exploring unknown markets and new technologies. Organizations can be the disruption in their environment i.e. progressive + flexible.

"It is not the most intellectual of the species that survives; it is not the strongest that survives; but the species that survives is the one that is able to adapt to and to adjust best to the changing environment in which it finds itself".

In today's business environment the rapid production of knowledge and innovation is critical to organizational survival. Innovation involves creative problem-solving, innovation and learning, which have become critical to competitive advantage.

In response to these challenges, organizations can no longer engage in technical change by applying known solutions and current know-how that can be implemented by experts, rather they need to engage in adaptive change that "requires going beyond any authoritative expertise to mobilize discovery, shedding certain entrenched ways, tolerating losses and generating the new capacity to thrive anew". This requires experiments, new discoveries and invention from numerous places in the organization or community.

Organization at its best have the following positive signs

- Productive tension disrupts existing patterns and generates a search for new possibilities

- Creative thinking and problem solving by people drawing on multiple perspectives and taking risks in a safe environment.
- Collective strategic action with rich interactions coalition formation, negotiation and compromise.
- Systems-wide changes across borders and boundaries; multidimensional and fundamental changes.

1.3.5. Mapping of resilience levels and process maturity levels

For an easier comparison evaluation check lists for ANSP.

Table 1: Mapping of process maturity levels and resilience

Process maturity levels	**Resilience levels**
Level A & B	Preventative control
Level C	Mindful action
Level D	Performance optimization
Level E	Adaptive innovation

1.3.6. Evaluation method

The guidance material is recommending the corresponding human resource management process improvisation and their evaluation than evaluating factor by factor. By improving the process, ANSP will be able to address not only the listed factors but even beyond. At the same time without improvising the process, factors cannot be addressed effectively.

1.4. Safety Role of ATSEP

The term Air Traffic Safety Electronic Personnel (ATSEP) has been invented to describe those technical specialists working to provide and support the electronics and software, which enable ATS systems to function. ATSEP comprise engineers, technicians, and computer hardware and software specialists who are responsible for the specification, procurement, installation, calibration, maintenance, testing and certification of ground electronic systems used to help control aircraft movements.

ATSEP may perform tasks on a wide variety of CNS/ATM systems and equipment requiring a wide range of competencies and expertise as well as knowledge and skills in electronics, computer sciences and network. In addition, ATSEP activities may be carried out from technician to high-level engineering. [DOC 10057].

The possible scope of ATSEP activities using engineering lifecycle as a basis, include system conception through design, operations and finally decommissioning. In addition to technical activities, others may be added related to management, teaching or assessment, safety management, security management and quality management.

A typical working environment on which ATSEP performs their tasks is depicted in the figure. The environment includes people, procedures and equipment. ICAO SHELL model referred in DOC 9683 is well applicable and addresses the human factor issues of ATSEP.

Active participation and contribution of ATSEP are essential in all the stages of ANS ground facilities, right from the installation to operation. Addressing the human factor issues of ATSEP

during these stages are very essential and issues related in the operation environment are very significant, addressing of these issues contributes directly the safety, capacity and efficiency of ANS.

ATSEP are expected to perform duties with wide varying environment from high raised tower to cable trenches in the ground, very hot open place to temperature-controlled equipment room, very busy cities to very remote places of the state.

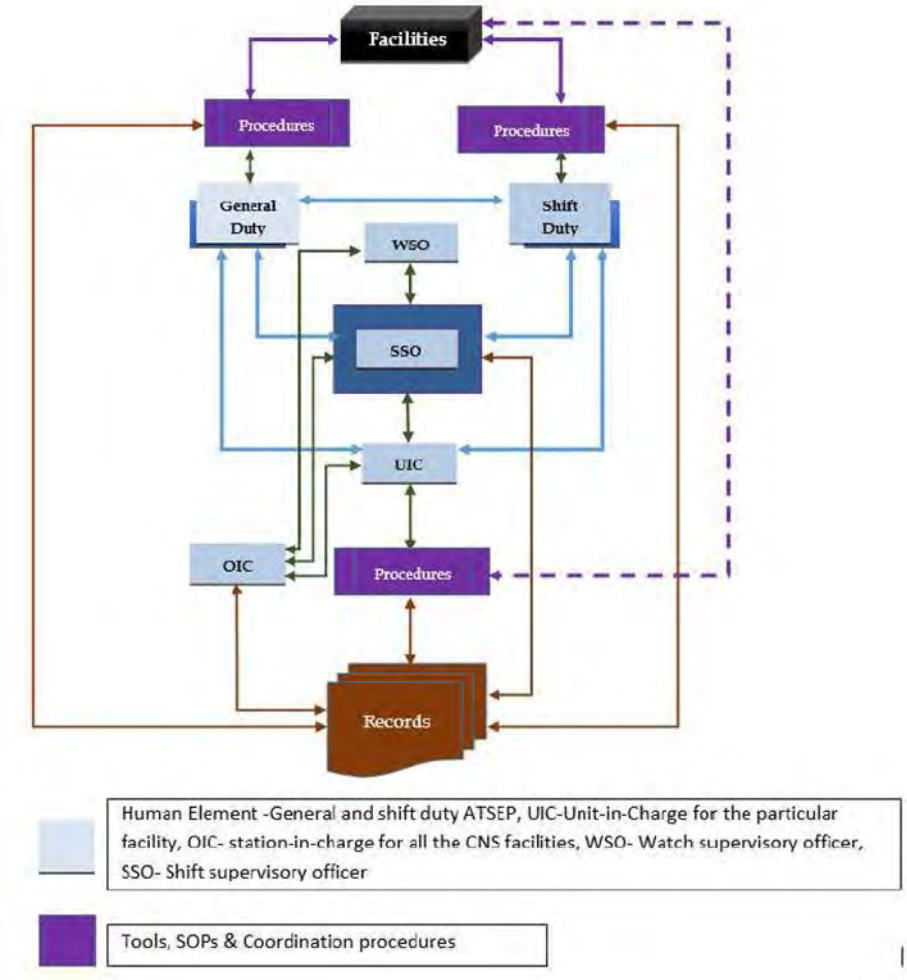

Figure 1: Working environment of ATSEP

The Aviation industry requires 24-hour activities to meet the operational demands. Global growth in the industry will continue to increase these round-the-clock requirements. Air Traffic Service must be available to support 24-hour a day operation to meet these industry demands.

Programs for modernizing the air navigation infrastructure in both CNS and ATM are well underway around the globe. The implementation of new technologies will bring significant benefits to air navigation service providers and their customers. At the same time, a new set of regulations are being established for the implementation and efficient operation of future CNS/ATM systems.

Air Traffic Safety Electronics Personnel (ATSEP) are the authorized personnel who are proven competent to install, operate, maintain, release and return into operations CNS/ATM

equipment. It needs to ensure they have qualified and competent ATSEP in order to install maintain and operate, at optimum performance and resilience, these globally interconnected and complex CNS/ATM systems.

ATSEP are responsible for ensuring the integrity and availability of the information used by both pilots and ATCO. Services performed by ATSEP have been proven throughout the years as critical to ensuring safety and efficiency in the civil aviation.

ATSEP are responsible for the provision of required communication, navigation and surveillance performance, which are critical enablers to ensure Performance-Based Navigation (PBN) in any given airspace as stipulated by ICAO. High availability, accuracy, continuity, and resilience of this services are very important factors in the aviation business. Unreliable CNS services lead to delays and increased pilot and controller workload.

Thus, the availability and continuity of ATM/CNS services impacts efficiency and increases user costs. Similarly, an ATM system failure can have major consequences. Traffic patterns of an entire flight information region can be affected with significant impact on flight schedules, increased fuel burn, and a more complex air traffic control environment.

Civil aviation is based on a worldwide interoperable system involving air and ground infrastructure, procedures, and regulations to ensure safe, efficient and effective operations. These interconnected systems pose cybersecurity challenges in ATM. ATSEP are in the forefront of addressing cybersecurity issues as soon as they arise in them.

ATSEP are responsible for ensuring the integrity and availability of the information used by both pilots and ATCO. Services performed by ATSEP have been proven throughout the years as critical to ensuring safety and efficiency in the civil aviation.

ATSEP must ensure the resilience of the whole system in a standardized manner. New cybersecurity challenges in the area of CNS/ATM (e.g. Remote Towers) ATSEP are in the forefront of addressing cybersecurity issues and threats equally in the networked ATM systems, at remote CNS facilities or for the ‘signal in space’. These professionals need to be trusted, competent and responsible. Identifying a technical failure from a cybersecurity breach is a significant responsibility for ATSEP.

The ATM system is evolving towards a globally integrated and collaborative system. Air traffic safety electronics personnel (ATSEP) involved in the installation, operation and maintenance of the CNS/ATM system must have a shared understanding of what is expected of them in terms of performance wherever they may work in order to support a globally interoperable system and to achieve optimum capacity within acceptable safety limits. This shared understanding becomes critical when considering the increasing traffic and the growing complexity and interconnectedness of the systems involved.

As controller-pilot and system-to-system interfaces evolve, the ATSEP installing, operating and managing the CNS/ATM system need to share a common reference to ensure seamless operations.

1.4.1. Activities.

1.4.1.1. Operational activities.

Supervision, monitoring, control, and reporting in real time of technical services, supported by electronic systems and/or equipment for CNS/ATM.

1.4.1.2. Maintenance activities.

Preventive maintenance, corrective maintenance and/or modification and updates of supporting electronic systems and/or equipment for CNS/ATM.

1.4.1.3. Installation activities.

Project management, specification, conception, validation, integration, test and acceptance, safety assessment, calibration, certification, optimization and upgrade of supporting electronic systems and/or equipment for CNS/ATM, engineering activities.

1.4.2. Unique characteristics of ATSEP working environment.

Operational environments, such as the flight deck or the ATC room, pilot or the controller will see the effects of the error before the aircraft completes its flight. It does not always apply to aircraft maintenance error. In contrast to the "real-time" nature of error in ATC and the flight deck, aircraft maintenance errors are often not identified at the time the error is made.

Whereas in case of ATSEP working environment, the error caused during the operation of the system will be known immediately to ATC as well as to ATSEP as they always work in the live system. At the same time any error caused during the installation, testing and commissioning stages won't be known immediately when the error is made.

ATSEP are expected to attend the degraded system live and always under pressure to make the system available in fullest capabilities. Unless otherwise there is a total breakdown, ATSEP carry their preventive and corrective maintenance works when the systems are working either in full capable mode or in degraded mode of operation. This makes their working environment very unique among the safety chain stake Holders

1.5. Outcomes and Endorsements

The International Federation of Air Traffic Safety Electronics Association (IFATSEA) emphasized the importance to study the human factor issues of ATSEP on their working environment, abilities, limitations and on other characteristics for evaluating their job and safety performance CNS / SG 23 at Bangkok. The meeting considered that establishment of a small working group would be necessary to support such study.

Based on the study, a report on human factors of ATSEP was presented in CNS SG/24 through web conference, and the meeting has forwarded the draft conclusion for adoption in APANPIRG 31. Consequent upon adoption in APANPIRG 31 and ICAO APAC has issued a state letter for the APAC states for encouraging them to consider the study recommendations for the implementation proactively and come forward to join the small work group for preparation of Regional ATSEP human factor guidance material.

The Ad-hoc work group of experts from Eight (8) member states (China, Hong Kong China, India, Indonesia, Japan, Republic of Korea, Singapore, and Thailand) and IFATSEA was established in April 2021 in response to the Conclusion APANPIRG/31/15-Addressing Human Factor Issues of ATSEP recommended by CNS SG/24 meeting for finding the left-out gaps and for preparing the regional ATSEP human factor guidance material.

1.6. Arrangements of this document

The regional ATSEP human factors guidance material has the following parts

(1) Introduction,
(2) Reference Documents,

(3) People Resourcing,
(4) Job, Role And Skills Analysis And Competency Modelling,
(5) Knowledge Management, Talent Management, Learning And Development,
(6) Induction Of New Systems And Maintenance Philosophy,
(7) Work Environment, Well-Being, Performance, And Reward,
(8) Motivation, Commitment, And Engagement,
(9) Behavioural And Role Specific Competencies,
(10) Safety Culture Promotion.

In addition to the above the guidance material has the following appendix

(1) Stress factor mapping (2) Stress factors, (3) Counter measures, (4) ATSEP duty time limitation, (5) Measures during Pandemic, (6) Progressive Training, (7) Stress management and (8) Safety culture.

1.7. Document History and Management

This document was introduced in the CNS SG/26 meeting (5th September 2022 to 9th September 2022 for review and adoption.

1.8. Copies

Paper copies of this document are not distributed. Controlled and endorsed copies can be found at the following website: http://www.icao.int/APAC/Pages/edocs.aspx and may be freely downloaded from the website, or by emailing APANPIRG through the ICAO Asia and Pacific Regional Office who will send a copy by return email.

1.9. Changes to this document

Whenever a user identifies a need for a change to this document, a Request for Change (RFC) Form (see Section 1.11 below) should be completed and submitted to the ICAO Asia and Pacific Regional Office. The Regional Office will collate RFCs for consideration.

When an amendment has been adopted by the meeting of the CNS /SG, then a new version of the regional ATSEP human factors guidance material will be prepared, with the changes marked by an "|" in the margin, and an endnote indicating the relevant RFC, so a reader can see the origin of the change. If the change is in a table cell, the outside edges of the table will be highlighted, e.g.:

Final approval for publication of an amendment to this will be the responsibility of APANPIRG.

1.10. Editing Conventions

(Intentionally blank).

1.11. ATSEP human factors guidance material - Request for Change Form.

Please use this form when requesting a change to any part of this **ATSEP human factors guidance material**. This form may be photocopied as required, emailed, faxed or e-mailed to ICAO Asia and Pacific Regional Office +66 (2) 537-8199 or APAC@icao.int.

Table 2: Request for change form

1. SUBJECT:			
2. REASON FOR CHANGE:			
3. DESCRIPTION OF PROPOSAL: [expand / attach additional pages if necessary]			
4. REFERENCE(S):			
5. PERSON INITIATING:		**DATE:**	
ORGANISATION:			
TEL/FAX/E-MAIL:			
6. CONSULTATION	**RESPONSE DUE BY DATE:**		
Organization	**Name**	**Agree/Disagree**	**Date**
7. ACTION REQUIRED :			
8. DAPs IGD EDITOR		**DATE REC'D :**	
9. FEEDBACK PASSED		**DATE :**	

1.12. Amendment Record.

Amendment Number	Date	Amended by	Comments
0.1			

2. REFERENCE DOCUMENTS

Table 3: List of references

Id	Name of the document	Edition	Date	Origin	Domain
1	CANSO Standard of Excellence in Human Performance Management	-	2019	CANSO	
2	ATM Safety Framework Maturity Survey (Methodology for ANSPs) Document No: ESP-2009-78	Edition 1	31 Aug 2009	Eurocontrol	
3	Swedish Radiation Safety Authority, Report number: 2017:34 ISSN: 2000-0456 Just Culture Manual for ATCO, ANSE & ATSEP behavior after an incident and further proceedings Brochure designed and written by Swiss ATCA	-	2017	Swiss Air Traffic Controllers' Association	
4	Organizational Resilience: A summary of Academic evidence, Business insights and new thinking by BSI and Cranfield	Edition 1	2017	School of Management BSI and Cranfield University	
5	Guidance on Organizational Resilience BSI Standard Limited, Ref no.: BS 65000:2014	-	November 2014	BSI Standard Publication	
6					
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3. PEOPLE RESOURCING

3.1. Introduction

Through people resourcing, human resource management (HRM) objectives are strategically incorporated with organisational performance. Through effective people resourcing, an organisation may attract and retain the right amount of individuals who are qualified, motivated, and engaged in adding value to the organisation and its stakeholders..

3.2. Benefits to ANSP through strategic people resourcing

Optimum human resource requirements are worked out through workforce planning based on the projected changes in the types of activities carried out by the ANSP and the scale of those activities. Examples – New CNS/ATM projects, new airports, new runway, increased operational hours and additional facilities in the existing airport.

Ensures that ANSP achieves competitive advantage by recruiting, retaining, and developing more capable people and retains the talent by providing better opportunities, rewards, and conditions of employment. Even though all the systems are made human centric, the rapid growth and usage of technology impacts the air traffic to grater extent, leads to considerable financial loss, damage to the reputations of ANSP and safety issues during technical snags. Examples – FIR / ACC closures, diversions, delays, and cancellations.

Matching human resources to the ANSP's culture, strategic goals, and operational needs ensures optimal use of those resources. When the recruiting and retention of talent are ensured throughout time, ANSP develops a brand value and draws talent from the market using the retained talents..

3.3. Benefits to ATSEP through strategic people resourcing

Strategic people resourcing results in reduced tension and exhaustion owing to a sustainable workload and adequate breaks. ATSEP are able to share responsibilities more effectively with teammates who are equally competitive and efficient. Positive psychological contract results in greater commitment, trust, and engagement between parties. A healthier workplace environment also results in longer, more enjoyable family time.

3.4. Actions to be taken by ANSP

Strategic resourcing: It is concerned not only with obtaining and keeping the number and quality of staff required but also with selecting and promoting people who ‘fit’ the culture and the strategic requirements of the organization. It also deals with ensuring full utilization of those resources.

Workforce planning: This process identifies anticipated changes to the scope and nature of the organization's activities. It defines the essential skills and behaviours that the company needs in order to accomplish its objectives.

Recruitment and selection - it deals with finding and engaging the right people for the organization needs.

Talent Management - The process of ensuring that an organization has the talented people it requires to achieve its business goals is known as talent management. It entails creating and maintaining a talent pipeline in order to strategically manage the flow of talent through an organization.

3.5. Actions to be taken by ATSEP

Understanding the culture and strategic requirements of the organisation aids ATSEP in increasing engagement and commitment in order to create mutual trust and the psychological contract. They add unique value to the organisation through their talent and skills.

3.6. Most influential Counter measures

The stress and fatigue levels of ATSEP can be reduced and safety goals can be met with regular optimum augmentation of human resources based on existing tasks, expected retirements, and expected additional facilities.

Assessing optimal manpower requirements, recruiting competent people, training, deploying, and promoting accordingly..

3.7. Human factors issues addressed

3.7.1. Directly addressed factors that are adding stress and fatigue due to over workload and lack of human resources

The following factors are addressed directly by the process of people resourcing i.e. by provisioning the optimum human resources all the time.

1	Approval of projects without looking into the resource's requirements like human, vehicles, and other support. Workload increases on coordinating for essential supporting resources and prevents the concentration on core project activities as well as to skip the maintenance activities of ongoing operational facilities.
2	Combined project and operational tasks.
3	Continuous works including weekends during the demanding situations for meeting the special maintenance and project works along with routine operational works.
4	Extra shift duties are forced due to shortage of manpower
5	Forced to carryout major maintenance works only during late night and need to return to duty next day by 0930AM.
6	Frequent changes in the team members or team lead prevents better teamwork and communications.
7	Improper and unbalanced work distribution with undue over burden and undue over leniency.
8	Inhibition of valuable suggestions and ideas due to the overload of works.
9	Innumerable, unspecified, and unpredicted works assigned to selected ATSEP preventing their attention from core maintenance tasks.
10	Irregular duty calls without any pattern due to shortage of manpower
11	Lack of competitive colleagues. People with substandard knowledge and skills are getting selected.
12	Lack of fresh recruitments, but more retirements and induction of new equipment.
13	Lack of job rotation and equal opportunities.

14	Lack of pride as not recognized as expert in particular field and transferred anywhere without considering the competencies acquired.
15	Lack of project management skills and competencies at the same time, simultaneous operation and projects tasks given with unrealistic timelines.
16	Lack of support on career development and career plan.
17	Lack of time to family
18	Leave requests not approved
19	Must report again by 0930AM even after late night breakdown calls and late-night project works.
20	No alternate/standby operational team to share the workload even at emergency.
21	No clear OFFs before shift pattern changes
22	No standardized duty pattern, duration, breaks and rest periods
23	Non deployment of competent persons in right place after equipment training.
24	Permanent combined duties due to shortage of manpower increases workload and reduces the attention in all the combined units.
25	Selection criteria for inducting various levels of ATSEP for ensuring more competent people recruited in the higher levels.
26	Simultaneous project supervision and maintenance activities without additional manpower.
27	Single man shift.
28	Too many additional facilities added into ANSP like RADARS, CNS/ATM automation facilities, Nav-Aids at new airports and new RWYs in the last decade, without augmenting the human and other resources.

3.7.2. Indirectly addressed factors that are adding stress and fatigue due to over workload and lack of human resources.

The following factors are addressed indirectly by the process of people resourcing i.e. by provisioning the optimum human resources all the time.

1	Acceptance of inefficient manpower by management without any mitigation.
2	Additional tasks assigned by regional and or corporate head quarter in addition to local airport works. (QR preparation, tender evaluation, course development, etc..,)
3	Annual plan for ATSEP training and development in line with the operational and competency requirements.
4	Expected competencies in all domains of CNS/ATM systems.
5	Difference in stated corporate Mission/Vision and the ground reality.
6	Lack of equipment training even after years of deployment in the unit.
7	Lack of KS and Competency to manage complex modern equipment.
8	Lack of opportunity for developing and or retaining core competencies due to deployment in non-core areas for a prolonged period before and after equipment training.
9	Lack of opportunity to develop expertise on networking, operating systems, cyber security, project management etc. due to lack of in-house expertise instructors and training infrastructure.
10	No clear demarcation of competencies so spending more time on KSC update on all areas without even having the access to the equipment and facilities. (Too many make and models)

11	No clear demarcation of technical and managerial responsibilities among the junior ATSEP and senior ATSEP.
12	Sleep loss due to irregular shift pattern or fast rotating shift pattern
13	Too many unclassified additional works in smaller airports. Essential maintenance tasks skipped.
14	Uncertainty on future roles and responsibilities.

3.7.3. Additional factors addressed, that are aggravating stress and fatigue when the workload is more, and human resources are less.

The following additional factors that are addressed, which are aggravating stress and fatigue when the workload is more, and the human resources are less.

1	Different make and model for each facility / system.
2	Deployment in non-core activities for longer duration.
3	Compulsory movements within the nation during service life
4	Less human resources for core jobs but deployment in non-core areas like terminal management, security systems, airport systems, administration works, commercial, and general stores.
5	Manhours spent in Cargo, Customs clearance, without proper expertise or supporting staff instead of spending time on critical maintenance works and project works.
6	Multiple jobs of diversified nature in quick successions without notice or planning.
7	Often project deadlines are set without freezing the scopes and augmenting with necessary resources.
8	Where there is electronics, there shall be an ATSEP – Belief of airport in-charges.

3.8. Self-evaluation checklist

3.8.1. Self-evaluation check list for ANSP.

Human performance management processes maturity level
Self-Evaluation Check list for ANSP – PEOPLE RESOURCING

##	Process	Maturity level	Description of the maturity level	Tick
1)	Strategic people resourcing for **directly addressing** the factors that are adding stress and fatigue to ATSEP due to over workload and due to lack of human resources	**Level A**	Human performance management processes and/or requirements have not been agreed at the organization level – they are either not routinely undertaken or depend on the individual assigned the task	
		Level B	Human performance management processes and/or requirements are defined but not yet fully implemented, documented, or consistently applied.	
		Level C	Human performance management processes and/or requirements meet the required regulatory standards and comply with relevant ICAO Annexes. Human performance management processes and/or requirements are formally documented and consistently applied	
		Level D	Evidence is available to provide confidence that human performance management processes and/or requirements are being applied appropriately and are delivering positive, measured results.	

		Level E	Human performance management processes and/or requirements set international best practice, focusing on innovation and improvement. The effectiveness of the human performance management improvement actions is measured and evaluated against defined improvement criteria	
2)	Strategic people resourcing for **indirectly addressing** the factors that are adding stress and fatigue to ATSEP due to over workload and due to lack of human resources	Level A		
		Level B		
		Level C		
		Level D		
		Level E		
3)	Strategic people resourcing for addressing the factors that are **aggravating** stress and fatigue when the workload is more, and human resources are less	Level A		
		Level B		
		Level C		
		Level D		
		Level E		
4)	**Resilience Level** w.r.t score of (1)	A & B – Preventative Control, C- Mindful action, D-Performance optimization, E – Adaptive innovation		
5)	**If maturity level is D** w.r.t score of (1)			
	Do you have workforce planning based on projected changes?			Y/N
	Did you recruit people as per the workforce planning?			Y/N
	Did you provide better opportunities and better working conditions to your people?			Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and take necessary measures to reach the next level.			
6)	**If maturity level is E** w.r.t score of (1)			
	Did you revise the workforce planning in the last two years?			Y/N
	Did you revise the recruitment process to suit the business strategy?			Y/N
	Are you able to get more competitive people successively from the market?			Y/N
	Have you set the key performing indicators for measuring the above?			Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and evaluate			
If your final level of maturity is D or E, please ascertain with the self-evaluation of ATSEP				

3.8.2. Self-evaluation check list for ATSEP.

Human performance management processes maturity level Self-Evaluation Check list for ATSEP – PEOPLE RESOURCING					
##		**Process**	**Maturity level**	**Description of the maturity level**	**Tick**
1)	A	I have understood the strategic requirements of my ANSP?			Y/N
	B	I have psychological contract with ANSP, that has built the mutual trust, increased commitment, and engagement.			Y/N
	C	I have improvised my unique talent and skills and adding values to my ANSP			Y/N
2)	*If your choice for one or more questions is "N", please state the specific reasons*				
	1) A				

	1) B		
	1) C		

3.9. Resilience and cost benefits

These actions incur negligible additional costs because only process improvement is required in the already established human resource management system.

In contrast, the organisation will save money in the long run for the following reasons: (1) optimum human resources are made available only in accordance with their business strategy, and they are fully utilised on the core areas. (2) Ensures competitive advantage by developing and retaining business-critical talent. (3) With increased employee commitment, the organisation transforms into a high-performing one.

In terms of organizational resilience, ANSP can reach the level of adaptive innovation.

4. JOB, ROLE AND SKILLS ANALYSIS AND COMPETENCY MODELLING

4.1. Introduction

The analysis of job, role, skill and competency modelling provides the information needed to create job descriptions, roles and learning requirements. They are critical in organisational and job design, recruitment and selection, performance management, learning and development, management development, career management, job evaluation, and the design of grade and pay structures.

4.2. Benefits to ANSP through Job, role and skills analysis and competency modelling

A strong performance management system with clearly defined key result areas, accountability, and expected outcomes help in effectively grooming the key workforce with clearly defined learning specifications and personal specifications, which in turn results in lower costs as only necessary training investments are made.

Individuals and teams perform better because both behavioural and functional competencies are well defined. Job design, recruitment and selection, performance management, learning and development, management development, career management, job evaluation, and grade and pay structure design are all done in accordance with the organization's business strategy.

4.3. Benefits to ATSEP through Job, role and skills analysis and competency modelling

Reduced stress due to unambiguous job profile, clear communication on accountabilities and expected outcome.

Defined key result areas facilitate the motivation towards knowledge and skills update to achieve an acceptable level of performance. Defined behavioural competencies expectations facilitate the motivation in improving the behavioural competencies.

4.4. Actions to be taken by ANSP

Job descriptions based on job analysis - Job analysis gives the information on what the job holder is expected to contribute, to whom the job holder reports and who reports to the job holder, the nature and scope of the job in terms of the tasks and operations to be performed and the duties to be carried out. The job description includes the job title, the function in which the job is performed, and the job level within that function. Based on the job analysis, the job description also includes the main activities, tasks, or duties. Job descriptions are very specific, giving a clear indication of what must be done, what is done, and the purpose of the activity in terms of outcomes, outputs, or standards to be met.

Role analysis and role profile - identifying inputs – KSAs (knowledge, skill, and attitude), competency requirements (behavioural and functional) and required outcomes (key result areas or accountabilities). A role profile is initially set out under the same headings as a job description, i.e., role title, responsible to, responsible to role holder, and the purpose of the role, but it then focuses on the following aspects of the role: key result areas; knowledge, skills and abilities required; behavioural competencies.

Competency modelling based on skill analysis and job analysis - Skills analysis determines the skills required to achieve an acceptable standard of performance. It is primarily used for technical, craft, manual, and office jobs as the foundation for developing learning and training programmes. Skills analysis begins with a broad job analysis and then delves into the specifics of not only what job holders must do, but also the abilities and skills required to do so. Individual-level competencies that are core or common for an occupational group, entire level of jobs (e.g., executive, management, supervisory, hourly), or the organisation are typically described by competency modelling approaches. Competency modelling is the basis for defining behavioural and technical competencies. Behavioural competencies are the behaviours that organisations expect their employees to exhibit in the course of their work.

4.5. Actions to be taken by ATSEP

Understanding the key result areas, and accountabilities for their roles. Understanding the knowledge, skill, and competency requirements for their roles. Developing the knowledge and skills needed to achieve an acceptable level of performance.

4.6. Most influential Counter measures

By defining the roles and responsibilities clearly along with accountabilities, individual job performance of ATSEP will increase and in-turn over all safety performance of ANSP will also increase.

Improving the safety job performance of ATSEP by restricting their deployment within the scope defined in DOC 10057.

By limiting their stream of competency among CNS/ATM facilities, higher levels of expertise and competencies can be developed and retained.

4.7. Human factors issues addressed

4.7.1. Directly addressed factors that are adding stress and fatigue due to job, role and skills analysis and competency modelling.

1	Acceptance of inefficient manpower by management without any mitigation.
2	Annual plan for ATSEP training and development in line with the operational and competency requirements.
3	ATSEP desire for recognition on all the facilities (CNS/ATM Automation) and on different makes and models.
4	Combined project and operational tasks.
5	Deployment in non-core activities for longer duration.
6	Diversified tasks during duty.
7	Expected competencies in all domains of CNS/ATM systems.
8	Forced to do tasks even without qualification (attending power lines of UPS and working at heights etc..,)
9	Gender bias and equal field works not assigned to women ATSEP.
10	Improper and unbalanced work distribution with undue over burden and undue over leniency.
11	Innumerable, unspecified, and unpredicted works assigned to selected ATSEP preventing their attention from core maintenance tasks.

12	Lack of delegation or poor overlapping delegation and preferences towards frontline tasks not on managerial or leadership tasks.
13	Lack of leadership in communicating the priorities to sub-ordinates.
14	Lack of mutual performance assessment as per the roles and responsibilities assigned.
15	Lack of opportunity for developing and or retaining core competencies due to deployment in non-core areas for a prolonged period before and after equipment training.
16	Lack of opportunity to develop expertise on networking, operating systems, cyber security, project management etc. due to lack of in-house expertise instructors and training infrastructure.
17	Lack of pride as not recognized as expert in particular field and transferred anywhere without considering the competencies acquired.
18	Lack of regulatory requirements for complying standardized trainings and licencing to ATSEP
19	Lack of scientific annual performance assessment and rewarding scheme considering the unique working environment and expected level of performance of ATSEP.
20	Lack of teamwork, more dependency on individuals and collective inputs not taken by team lead for decision.
21	Less human resources for core jobs but deployment in non-core areas like terminal management, security systems, airport systems, administration works, commercial, and general stores.
22	Manhours spent in Cargo, Customs clearance, without proper expertise or supporting staff instead of spending time on critical maintenance works and project works.
23	Multiple jobs of diversified nature in quick successions without notice or planning.
24	No clear demarcation of competencies so spending more time on KSC update on all areas without even having the access to the equipment and facilities. (Too many make and models)
25	No clear demarcation of technical and managerial responsibilities among the junior ATSEP and senior ATSEP.
26	No clear job description, roles and responsibilities are varying after each movement, deployed at non-core areas.
27	Non deployment of competent persons in right place after equipment training.
28	Poor workload distribution makes few carries stress, pressure, fatigue, and timeline pressure throughout without any relief.
29	Uncertainty on future roles and responsibilities.
30	Where there is electronics, there shall be an ATSEP – Belief of airport in-charges.

4.7.2. Indirectly addressed factors that are adding stress and fatigue due to job, role and skills analysis and competency modelling.

1	Always under pressure to give back the facilities within the EST of NOTAM
2	Compromising qualities, essential OEM documentations, training and after acquisition supports on new systems against the cost (L1).
3	Compulsory movements within the nation during service life
4	Constant mind switchover between old and modern technologies, procedures, tools etc.., within the same service facilities. Different aged, make and model of equipment within a single service facility like VHF, Nav-Aids, and surveillance.
5	Delayed annual and other planned preventive and corrective maintenance due to non-availability of time for maintenance actions.

6	Delayed flight calibration due to poor preparation and planning.
7	Difference in stated corporate Mission/Vision and the ground reality.
8	Different make and model for each facility / system.
9	Expectations on making quick decision, in less reactive time with zero error tolerance and on fixing the system immediately.
10	Extraordinary file work delays in getting approvals for proceeding to next stages.
11	Lack of equipment training even after years of deployment in the unit.
12	Lack of fresh recruitments, but more retirements and induction of new equipment.
13	Lack of job rotation.
14	Lack of knowledge and expert support while trying to fix an unfamiliar technical glitch.
15	Lack of knowledge in handling emergencies and disastrous situations.
16	Lack of KS and Competency to manage complex modern equipment.
17	Lack of support on career development and career plan.
18	Little or no-hands on training
19	Managing the procurement tasks and maintenance tasks of multiple airports in addition to the local.
20	Single man shift.

4.8. Self-evaluation checklist

4.8.1. Self-evaluation check list for ANSP.

Human performance management processes maturity level
Self-Evaluation Check list for ANSP – JOB, ROLE AND SKILLS ANALYSIS AND COMPETENCY MODELLING

##	Process	Maturity level	Description of the maturity level	Tick
1)	Job, role and skills analysis and competency modelling for **directly addressing** the factors that are adding stress and fatigue to ATSEP due to ambiguities on accountabilities and responsibilities.	**Level A**	Human performance management processes and/or requirements have not been agreed at the organization level – they are either not routinely undertaken or depend on the individual assigned the task	
		Level B	Human performance management processes and/or requirements are defined but not yet fully implemented, documented, or consistently applied.	
		Level C	Human performance management processes and/or requirements meet the required regulatory standards and comply with relevant ICAO Annexes. Human performance management processes and/or requirements are formally documented and consistently applied	
		Level D	Evidence is available to provide confidence that human performance management processes and/or requirements are being applied appropriately and are delivering positive, measured results.	
		Level E	Human performance management processes and/or requirements set international best practice, focusing on innovation and improvement. The effectiveness of the human performance management improvement actions is measured and evaluated against defined improvement criteria	
2)		Level A		

	Job, role and skills analysis and competency modelling for **indirectly addressing** the factors that are adding stress and fatigue to ATSEP due to ambiguities on accountabilities and responsibilities.	Level B	
		Level C	
		Level D	
		Level E	
3)	**Resilience Level** w.r.t score of (1)	A & B – Preventative Control, C- Mindful action, D-Performance optimization, E – Adaptive innovation	
4)	**If maturity level is D** w.r.t score of (1)		
	Do you have clear job description?		Y/N
	Did you have clear role profile?		Y/N
	Do you have competency modelling of both behavioural and functional competencies?		Y/N
	Do you have annual training plan prepared based on the role profiles of ATSEP?		Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and take necessary measures to reach the next level.		
5)	**If maturity level is E** w.r.t score of (1)		
	Have you done the job evaluation of your ATSEP job role profiles in the last two years?		Y/N
	Have you recruited new ATSEP based on the outcome of this process?		Y/N
	Is ATSEP performance management system designed as per the outcome of this process?		Y/N
	Have you set the key performing indicators for measuring the above?		Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and evaluate		
If your final level of maturity is D or E, please ascertain with the self-evaluation of ATSEP			

4.8.2. Self-evaluation check list for ATSEP.

Human performance management processes maturity level
Self-Evaluation Check list for ATSEP – JOB, ROLE AND SKILLS ANALYSIS AND COMPETENCY MODELLING

##		Process	Maturity level	Description of the maturity level	Tick
1)	A	I have understood the key result areas and accountabilities of my role			Y/N
	B	I have understood the knowledge, skill, and competency requirements for my role			Y/N
	C	I have developed the knowledge and skills needed to achieve an acceptable level of performance			Y/N
2)	*If your choice for one or more questions is "N", please state the specific reasons*				
	1) A				
	1) B				
	1) C				

4.9. Resilience and cost benefits

These actions incur negligible additional costs because only process improvement is required in the already established human resource management system.

However, the organisation will save money on training investments and developing key personnel in accordance with learning specifications and personal specifications. Evaluations of the outcome in key areas for which recruitment was done are made using efficient performance management systems. Organizations transform into high-performing organisations by developing the key workforce's behavioural and functional competencies.

5. KNOWLEDGE MANAGEMENT, TALENT MANAGEMENT, LEARNING AND DEVELOPMENT

5.1. Introduction

Knowledge management - Knowledge management is concerned with storing and sharing the wisdom, understanding and expertise accumulated in an enterprise about its processes, techniques, and operations. It treats knowledge as a key resource. Knowledge management is about getting knowledge from those who have it to those who need it to improve organizational effectiveness. Knowledge management identifies relevant information and then disseminates it so that learning can take place. It promotes the sharing of knowledge by linking people with people and by linking them to information so that they learn from recorded experiences.

Talent management - Talent management contains strategies and protocols for the systematic attraction, identification, development, retention, and deployment of individuals with high potential who are of value to an organization. Talent management is the process of ensuring that an organization has the talented people it requires to achieve its business objectives.

Leaning and Development - Learning and development strategies and practices, aim to ensure that people in the organization acquire and develop the knowledge, skills, and competencies they need to carry out their work effectively and advance their careers to their own benefit and that of the organization. Individuals are given the opportunity to learn, frequently on their own, with guidance and support.

5.2. Benefits to ANSP through KM, TM, L&D

Cost benefits due to early completion of the task, even problematic tasks are solved early. Efficient utilization of man-hours and environment for innovation and organizational learning. Managed intellectual capitals in the organization. Increased organization performance due to established shared understanding.

Cost benefits on hiring and developing. Provides means for developing the organization from within by using job experience, coaching, and mentoring to cultivate the potential in managers. Ensures the availability of talents it needs to attain its business goals. Provides the organization a long-term recruiting strategy and valuable human capital. Strategically implemented talent management ensures systematic attraction of talent, identification, development, retention, and deployment of individuals with high potential who are of value to an organization.

Organization can deliver the business objective cost effectively due to the availability of human resource having the required competencies. Overall improved performance due to the mechanism that ensures the improvement of individuals as well as teams. Effective utilization of resources in learning and development through self-managed learnings.

5.3. Benefits to ATSEP through KM, TM, L&D

Reduced stress and frustration due to readily available knowledge and expertise. Reduced stress and increased self-efficacy, optimism, hope and resiliency.

Reduces stress caused by a lack of knowledge, skills, and competencies by ensuring continuous improvement in skills and competencies through various trainings to different levels of executives.

It reduces the ambiguity among ATSEP on their career and motivates them to progress in developing the competencies and qualities that are required for the career progression. Talented people remain engaged and be committed members of the organization as they are aware of the opportunities for career development and growth.

Feeling of accomplishment for educated graduate recruits who are given education and training for core technical or professional roles.

Gaps in the knowledge, skills and competencies is addressed through systematic workplace learning and planned experience. Reduced stress due to lack of knowledge, skills and competencies, through various means of L & D, the gaps can be filled through self-directed learning. Motivated to improve their leadership and management skills toward the career progression. Motivated to assume higher responsibilities as they are developed with appropriate workplace learning and planned experience

5.4. Actions to be taken by ANSP

Establishing ANSP level knowledge management system.

Talent planning - the process of determining how many and what types of talented individuals are required now and in the future. It employs workforce planning techniques.

Talent resourcing plans - the outcomes of talent planning are programmes for obtaining people from within and outside the organization (internal and external resourcing). Internally they involve the identification of talent, and their development and career management. Externally, they refer to the implementation of policies aimed at attracting high-quality workers.

Talent development - learning and development policies and programmes are key components of talent management. They aim to ensure that people acquire and enhance the skills and competencies they need. Policies should be formulated by reference to 'employee success profiles', which are described in terms of competencies and define the qualities that need to be developed.

The talent pipeline – the processes of resourcing, talent development and career planning that maintain the flow of talent needed to create the talent pool required by the organization.

Integrate learning and development plans and programs with the business strategy and human resource strategy. Designing the learning and development programs as performance related, to achieve specified improvements in corporate, functional, team and individual performance and make a major contribution to bottom-line results. Framework for individual learning through self-managed learning and are supported by coaching, mentoring and formal training. Ensuring the blend of learning through workplace learning and planned experience so that required knowledge, skills and competencies are addressed without gaps.

5.5. Actions to be taken by ATSEP

Making use of the opportunities given for learning and developing the skills and competencies. Investing time on knowledge update in the required areas. Discussing with the senior colleagues and clarifying the doubts.

Organizing the unique knowledge gathered. Sharing the unique knowledge to others. Contributing for the knowledge management.

Self-directed learning to improve performance in their present job or to develop their potential and satisfy their career aspirations. Develop leadership skills as well as management skills to progress in the career. Prepare to assume higher responsibilities through workplace learning and planned experience.

5.6. Most influential Counter measures

By providing only optimum number of verified and validated SOPs without redundancy, the stress of restoring facilities in brief time, will reduce significantly.

ANSP level scientific knowledge management on operations, maintenance, projects, and emergencies will reduce the stress significantly as ATSEP are continuously learning the latest problems and solutions and be ready with the proven techniques.

5.7. Human factors issues addressed

5.7.1. Directly addressed factors that are adding stress and fatigue due to improper tools, procedures and shared knowledge and practices.

1	Different make and model for each facility / system.
2	Frequent failures of OFC and leased lines connectivity. Non availability of near perfect cable or line diagrams for optical fibre cable and power lines in the operational area.
3	Impact of changes not communicated, and individuals are reluctant to adopt.
4	Improper Complaint reporting mechanism by user, which do not convey the key information required for the early rectification of the equipment.
5	Improper training (Training, assessing and evaluation) for the required competencies. There is a gap in the training provided and the practical work environment.
6	In compatible interfaces and data formats among different makes and models for integration and extending the data and voice to other ACC or APP airports.
7	Inaccurate procedures, lack of tested and validated SOPs leads to corrective maintenance delays.
8	Lack of brainstorming on handling unfamiliar situation and regular interactions for knowledge sharing.
9	Lack of document control and missing acknowledgement on new update on regulations and operational procedures.
10	Lack of effective annual spare and capital procurement plan and related budget provisions.
11	Lack of effective coordination procedures for men material movements inside the operational areas of private operator owned airports.
12	Lack of external training, workshops, and seminars to keeping up-to-date knowledge on modern technology and systems well before the systems getting inducted.
13	Lack of knowledge and expert support while trying to fix an unfamiliar technical glitch.
14	Lack of knowledge in handling emergencies and disastrous situations.
15	Lack of knowledge on critical maintenance aspects of the equipment outsourced.
16	Lack of knowledge sharing on latest developments in local airport level and in ANSP level to frontline ATSEP.
17	Lack of KS and Competency to manage complex modern equipment.

18	Lack of operational training to develop competency on the old generation equipment even after service life expansion program in place.
19	Lack of opportunity to develop expertise on networking, operating systems, cyber security, project management etc. due to lack of in-house expertise instructors and training infrastructure.
20	Lack of self-learning tools
21	Lack of teamwork, more dependency on individuals and collective inputs not taken by team lead for decision.
22	Lack of training and documentation increases workload and time.
23	Lack of update in the maintenance procedures, operating procedures, and maintenance philosophies in line with the technologies.
24	Mismatching in course development that does not make the ATSEP competent enough to address the practical field issues.
25	No clear demarcation of competencies so spending more time on KSC update on all areas without even having the access to the equipment and facilities. (Too many make and models)
26	Poor OEM documentation on system, diagnostic procedures, site adaptable parameters and on HMI.
27	Procedural delays and extended file works on spare procurements.
28	Requirement of diversified expertise (Cyber security, Information technology, interface devices, data convertors, communication lines and links) other than core equipment for maintaining the service level.
29	Short of ideas; being alone.
30	Sudden failures of the systems due to natural calamities and power supply issues.
31	Unable to resolve external interference problems and other typical problems not covered in the training.

5.7.2. Indirectly addressed factors that are adding stress and fatigue due to improper tools, procedures and shared knowledge and practices.

1	Additional tasks assigned by regional and or corporate head quarter in addition to local airport works. (QR preparation, tender evaluation, course development, etc..,)
2	Always under pressure to give back the facilities within the EST of NOTAM
3	Project management.
4	Contract management.
5	Fear on consequences of failure while trouble shooting in live system.
6	Inadequate first-hand information given by user.
7	Constant mind switchover between old and modern technologies, procedures, tools etc.., within the same service facilities. Different aged, make and model of equipment within a single service facility like VHF, Nav-Aids, and surveillance.
8	Expectations on making quick decision, in less reactive time with zero error tolerance and on fixing the system immediately.
9	Extraordinary file work delays in getting approvals for proceeding to next stages.
10	Forced to do tasks even without qualification (attending power lines of UPS and working at heights etc..,)
11	Frequent failures and outages of out-lived equipment and facilities.
12	Lack of guidelines and provisions of PPE to ATSEP for protecting them while working at highly polluted with noise and dust, heights, closer to high power radiating radars, X-rays, etc..,

13	Lack of opportunity for developing and or retaining core competencies due to deployment in non-core areas for a prolonged period before and after equipment training.
14	Lack of project management skills and competencies at the same time, simultaneous operation and projects tasks given with unrealistic timelines.
15	Lack of protection and guidelines while attending equipment during heavy lightning and abnormal weather conditions.
16	Little or no-hands on training
17	Manhours spent in Cargo, Customs clearance, without proper expertise or supporting staff instead of spending time on critical maintenance works and project works.
18	Repairing critical modules of the facilities that are under NOTAM
19	Sense of expectation on out-lived equipment failures even while conducting preventive maintenance.
20	Trouble shooting in busy working environment on live interconnected systems.
21	Unrealistic timelines due to poor planning and coordination with ATCOs before making maintenance activities.
22	User requirements defined not met with the supplied system.

5.8. Self-evaluation checklist

5.8.1. Self-evaluation check list for ANSP.

Human performance management processes maturity level
Self-Evaluation Check list for ANSP – KNOWLEDGE MANAGEMENT, TALENT MANAGEMENT, LEARNING AND DEVELOPMENT

##	Process	Maturity level	Description of the maturity level	Tick
1)	Knowledge management, talent management, learning and development for **directly addressing** the factors that are adding stress and fatigue to ATSEP due to improper tools, procedures and shared knowledge and practices.	**Level A**	Human performance management processes and/or requirements have not been agreed at the organization level – they are either not routinely undertaken or depend on the individual assigned the task	
		Level B	Human performance management processes and/or requirements are defined but not yet fully implemented, documented, or consistently applied.	
		Level C	Human performance management processes and/or requirements meet the required regulatory standards and comply with relevant ICAO Annexes. Human performance management processes and/or requirements are formally documented and consistently applied	
		Level D	Evidence is available to provide confidence that human performance management processes and/or requirements are being applied appropriately and are delivering positive, measured results.	
		Level E	Human performance management processes and/or requirements set international best practice, focusing on innovation and improvement. The effectiveness of the human performance management improvement actions is measured and evaluated against defined improvement criteria	
2)	Knowledge management, talent management, learning and	Level A		
		Level B		
		Level C		

	development for **indirectly addressing** the factors that are adding stress and fatigue to ATSEP due to improper tools, procedures and shared knowledge and practices.	Level D	
		Level E	
3)	**Resilience Level** w.r.t score of (1)	A & B – Preventative Control, C- Mindful action, D-Performance optimization, E – Adaptive innovation	
4)	**If maturity level is D** w.r.t score of (1)		
	Have you established organizational knowledge management?		Y/N
	Have you managed talent management to match with the strategic people resourcing?		Y/N
	Have you established learning and development system for individuals as well as teams?		Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and take necessary measures to reach the next level.		
5)	**If maturity level is E** w.r.t score of (1)		
	Did you bring new knowledges in the knowledge management in the last year?		Y/N
	Did you bring any changes in the talent planning to suit the business strategy in last two years?		Y/N
	Did you evaluate the effectiveness of the learning and development process in last year?		Y/N
	Have you set the key performing indicators for measuring the above?		Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and evaluate		
	If your final level of maturity is D or E, please ascertain with the self-evaluation of ATSEP		

5.8.2. Self-evaluation check list for ATSEP.

Human performance management processes maturity level
Self-Evaluation Check list for ATSEP – KNOWLEDGE MANAGEMENT, TALENT MANAGEMENT, LEARNING AND DEVELOPMENT

##		Process	Maturity level	Description of the maturity level	Tick
1)	A	I have understood the opportunities for my career development and growth.			Y/N
	B	I know the provisions for developing myself to core technical or professional roles			Y/N
	C	I have developed the leadership and management skills toward the career progression			Y/N
2)	*If your choice for one or more questions is "N", please state the specific reasons*				
	1) A				
	1) B				
	1) C				

5.9. Resilience and cost benefits

These actions have a negligible financial impact on the ANSP, which has well-established information technology and training infrastructure. Initial man-hours spent designing systems with available infrastructure will yield very good long-term results. These efforts will reduce the costs of corrective maintenance and lost opportunities during breakdowns. It also reduces the time required for all tasks, saving money in terms of man-hours. Long-term strategies and valuable human capital benefit ANSP.

5.10. Other counter measures to be considered

By ensuring necessary OEM documentation and support on spare that suits the maintenance philosophies of the ANSP, overall effectiveness of corrective maintenance will improve.

Provisioning online based self-learning tools.

Conducting seminar on best practices adopted at different airports within ANSP.

5.11. Relevant Appendix

Please refer Appendix 6 – Progressive Training, for understanding the available ICAO framework, roadblocks in adoption and how to address those roadblocks.

6. INDUCTION OF NEW SYSTEMS AND MAINTENANCE PHILOSOPHY

6.1. Introduction

Strategic maintenance increases profits of ANSP by increasing the availability of all the CNS/ATM facilities in fullest functional capabilities for which they are designed. Maintenance strategies with adaptive innovation also contributes to overall reduction of costs through optimum usage of men, materials, contracts, and energy.

6.2. Benefits to ANSP

Ensures trust relations with all the stakeholders, especially outside ANSP. Effective preventive maintenance reduces the costs due to reactive maintenance even reducing their occurrences. Strategic maintenance reduces costs due to optimum spares on inventory. ANSP has data for financial optimization decisions like whether to repair in-house or repair or replace. ANSP has the significant capability of increasing the service life of the equipment which directly adds to the cost benefits of ANSP. ANSP will be able to establish the system for predictive maintenance to prevent reactive maintenance.

6.3. Benefits to ATSEP

Feel recognized as key role player in the organization and motivated to develop knowledge, skills, and competencies to meet the performance requirements. Reduced stress due to availability of documentation from original equipment manufacturers for additional references and improvisation. Get better coordination results from the stakeholders on carrying planned maintenance.

6.4. Actions to be taken by ANSP

The maintenance strategy shall drive the ANSP for an integrated best practice that includes preventive maintenance, inventory and procurement, workflow and controls, computerized maintenance management system usage, stakeholders' involvement, predictive maintenance, reliability centred maintenance and total productive maintenance.

The preventive maintenance (PM) program is the key to any attempt to improve the maintenance process. This program reduces the amount of reactive maintenance to a level that allows the other practices in the maintenance process to be effective. Effective preventive maintenance reduces the costs due to reactive maintenances even reduceing their occurrences.

Proactive measures before the induction of new systems to ensure the resources and competencies are made available before the installation of new systems. Involving the filed level experts in the major system procurements from the preparations of the specifications preparations till commissioning including factory acceptance, site acceptance, and OEM document verifications.

Ensuring the OEM documentation on recommended maintenance procedures and detailed technical and operation manuals in line with the maintenance philosophies of the ANSP. Before the ANSP progress to next level of process improvisation, the initial preventive maintenance begins only with the OEM documentation. Any gap in this will severely impact the fundamental resilience of the ANSP that is preventative control. Most important resilience level is to keep

all the stakeholders outside the ANSP trust. Also, ANSP will fail to meet the regulatory requirements.

Ensuring required tools, knowledge, skills, and competencies are available with the field level ATSEP for carrying out the maintenance effectively.

All the maintenance activities should be documented for traceability from initiation to completion. This documentation helps in the effective planning and scheduling of future proactive maintenance schedules. Computerization of these data flow will help the ANSP for processing and analysing for process improvisation. Computerized data analysis that includes downtime, maintenance cost, duration of the degraded mode of operations, etc., will guide to financial optimization to decide whether to repair or replace the system. This will also give ANSP the key data for the service life expansion program.

Established stakeholders' agreement on owning the maintenance activities as a common task and all planned activities are carried out in time to save cost on reactive maintenance tasks. The entire stakeholders should be aware of the system capability, performance, and the importance of maintenance activities.

Carrying the flight calibration as required in time to ensure the safety certification as well as to prevent the increased man-hours on additional ground checks.

Innovated means of observations and data logging through technologies for automated investigation of equipment without disturbing the operation, reduces man-hours spent on traveling to remote sites, carrying out routine activities, and gives data for predictive maintenance.

Continuous improvement on maintenance philosophies, as well as training and development of the ATSEP in accordance with the reviewed maintenance philosophies, must be done on a regular basis to ensure safety and cost savings. Internal or external benchmarking with key performance indicators will propel the organisation to higher levels of maturity.

6.5. Actions to be taken by ATSEP

Planning and undertaking scheduled maintenance tasks. Responding to breakdowns, diagnosing faults, repairing, and restoring the facilities. Maintain all the records of maintenance including the cost involved. Initiate root cause analysis on repeated faults to understand the primary and secondary failures. Planning for the annual spare and other maintenance material required, provision the budget needed, and stock the optimum spares. Propose new and improvised maintenance procedures for approval. Ensuring the health and safety regulatory requirements. Adhering to standard operating procedures and all coordination procedures.

6.6. Most influential Counter measures

Reviewing maintenance philosophies, utilizing technologies, and bringing innovation to supervise CNS/ATM systems for reducing paper works, physical visits and saving manhours.

Pro-active procurement and replacement policies in managing the out-lived equipment will reduce the stress among the key stake holders of ANSP due to their safety commitment.

6.7. Human factors issues addressed

6.7.1. Directly addressed.

1	Being helpless in rectifying the unit after knowing inherent flaws in the design of the equipment and its unreliability
2	Compromising qualities, essential OEM documentations, training and after acquisition supports on new systems against the cost (L1).
3	Continuous changes in the scope and requirements on complex projects from the user point of view, without proper consideration from the maintenance point of view.
4	Delayed annual and other planned preventive and corrective maintenance due to non-availability of time for maintenance actions.
5	Delayed flight calibration due to poor preparation and planning.
6	Faulty equipment design and or faulty alert mechanism. Mis-leading front panel indications and irrelevant documentations. Unknown bug and or hidden deficiencies cropping up after the warranty and service agreement.
7	Frequent failures and outages of out-lived equipment and facilities.
8	Improper Complaint reporting mechanism by user, which do not convey the key information required for the early rectification of the equipment.
9	Lack of effective annual spare and capital procurement plan and related budget provisions.
10	Lack of readily available spare parts and poor supply chain management makes the recovery delays after emergencies and disasters.
11	Lack of update in the maintenance procedures, operating procedures, and maintenance philosophies in line with the technologies.
12	Non availability of calibrated working test equipment as required for the preventive as well as for the corrective maintenance.
13	Non availability of vehicle to reach the remote site.
14	Non-utilization of technologies and machines for the installation and maintenance works and planning.
15	Often project deadlines are set without freezing the scopes and augmenting with necessary resources.
16	Planning (for replacement of obsolete system) and procurement.
17	Poor OEM documentation on system, diagnostic procedures, site adaptable parameters and on HMI.
18	There is a long wait and no provision of comfortable and appropriate mode of commute to approach remote sites even though during scorching summer days.
19	Too much of file works for a low-cost but immediate and essential spare procurement.
20	User requirements defined not met with the supplied system.
21	Too many additional facilities added into ANSP like RADARS, CNS/ATM automation facilities, Nav-Aids at new airports and new RWYs in the last decade, without augmenting the human and other resources.

6.7.2. Indirectly addressed.

1	Approval of projects without looking into the resource's requirements like human, vehicles, and other support. Workload increases on coordinating for essential supporting resources and prevents the concentration on core project activities as well as to skip the maintenance activities of ongoing operational facilities.

2	Constant mind switchover between old and modern technologies, procedures, tools etc.., within the same service facilities. Different aged, make and model of equipment within a single service facility like VHF, Nav-Aids, and surveillance.
3	Frequent (change of) exposure to too low temperature in the server or equipment room and too high outside temperature.
4	Frequent exposure of high outside remote site temperature and less inside equipment room temperature in a shift.
5	Frequent failures of OFC and leased lines connectivity. Non availability of near perfect cable or line diagrams for OFCs and power lines in the operational area.
6	Installations at very remote places, and high mountains preventing regular visits due to resources.
7	Lack of guidelines and provisions of PPE to ATSEP for protecting them while working at highly polluted with noise and dust, heights, closer to high power radiating radars, X-rays, etc..,
8	Lack of protection and guidelines while attending equipment during heavy lightning and abnormal weather conditions.
9	Managing the procurement tasks and maintenance tasks of multiple airports in addition to the local.
10	Procedural delays and extended file works on spare procurements.
11	Age and condition of supporting equipment like generators, electrical installations, air conditioners etc…,
12	Annual plan for ATSEP training and development in line with the operational and competency requirements.
13	Different make and model for each facility / system.
14	Difficulties in trouble shooting behind the ATC consoles in general and at late night hours due to poor lighting at the behind the console.
15	Extraordinary file work delays in getting approvals for proceeding to next stages.
16	Fear on consequences of failure while trouble shooting in live system.
17	Frequent movement to and from in between ATC complex and different operational sites especially in case of A-SMGCS, ILS sites and multiple RADAR sites for daily checks and maintenance work.
18	In compatible interfaces and data formats among different makes and models for integration and extending the data and voice to other ACC or APP airports.
19	Inadequate first-hand information given by user.
20	Insufficient logistics support and communication infrastructure to support ATSEP works, those at remote site/area.
21	Mismatching in course development that does not make the ATSEP competent enough to address the practical field issues.
22	Narrow space around equipment racks filled with too many wires and connections, making difficulties in accessing and replacing the modules.
23	No access of fresh air and sunlight for long duration.
24	Permanent combined duties due to shortage of manpower increases workload and reduces the attention in all the combined units.
25	Repairing critical modules of the facilities that are under NOTAM
26	Sense of expectation on out-lived equipment failures even while conducting preventive maintenance.
27	Single man shift.
28	Trouble shooting in busy working environment on live interconnected systems.

6.8. Self-evaluation checklist

6.8.1. Self-evaluation check list for ANSP.

Human performance management processes maturity level Self-Evaluation Check list for ANSP – INDUCTION OF NEW SYSTEMS AND MAINTENANCE PHILOSOPHY				
##	**Process**	**Maturity level**	**Description of the maturity level**	**Tick**
1)	Induction of new systems and maintenance philosophy for **directly addressing** the factors that are adding stress and fatigue to ATSEP due to improper tools, procedures and shared knowledge and practices.	**Level A**	Human performance management processes and/or requirements have not been agreed at the organization level – they are either not routinely undertaken or depend on the individual assigned the task	
		Level B	Human performance management processes and/or requirements are defined but not yet fully implemented, documented, or consistently applied.	
		Level C	Human performance management processes and/or requirements meet the required regulatory standards and comply with relevant ICAO Annexes. Human performance management processes and/or requirements are formally documented and consistently applied	
		Level D	Evidence is available to provide confidence that human performance management processes and/or requirements are being applied appropriately and are delivering positive, measured results.	
		Level E	Human performance management processes and/or requirements set international best practice, focusing on innovation and improvement. The effectiveness of the human performance management improvement actions is measured and evaluated against defined improvement criteria	
2)	Induction of new systems and maintenance philosophy for **indirectly addressing** the factors that are adding stress and fatigue to ATSEP due to improper tools, procedures and shared knowledge and practices.	Level A		
		Level B		
		Level C		
		Level D		
		Level E		
3)	**Resilience Level** w.r.t score of (1)	A & B – Preventative Control, C- Mindful action, D-Performance optimization, E – Adaptive innovation		
4)	**If maturity level is D** w.r.t score of (1)			
	Maintenance strategy includes all the process in addition to preventive maintenance			Y/N
	All the maintenance activities are documented for easy traceability			Y/N
	Annual reactive maintenance duration is only 20% or less than the total maintenance duration?			Y/N
	Required competencies and resources made available prior to the installation of new systems.			Y/N
	All OEM documents required to meet the maintenance strategies were ensured before SAT			Y/N
	Computer-based maintenance data analysis established for financial optimization			Y/N
	Root cause analysis is being practiced on safety sensitive facilities for finding primary failures			Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and take necessary measures to reach the next level.			
5)	**If maturity level is E** w.r.t score of (1)			
	Innovated means of observations and data logging done for automated investigation			Y/N
	Continuous improvement on maintenance process including training done as per new systems			Y/N

	Annual reactive maintenance cost is reduced when compared to last year	Y/N
	Computer based maintenance data analysis helped in carrying out predictive maintenance	Y/N
	Repeated failures were analysed through root cause failure and identified primary failures	Y/N
	Trained and developed ATSEP on FAT, SAT and document verification to ensure OEM documents and system delivered as per the user requirements.	Y/N
	Have you set the key performing indicators for measuring the above?	Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and evaluate	
If your final level of maturity is D or E, please ascertain with the self-evaluation of ATSEP		

6.8.2. Self-evaluation check list for ATSEP.

Human performance management processes maturity level
Self-Evaluation Check list for ATSEP – INDUCTION OF NEW SYSTEMS AND MAINTENANCE PHILOSOPHY

##		Process	Maturity level	Description of the maturity level	Tick
1)	A	I have understood all the process involved in the maintenance strategy of my ANSP			Y/N
	B	I have well documented all the activities of maintenance for easy traceability			Y/N
	C	I have acquired all the skills and competencies required for maintaining new systems			Y/N
	D	I have acquired the skills for carrying root cause failure analysis			Y/N
	E	I have made the annual plan for the spares and other materials including budgeting			Y/N
2)	*If your choice for one or more questions is "N", please state the specific reasons*				
	1) A				
	1) B				
	1) C				
	1) D				
	1) E				

6.9. Resilience and cost benefits

These actions are very essential for any ANSP as this is the lowest level of resilience any organizations to possess to retain the trust of the stakeholders and to meet the regulatory requirements. With effective preventive or proactive maintenances, reactive maintenance and its cost will come down to a greater extent. With innovation in carrying out the routine maintenance activities ANSP can reduce the costs of maintenance activities. With the systematic capture and analysis of the maintenance data ANSP can take financially optimized decisions like service life expansion instead of replacement.

6.10. Other counter measures to be considered

Pre-planning the pre-monsoon, annual and other major preventive maintenance tasks well in advance and carrying out the tasks as planned. So that sudden or total failures and long corrective maintenance works prevented.

Roadblocks on procurement process can be reduced by training selected ATSEP on government compliance requirements by experts having background on the financial regulation. ATSEP those who participate in the major or repeated procurement process can be permitted to have consultants on these areas.

Following procurement policies that facilitates buying quality systems.

7. WORK ENVIRONMENT, WELL-BEING, PERFORMANCE, AND REWARD

7.1. Introduction

The work environment consists of the system of work, the design of jobs, working conditions and the ways in which people are treated at work by their managers and co-workers. Working conditions need to meet health and safety requirements. The way people are treated is affected by managerial behaviour, achieving work-life balance and how issues such as stress, harassment and bullying are dealt with.

Well-being at work exists when people are happy with what they do, how they are treated, how they get on with others. The well-being of employees depends on the quality of working life provided by their employers the feelings of satisfaction and happiness arising from the work itself and the work environment.

Performance management and reward management are closely associated topics that play an important part in achieving one of the key goals of HRM – to contribute to the development of a high-performance culture.

Performance management is a means of getting better results by providing the means for individuals to perform well within an agreed framework of planned goals, standards and competency requirements It entails developing a shared understanding of what is to be accomplished and how it is to be accomplished.

Performance management, if carried out properly, can reward people by recognition through feedback, the provision of opportunities to achieve, the scope to develop skills, and guidance on career paths. All these are non-financial rewards that can encourage job and organizational engagement and make a longer-lasting and more powerful impact than financial rewards such as performance-related pay.

Reward strategy defines what how an organization wants intends to do about to reward their employees. It leads to the development of a reward system that consists of interrelated processes and practices that combine to ensure that reward management is carried out to the benefit of the organization and its employees.

7.2. Benefits to ANSP

Increased job satisfaction and happiness among the workforces. Development towards a high-performance culture. Getting better results from all. Increased level of engagement among the workforces. Talented people are attracted and retained.

7.3. Benefits to ATSEP through

A set of properties of the work environment, perceived directly or indirectly by the employees, that is assumed to be a major force in influencing employee behaviour. Engagement and commitment strategies may be more about taking action that affects employees collectively such as improvements in the work environment.

A satisfactory work environment leads to reduced stress, improves work-life balance, eliminates sexual harassment and bullying problems, providing services for individuals including employee assistance programmes, and provides individual

services such as employee assistance programmes, and provides group services such as restaurants and social/sporting facilities.

They include non-monetary recognition of accomplishments, the creation of fulfilling jobs, providing opportunities for people to advance their skills and careers, and providing a work environment that promotes a high quality of life at work and an appropriate balance of work and personal life (work-life balance).

7.4. Actions to be taken by ANSP

Employers are responsible for creating a good work environment, not only because it is their duty to do so but also as part of the total reward system. Total reward approaches that emphasize the importance of enhancing the work environment.

ANSP need to create a work environment that is conducive to high performance and can introduce policies and practices that encourage people to do everything expected of them.

Performance management provides the basis for self-development but, importantly, it is also about ensuring that the support and guidance people need to develop and improve are readily available. Performance management can play an important role in rewarding employees by providing them with positive feedback and the recognition of their accomplishments.

Developing reward policies and practices that support the achievement of business goals. Rewarding people according to their contribution. Recognizing the value of everyone who is making an effective contribution, not just the exceptional performers. Providing incentives that attract and retain employees and contribute to the development of a high-performance culture.

Creating non-monetary rewards focuses on the varying degrees of recognition, achievement, personal growth, and acceptable working conditions that people have. Non-monetary rewards can be extrinsic, such as praise or recognition, or intrinsic, such as job challenge and interest, as well as feelings that one's work is worthwhile.

7.5. Actions to be taken by ATSEP

Perform well in a good work environment. Develop on the required area based on the performance management feedback by utilizing readily available support and guidance.

7.6. Most influential Counter measures

Providing a working environment, with consideration to human factor issues of ATSEP.

Following HR policies that encourage recognition, appreciation, and suitable compensations.

7.7. Human factors issues addressed

7.7.1. Directly addressed factors.

1	ATSEP desire for recognition on all the facilities (CNS/ATM Automation) and on different makes and models.
2	Behind the curtain profession
3	Below par and uncomfortable residential facilities at faraway places instead of provisions of comfortable nearby quarters with reasonable rent.

4	Congested or no desk / table. Too many items placed in the control and monitoring room. No space for keeping important manuals, procedures, SOPs in most visible and accessible manner.
5	Continuous works including weekends during the demanding situations for meeting the special maintenance and project works along with routine operational works.
6	Difficulties in trouble shooting behind the ATC consoles in general and at late night hours due to poor lighting at the behind the console.
7	Frontline ATSEP views ignored, and not recognized as experts.
8	Gender bias and equal field works not assigned to women ATSEP.
9	Insufficient logistics support and communication infrastructure to support ATSEP works, those at remote site/area.
10	Lack of attractive compensation for extra shift works performed
11	Lack of basic workplace facilities like parking, canteen, fixtures, rest rooms, vending machines, common transport for pickup and drop from employee quarters to workplace, etc..,
12	Lack of guidelines and provisions of PPE to ATSEP for protecting them while working at highly polluted with noise and dust, heights, closer to high power radiating radars, X-rays, etc..,
13	Lack of motivating compensations for extra manhours spent in general maintenance, VVIP movements, project works, additional works, and additional shifts.
14	Lack of opportunity and fund provisions for innovation and carry station level smaller projects.
15	Lack of pride as not recognized as expert in particular field and transferred anywhere without considering the competencies acquired.
16	Lack of protection and guidelines while attending equipment during heavy lightning and abnormal weather conditions.
17	Lack of scientific annual performance assessment and rewarding scheme considering the unique working environment and expected level of performance of ATSEP.
18	Lack of specific workplace facilities for women like identified rest rooms in the operational areas, Creche, childcare leave, etc…,
19	Lack of time to family
20	Lack policies and practices towards the human factors of ATSEP.
21	Narrow space around equipment racks filled with too many wires and connections, making difficulties in accessing and replacing the modules.
22	No access of fresh air and sunlight for long duration.
23	No refreshment breaks
24	No say of ATSEP in HR policies being set for them.
25	No standardized duty pattern, duration, breaks and rest periods
26	Odd hours and on field shift duties for women ATSEP without basic rest room facilities in the operational sites.
27	Payment delays.
28	Salary and allowances not at par with the industry standards for the level of stress and workload.
29	Sense of being unheard by management
30	Sleep loss due to irregular shift pattern or fast rotating shift pattern
31	Stress and fatigue management.
32	Stressful 12 hours night shift without breaks and rests

33	There is a long wait and no provision of comfortable and appropriate mode of commute to approach remote sites even though during scorching summer days.
34	Working in lower temperature in equipment room.
35	Working under noise pollution in the airfield.
36	Working under severe dust pollution during the project work.
37	Acceptance of inefficient manpower by management without any mitigation.
38	Improper and unbalanced work distribution with undue over burden and undue over leniency.
39	Lack of support on career development and career plan.
40	No clear OFFs before shift pattern changes

7.7.2. Indirectly addressed factors.

1	Compulsory movements within the nation during service life
2	Lack of involvements in the discussion sessions and feedback sessions on major policy decisions.
3	Lack of involvements of frontline experts in policies designed for improving the performance of frontline experts.
4	Annual plan for ATSEP training and development in line with the operational and competency requirements.
5	Approval of projects without looking into the resource's requirements like human, vehicles, and other support. Workload increases on coordinating for essential supporting resources and prevents the concentration on core project activities as well as to skip the maintenance activities of ongoing operational facilities.
6	Difference in stated corporate Mission/Vision and the ground reality.
7	Extra shift duties are forced due to shortage of manpower
8	Forced to carryout major maintenance works only during late night and need to return to duty next day by 0930AM.
9	Frequent (change of) exposure to too low temperature in the server or equipment room and too high outside temperature.
10	Frequent exposure of high outside remote site temperature and less inside equipment room temperature in a shift.
11	Frequent movement to and from in between ATC complex and different operational sites especially in case of A-SMGCS, ILS sites and multiple RADAR sites for daily checks and maintenance work.
12	Inhibition of valuable suggestions and ideas due to the overload of works.
13	Innumerable, unspecified, and unpredicted works assigned to selected ATSEP preventing their attention from core maintenance tasks.
14	Installations at very remote places, and high mountains preventing regular visits due to resources.
15	Irregular duty calls without any pattern due to shortage of manpower
16	Lack of effective coordination procedures for men material movements inside the operational areas of private operator owned airports.
17	Lack of knowledge in handling emergencies and disastrous situations.
18	Late hour calls and frequent calls after duty hours even during weekly OFFs
19	Leave requests not approved
20	Mandatory transfers
21	Monotonous monitoring for a long time.

22	Mostly corrective maintenance work conducted at night.
23	Multiple jobs of diversified nature in quick successions without notice or planning.
24	Must report again by 0930AM even after late night breakdown calls and late-night project works.
25	Non availability of calibrated working test equipment as required for the preventive as well as for the corrective maintenance.
26	Non availability of vehicle to reach the remote site.
27	Permanent combined duties due to shortage of manpower increases workload and reduces the attention in all the combined units.
28	Short of ideas; being alone.
29	Simultaneous project supervision and maintenance activities without additional manpower.
30	Single man shift.
31	Too many unclassified additional works in smaller airports. Essential maintenance tasks skipped.
32	Travelling long distance from home to workplace as green field airports are situated at outer part of the cities and no provision of common transportation facility.
33	Uncertainty on future roles and responsibilities.
34	Where there is electronics, there shall be an ATSEP – Belief of airport in-charges.

7.8. Self-evaluation checklist

7.8.1. Self-evaluation check list for ANSP.

Human performance management processes maturity level
Self-Evaluation Check list for ANSP – WORK ENVIRONMENT, WELL-BEING, PERFORMANCE, AND REWARD

##	Process	Maturity level	Description of the maturity level	Tick
1)	Work environment, well-being, performance, and reward for **directly addressing** the factors that are adding stress and fatigue to ATSEP due to improper tools, procedures and shared knowledge and practices.	**Level A**	Human performance management processes and/or requirements have not been agreed at the organization level – they are either not routinely undertaken or depend on the individual assigned the task	
		Level B	Human performance management processes and/or requirements are defined but not yet fully implemented, documented, or consistently applied.	
		Level C	Human performance management processes and/or requirements meet the required regulatory standards and comply with relevant ICAO Annexes. Human performance management processes and/or requirements are formally documented and consistently applied	
		Level D	Evidence is available to provide confidence that human performance management processes and/or requirements are being applied appropriately and are delivering positive, measured results.	
		Level E	Human performance management processes and/or requirements set international best practice, focusing on innovation and improvement. The effectiveness of the human performance management improvement actions is measured and evaluated against defined improvement criteria	

2)	Induction of new systems and maintenance philosophy for **indirectly addressing** the factors that are adding stress and fatigue to ATSEP due to improper tools, procedures and shared knowledge and practices.	Level A	
		Level B	
		Level C	
		Level D	
		Level E	
3)	**Resilience Level** w.r.t score of (1)	A & B – Preventative Control, C- Mindful action, D-Performance optimization, E – Adaptive innovation	
4)	**If maturity level is D** w.r.t score of (1)		
	Total reward system approaches in practice that emphasize the enhanced work environment.		Y/N
	Work environment is conducive to high performance.		Y/N
	Performance management system in practice ensures the support and guidance people need to develop and improve are readily available.		Y/N
	Reward system includes non-financial rewards like recognition, achievement, personal growth		Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and take necessary measures to reach the next level.		
5)	**If maturity level is E** w.r.t score of (1)		
	Work environment is periodically reviewed for enhancement		Y/N
	Increased level of job satisfaction and happiness found after enhancing work environment		Y/N
	Unique values added by all the employees were recognized and rewarded		Y/N
	Increased level of engagement among the workforces were observed		Y/N
	Have you set the key performing indicators for measuring the above?		Y/N
	If your score is one or more "N", please assume the immediate lower level of maturity and evaluate		
If your final level of maturity is D or E, please ascertain with the self-evaluation of ATSEP			

7.8.2. Self-evaluation check list for ATSEP.

Human performance management processes maturity level
Self-Evaluation Check list for ATSEP – WORK ENVIRONMENT, WELL-BEING, PERFORMANCE, AND REWARD

##		Process	Maturity level	Description of the maturity level	Tick
1)	A	Work environment enabled me towards more engagement and commitment.			Y/N
	B	Work environment has reduced my stress and improved my work-life balance			Y/N
	C	I have not experienced or heard of any sexual harassment and bullying problems.			Y/N
	D	I am benefited by the individual as well as group services provide by my ANSP			Y/N
	E	I am highly motivated due to the non-financial reward systems in place.			Y/N
2)	*If your choice for one or more questions is "N", please state the specific reasons*				
	1) A				
	1) B				

	1) C	
	1) D	
	1) E	

7.9. Resilience and cost benefits

ANSP incurs minimal costs in improving the work environment and incurs no additional costs in implementing non-monetary rewards. Organizations progress toward high performance by increasing employee job satisfaction and happiness. Talent management objectives are met when talented people are attracted and retained, and employee behaviour and organisational culture are improved.

7.10. Relevant Appendix

Please refer Appendix – 4 on ATSEP Duty Time Limitation, for understanding the present system of watch hours, shift duty cycles, duty hours in a day, number of duties per week, number hours of duty per week, impact, and guidelines for better management of duty cycles and duty hours.

Please refer Appendix – 5 Measures During Pandemic, for understanding the fear psychosis behind Covid-19, mitigation measures, and action in future in similar occasion.

Please refer Appendix – 7 Stress management, for understanding three stage process of stress, stressors in working environment, consequences of stress, and stress management principles.

8. MOTIVATION, COMMITMENT, AND ENGAGEMENT

8.1. Introduction

Motivation, commitment, and engagement are all factors that influence behaviour and thus performance. Motivation is the driving force that propels, directs, and sustains behaviour. Well-motivated people who are willing to exert discretionary effort, i.e., do more than is expected of them, achieve high performance.

Intrinsic motivation occurs when people believe that their work is important, interesting, and challenging, and that it gives them a reasonable degree of autonomy (freedom to act), opportunities to achieve and advance, and opportunities to use and develop their skills and abilities. It can be described as work-motivation. Job design can help to boost intrinsic motivation.

Extrinsic motivation occurs when things are done to or for people to motivate them. These include rewards such as incentives, increased pay, praise, or promotion; and punishments such as disciplinary action, withholding pay, or criticism. Extrinsic motivators can have an immediate and powerful effect, but it will not necessarily last long.

The intrinsic motivators, which are concerned with the 'quality of working life', are likely to have a deeper and longer-term effect because they are inherent in individuals.

Commitment represents the strength of an individual's identification with, and involvement in, an organization. Commitment refers to attachment and loyalty.

Engagement takes place when people are committed to their work and the organization and are motivated to achieve high levels of performance.

Both commitment and engagement are inextricably linked. Some of the factors that influence commitment and engagement are training, career opportunities, performance appraisal systems, autonomy, and rewards and recognition.

8.2. Benefits to ANSP

High performance is achieved through highly motivated, committed, and engaged employees. All of the benefits discussed in previous chapters where high performance is discussed apply here as well.

8.3. Benefits to ATSEP

Motivated to contribute more through increased commitment and engagement. All of the benefits discussed in previous chapters where high performance is discussed apply here as well.

8.4. Actions to be taken by ANSP

Keeping the motivation level high through both intrinsic as well extrinsic measures. Provide additional training to the people in their areas of interest. Provide career opportunities based on their performance which is evaluated through a scientific performance evaluation system. Provide autonomy to the workforce according to their position in the organization.

8.5. Actions to be taken by ATSEP

Making use of the training opportunities to add the knowledge in the areas of interest or where there is a need or where there is a gap. Efficient and contributing ATSEP are recognized through intrinsic measures and at the same time all contributions are taken care by extrinsic means.

8.6. Most influential counter measures

All the counter measures discussed in the earlier topics will also enhance the motivation, commitment, and engagement. However, additional counter measures to consider are given in the end of this chapter.

8.7. Human factors issues addressed

8.7.1. Collectively addressed factors.

Considering all the influential counter measures discussed so far, collectively the following factors are addressed that add stress and fatigue.

1	Acceptance of inefficient manpower by management without any mitigation.
2	ATSEP desire for recognition on all the facilities (CNS/ATM Automation) and on different makes and models.
3	Continuous changes in the scope and requirements on complex projects from the user point of view, without proper consideration from the maintenance point of view.
4	Frontline ATSEP views ignored, and not recognized as experts.
5	In compatible interfaces and data formats among different makes and models for integration and extending the data and voice to other ACC or APP airports.
6	Inhibition of valuable suggestions and ideas due to the overload of works.
7	Lack of attractive compensation for extra shift works performed
8	Lack of brainstorming on handling unfamiliar situation and regular interactions for knowledge sharing.
9	Lack of corrective measure in addressing the commitment levels and contributions of ATSEP.
10	Lack of effective annual spare and capital procurement plan and related budget provisions.
11	Lack of guidance, information exchange, and non-participation in the discussion make the freshers isolated.
12	Lack of involvements in the discussion sessions and feedback sessions on major policy decisions.
13	Lack of involvements of frontline experts in policies designed for improving the performance of frontline experts.
14	Lack of knowledge and expert support while trying to fix an unfamiliar technical glitch.
15	Lack of knowledge in handling emergencies and disaster situations.
16	Lack of motivating compensations for extra manhours spent in general maintenance, VVIP movements, project works, additional works, and additional shifts.
17	Lack of mutual respect and mentorship for knowledge and experience sharing among the generations.

18	Lack of opportunity and fund provisions for innovation and carry station level smaller projects.
19	Lack of pride as not recognized as expert in particular field and transferred anywhere without considering the competencies acquired.
20	Lack of scientific annual performance assessment and rewarding scheme considering the unique working environment and expected level of performance of ATSEP.
21	Lack of skills and competencies in managing the CNS/ATM automation systems (Configuration, adaptation, replacement and upgrading the network devices, operating systems, shared storage devices, firewalls, and device drivers etc..,) due to lack of OEM documentations.
22	Lack of support on career development and career plan.
23	Lack of teamwork, more dependency on individuals and collective inputs not taken by team lead for decision.
24	Mismatching in course development that does not make the ATSEP competent enough to address the practical field issues.
25	Monotonous monitoring for a long time.
26	No clear job description, roles and responsibilities are varying after each movement, deployed at non-core areas.
27	No say of ATSEP in HR policies being set for them.
28	Non-utilization of technologies and machines for the installation and maintenance works and planning.
29	Peer pressure due to evaluation and comments from colleagues who are not accountable
30	Poor workload distribution makes few carries stress, pressure, fatigue, and timeline pressure throughout without any relief.
31	Salary and allowances not at par with the industry standards for the level of stress and workload.
32	Short of ideas; being alone.
33	Unable to resolve external interference problems and other typical problems not covered in the training.
34	Unrealistic timelines due to poor planning and coordination with ATCOs before making maintenance activities.

8.8. Resilience and cost benefits

Every cost and resilience benefit that we have previously addressed whenever high performance is mentioned also applies here.

8.9. Other counter measures to consider

Encourage innovation on routine tasks.

Promote research groups within the ANSP.

Rewards and promotion based on contribution and effort.

Assign dedicated small assignments based on the specific talents and skills.

Innovative ideas should be welcomed through brainstorming sessions with the frontline experts before making major policies and procurements of new systems.

By limiting their stream of competency and developing higher level expertise and competencies, forming ANSP level backup team for emergency, disaster, and pandemic situation.

9. BEHAVIOURAL AND ROLE SPECIFIC COMPETENCIES

9.1. Introduction

Behavioural competencies, also referred to as soft skills, specify behavioral expectations, i.e., the kind of behaviour needed to produce results under such topics as teamwork, communication, leadership, and decision-making. The focus on providing services to airlines and managing air traffic, awareness of developments in civil aviation, team orientation, results orientation, communication effectiveness, leadership, conflict resolution, innovation, adaptability, self-confidence and assertiveness, people management, planning and organising, technical skills, and decisiveness are a few examples of behavioural competencies.

Technical competencies—also referred to as "hard skills"—define what people must know and be able to accomplish (knowledge and skills) in order to carry out and satisfy performance objectives. They might relate to generic roles (sets of related roles) or to specific roles (referred to as "role-specific competences"). Typically, they are not included in a behavioural-based competency framework, even though they are connected when analysing and evaluating position needs and requirements.

9.2. Benefits to ANSP

All the benefits come out of knowledge management, talent management and learning and development are applicable here as well.

9.3. Benefits to ATSEP

All the benefits come out of knowledge management, talent management and learning and development are applicable here as well.

9.4. Actions to be taken by ANSP

All the actions discussed on knowledge management, talent management and learning and development are applicable here as well.

9.5. Actions to be taken by ATSEP

All the actions discussed on knowledge management, talent management and learning and development are applicable here as well.

9.6. Most influential Counter measures

Train ATSEP in human factors as per DOC 10057 in various levels that suits their technical and managerial accountabilities.

9.7. Human factors issues addressed

9.7.1. Directly addressed factors.

1	24H operations with stringent regulatory compliance.

2	Expectations on making quick decision, in less reactive time with zero error tolerance and on fixing the system immediately.
3	Frequent changes in the team members or team lead prevents better teamwork and communications.
4	Lack of guidance, information exchange, and non-participation in the discussion make the freshers isolated.
5	Lack of involvements of frontline experts in policies designed for improving the performance of frontline experts.
6	Lack of knowledge and expert support while trying to fix an unfamiliar technical glitch.
7	Lack of knowledge in managing the available scarce human resources for maximum performance due to lack of soft skills.
8	Lack of leadership in building relationships and establishing communication or coordination frameworks with internal as well as external stakeholders.
9	Lack of leadership in communicating the priorities to sub-ordinates.
10	Lack of leadership in ensuring the safety conscious among sub-ordinate, instead of being reactive and blaming.
11	Lack of leadership in handling professional disagreement with internal and external stakeholders and pass it to frontline ATSEP.
12	Lack of leadership in managing conflicts and ensuring team goals and safety objectives over individuals interests and goals.
13	Lack of mutual respect and common values among internal stakeholders. (ATCOs, ATSEP, Engineers)
14	Lack of mutual respect and mentorship for knowledge and experience sharing among the generations.
15	Lack of teamwork, more dependency on individuals and collective inputs not taken by team lead for decision.
16	Managerial or higher responsibilities without proper training.
17	Peer pressure due to evaluation and comments from colleagues who are not accountable
18	Safety consciousness in keeping the facilities available all the time.
19	Sense of expectation on out-lived equipment failures even while conducting preventive maintenance.
20	Stress and fatigue management.
21	Timeline pressure from boss, management, ATCOs, and other stakeholders.

9.7.2. Indirectly addressed factors.

1	Always under pressure to give back the facilities within the EST of NOTAM
2	ATSEP desire for recognition on all the facilities (CNS/ATM Automation) and on different makes and models.
3	Being helpless in rectifying the unit after knowing inherent flaws in the design of the equipment and its unreliability
4	Constant mind switchover between old and modern technologies, procedures, tools etc.., within the same service facilities. Different aged, make and model of equipment within a single service facility like VHF, Nav-Aids, and surveillance.
5	Improper and unbalanced work distribution with undue over burden and undue over leniency.

6	Improper training (Training, assessing and evaluation) for the required competencies. There is a gap in the training provided and the practical work environment.
7	Inhibition of valuable suggestions and ideas due to the overload of works.
8	Lack of effective coordination procedures for men material movements inside the operational areas of private operator owned airports.
9	Lack of knowledge in handling emergencies and disastrous situations.
10	Lack policies and practices towards the human factors of ATSEP.
11	Mostly corrective maintenance work conducted at night.
12	Poor workload distribution makes few carries stress, pressure, fatigue, and timeline pressure throughout without any relief.
13	Repairing critical modules of the facilities that are under NOTAM
14	Sudden failures of the systems due to natural calamities and power supply issues.
15	Unrealistic timelines due to poor planning and coordination with ATCOs before making maintenance activities.

9.8. Resilience and cost benefits

The knowledge management, people management, and learning and development benefits that increase resilience and lower costs are all applicable in this situation.

9.9. Other countermeasures to consider

Train ATSEP on the Engineering module as per DOC 10057 that suits the ANSP roles on projects and procurements.

Training on infrastructure as per DOC 10057.

Training on factory and site acceptance tests of major systems for verifying the performance of the system compliance of user requirements and tender terms and conditions.

Training on handling emergency and disaster situations.

Developing competency for preparing upcoming complex CNS/ATM systems specifications.

Developing Communication skills for effective communications with internal and external stakeholders.

Developing skills for preparing detailed project reports and technical reports.

Developing skills for analysing the external interference, external interfaces, data formats, communication protocol and communication links associated with CNS/ATM facilities.

Soft skill development to increase the productivity.

10. SAFETY CULTURE PROMOTION

10.1. Introduction

Culture refers to the cumulative deposit of knowledge, experience, beliefs, values, attitudes, meanings, acquired by a group of people during generations through individual and group striving.

Safety Culture is the way safety is perceived, valued, and prioritised in an organisation. It reflects the real commitment to safety at all levels in the organisation. It is something an organisation acquires over period as a product of the combined effects of organisational culture, and professional culture.

Safety Culture's essence is in what people believe about the importance of safety, including what they think that their peers, superiors, and leaders really believe about safety as a priority.

10.2. Benefits to ANSP through

Safety Culture have a direct impact on safe performance. With the safety culture, top management of ANSP show that safety is their priority, and the entire organization gives priority on safety.

An optimum Safety Culture will deliver a clearer and more comprehensive picture of operational risk, one that takes in all aspects of the activities of the organisation.

This enhancement of mutual trust with management gives a positive impact on productivity.

In an organization with a strong safety culture, individuals and groups take responsibility for safety by communicating safety concerns and striving to learn, adapt, and modify individual and organizational behaviour based on lessons learned.

10.3. Benefits to ATSEP through

Safety Culture is seen as a key business target so that the people at the 'sharp end' feel empowered to act in the interests of safety in the knowledge that the management will support them. This increases the mutual trust and motivation to play the safety role.

A strong safety culture helps ensure that personnel are trained and competent to perform their duties and that continual training and updates on safety progress are provided.

10.4. Actions to be taken by ANSP

Establishing better information flow and the maintenance of an effective dialogue within the organisation about safety performance as priority.

Promoting strong safety values means that all ANSP employees share lessons learned from investigations and experiences, both internally and from other organizations.

The tenets of Safety Promotion are used to foster a positive safety culture in which ANSP employees understand why safety is important and how they affect it, providing a sense of purpose to safety efforts.

Open communication is critical to a positive safety culture. ANSP communicates safety objectives to all operational personnel to improve the way safety is perceived, valued, and prioritized.

One of the initiatives that ANSP makes for maintaining positive safety culture is Voluntary Safety Reporting Programs. It's a confidential system for controllers and other employees to voluntarily identify and report safety and operational concerns.

Promoting the safety aspects of the roles played by ATSEP to the other stakeholders in ANSP so that they are not assigned with non-core activities, get the necessary information, infrastructural and other support for the operation and maintenance of CNS/ATM systems.

10.5. Actions to be taken by ATSEP

Each employee must consider the potential effect their decisions may have on safety and is responsible for understanding the significance of his or her job as it relates to safety. voluntarily identify and report safety and operational concerns.

10.6. Most influential Counter measures

Sensitizing all the stakeholders on the role of ATSEP in ATM service delivery and contributions to air safety.

10.7. Human factors issues addressed

10.7.1. Directly addressed factors.

1	Age and condition of supporting equipment like generators, electrical installations, air conditioners etc…,
2	Diversified tasks during duty.
3	Inadequate first-hand information given by user.
4	Behind the curtain profession
5	Delayed annual and other planned preventive and corrective maintenance due to non-availability of time for maintenance actions.
6	Difference in stated corporate Mission/Vision and the ground reality.
7	Improper and unbalanced work distribution with undue over burden and undue over leniency.
8	Improper Complaint reporting mechanism by user, which do not convey the key information required for the early rectification of the equipment.
9	Innumerable, unspecified, and unpredicted works assigned to selected ATSEP preventing their attention from core maintenance tasks.
10	Insufficient logistics support and communication infrastructure to support ATSEP works, those at remote site/area.
11	Lack of effective coordination procedures for men material movements inside the operational areas of private operator owned airports.
12	Lack of mutual performance assessment as per the roles and responsibilities assigned.
13	Lack of mutual respect and common values among internal stakeholders. (ATCOs, ATSEP, Engineers)
14	Lack of planning before maintenance works. Not adhering to the schedules if planned.

15	Lack of professional communication or poor communication on technical terms to approving authority, who is mostly a non-ATSEP.
16	Lack policies and practices towards the human factors of ATSEP.
17	Multiple jobs of diversified nature in quick successions without notice or planning.
18	No say of ATSEP in HR policies being set for them.
19	Poor workload distribution makes few carries stress, pressure, fatigue, and timeline pressure throughout without any relief.
20	Timeline pressure from boss, management, ATCOs, and other stakeholders.
21	Too many unclassified additional works in smaller airports. Essential maintenance tasks skipped.
22	Where there is electronics, there shall be an ATSEP – Belief of airport in-charges.

10.8. Resilience and cost benefits

All ANSP have already established the SMS systems and they will have to promote safety work culture in the organization through leadership. It may add negligible additional costs but ensures ANSP to ensure safety and maintain reputation. This will also improve the commitment and productivity of internal stakeholders.

10.9. Other counter measures to consider

Imparting human factors training to ATSEP and explaining the safety impacts from the perspective of human factors.

Rewarding the safety performance.

Encouraging them to voluntarily disclose the errors committed if any before major shutdown to find the root causes.

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APPENDIX 1 STRESS FACTOR MAPPING

1.1. Introduction

The excel sheet given below indicates the mapping of stress factors and countermeasures.

##	Table	Factor	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12.1	C12.2	C12.3	C12.4	C13.1	C13.2	C13.3	C13.4	C13.5	C13.6	C13.7	C13.8	C14.1	C14.2	C14.3	C14.4	C14.5	C15.1	C15.2	C15.3	C15.4	C15.5	C15.6	C15.7	C15.8	C15.9	C15.10	Top 10%	Top 20%	Top 30%	Top 40%
1	1	1				1																									1	1			1					0	0	1	1
2	1	3		1							1														1															0	1	1	1
3	1	4		1				1		1			1													1														1	1	1	1
4	1	5		1						1			1													1														1	1	1	1
5	1	6		1				1	1	1			1									1				1			1											1	1	1	1
6	1	7									1		1													1														1	1	1	1
7	1	8				1		1	1													1							1		1	1	1	1		1	1				1	1	1	1
8	1	10										1													1				1			1	1			1					0	0	1	1
9	1	11						1	1	1	1											1							1								1				1	1	1	1
10	1	12				1	1				1																1				1	1					1			0	1	1	1
11	1	13				1	1		1																		1		1		1	1	1							1	1	1	1
12	1	14		1						1			1													1														1	1	1	1
13	1	15											1													1														1	1	1	1
14	1	16						1	1		1					1	1			1		1			1				1	1	1							1		1	1	1	1
15	1	17						1														1							1			1				1				0	1	1	1
16	1	18				1		1	1				1													1						1	1		1				1	1	1	1	1
17	1	19						1	1													1			1											1				1	1	1	1
18	1	20																												1	1	1	1	1		1			0	1	1	1
19	1	21													1															1			1					1	0	1	1	1
20	1	22						1	1													1																	1	1	1	1
21	1	23		1				1		1			1									1				1			1											1	1	1	1
22	1	24						1	1													1							1											1	1	1	1
23	1	25																						1						1	1									0	1	1	1
24	1	26								1					1			1	1	1	1									1	1									0	1	1	1
25	2	1		1							1		1													1														1	1	1	1
26	2	2	1				1						1													1														1	1	1	1
27	2	3											1													1														1	1	1	1
28	2	4	1								1		1													1		1		1										1	1	1	1
29	2	5											1													1				1		1							1	1	1	1	1
30	2	6		1		1		1	1				1									1				1			1											1	1	1	1
31	2	7									1		1	1												1		1												1	1	1	1
32	2	8	1										1				1									1		1												1	1	1	1
33	2	9											1	1	1	1	1									1		1		1										1	1	1	1
34	2	10		1									1	1	1											1		1		1										1	1	1	1
35	2	11									1		1	1	1	1							1			1		1		1	1									1	1	1	1
36	2	12				1		1	1				1													1					1	1			1					1	1	1	1
37	2	13									1					1				1			1			1				1										1	1	1	1
38	2	14										1															1				1	1			1		1			0	0	1	1

##	Table	Factor	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12.1	C12.2	C12.3	C12.4	C13.1	C13.2	C13.3	C13.4	C13.5	C13.6	C13.7	C13.8	C14.1	C14.2	C14.3	C14.4	C14.5	C15.1	C15.2	C15.3	C15.4	C15.5	C15.6	C15.7	C15.8	C15.9	C15.10	Top 10%	Top 20%	Top 30%	Top 40%
39	2	15	1															1	1		1																			0	1	1	1
40	2	16				1	1				1																1					1	1			1					0	1	1	1
41	2	17								1			1	1												1		1													1	1	1	1
42	2	18		1				1		1	1		1									1				1			1											1	1	1	1
43	2	19	1				1	1	1																															1	1	1	1
44	2	20						1	1								1												1		1					1		1		1	1	1	1
45	2	21						1	1			1										1							1											1	1	1	1
46	2	22					1						1													1		1				1							1	1	1	1
47	3	1	1				1	1				1															1					1	1			1		1		0	1	1	1
48	3	2				1	1																				1													0	0	0	1
49	3	3			1									1																											0	0	0	1
50	3	4	1			1	1																				1													0	1	1	1
51	3	5	1											1														1													1	1	1	1
52	3	6						1	1			1					1												1												1	1	1	1
53	3	7						1	1			1																	1												1	1	1	1
54	3	8	1				1							1																								1			0	1	1	1
55	3	9	1		1						1																														0	1	1	1
56	3	10	1		1						1			1																											0	1	1	1
57	3	11	1		1																						1														1	1	1	1
58	3	12				1	1																	1			1					1	1			1		1		1	0	0	1	1
59	3	13					1	1	1			1						1	1		1											1	1		1	1		1			1	1	1	1
60	3	14		1				1	1	1																		1												1	1	1	1
61	3	15	1				1					1														1					1	1			1		1			0	1	1	1
62	3	16	1					1														1									1			1	1					0	1	1	1
63	3	17	1						1					1	1																			1						1	1	1	1
64	3	18	1	1						1			1													1			1	1										1	1	1	1
65	3	19			1			1	1					1														1			1			1						1	1	1	1
66	3	20	1			1	1		1															1			1														1	1	1	1
67	3	21	1					1	1			1																	1												1	1	1	1
68	3	22	1			1	1	1				1															1					1	1			1		1		0	1	1	1
69	3	23	1					1	1															1				1								1					1	1	1	1
70	4	1											1													1		1													1	1	1	1
71	4	2		1									1													1		1													1	1	1	1
72	4	3											1													1		1													1	1	1	1
73	4	4											1													1		1													1	1	1	1
74	4	5														1												1		1											1	1	1	1
75	4	6											1													1		1													1	1	1	1
76	4	7											1			1										1		1		1											1	1	1	1
77	4	10											1													1		1		1											1	1	1	1
78	4	11											1													1		1													1	1	1	1
79	4	12											1			1										1		1													1	1	1	1
80	4	13																										1													1	1	1	1
81	4	14														1				1								1		1											1	1	1	1
82	4	15																										1													1	1	1	1

##	Table	Factor	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12.1	C12.2	C12.3	C12.4	C13.1	C13.2	C13.3	C13.4	C13.5	C13.6	C13.7	C13.8	C14.1	C14.2	C14.3	C14.4	C14.5	C15.1	C15.2	C15.3	C15.4	C15.5	C15.6	C15.7	C15.8	C15.9	C15.10	Top 10%	Top 20%	Top 30%	Top 40%
83	4	16																										1													1	1	1	1
84	4	17											1													1		1													1	1	1	1
85	5	1																													1										0	1	1	1
86	5	2			1												1											1			1										1	1	1	1
87	5	3	1		1	1	1		1																						1										1	1	1	1
88	5	4			1																										1										0	1	1	1
89	5	5												1	1																1			1							0	1	1	1
90	5	6	1				1		1																						1										1	1	1	1
91	5	7	1			1	1		1		1																														1	1	1	1
92	5	9	1																									1													1	1	1	1
93	5	11													1			1	1	1	1										1										0	1	1	1
94	5	12									1			1		1				1											1										0	1	1	1
95	5	13	1				1					1															1				1										0	1	1	1
96	5	14					1						1													1	1					1								1	1	1	1	1
97	5	15	1					1	1								1																								1	1	1	1
98	5	16						1	1		1																				1										1	1	1	1
99	5	17						1	1		1						1														1										1	1	1	1
100	5	18					1	1	1	1							1														1										1	1	1	1
101	5	19			1				1															1							1			1							1	1	1	1
102	5	20						1	1	1	1											1			1				1		1										1	1	1	1
103	6	1									1			1																											0	1	1	1
104	6	2																													1			1							0	1	1	1
105	6	3																1	1		1			1						1											0	0	1	1
106	6	4												1																				1	1						0	0	0	1
107	6	5												1																	1			1							0	1	1	1
108	6	6															1														1										0	1	1	1
109	6	7						1	1						1														1											1	1	1	1
110	6	8											1													1					1										1	1	1	1
111	6	9															1														1										0	1	1	1
112	6	10						1	1									1	1					1					1												1	1	1	1
113	6	11																													1			1							0	1	1	1
114	6	12						1														1							1												0	1	1	1
115	6	13									1																														0	1	1	1
116	6	14																1	1	1	1										1										0	1	1	1
117	6	15						1	1													1							1												1	1	1	1
118	6	16													1	1				1																					0	0	0	0
119	6	17																1	1		1			1							1										0	1	1	1
120	6	18						1	1			1																				1	1			1	1				1	1	1	1
121	6	19						1	1		1							1	1		1										1										1	1	1	1
122	6	20									1																				1										0	1	1	1
123	6	21											1			1				1						1				1	1											1	1	1	1
124	7	1		1						1	1		1			1				1						1				1												1	1	1	1
125	7	2																										1		1											1	1	1	1
126	7	4									1		1													1					1										1	1	1	1

##	Table	Factor	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12.1	C12.2	C12.3	C12.4	C13.1	C13.2	C13.3	C13.4	C13.5	C13.6	C13.7	C13.8	C14.1	C14.2	C14.3	C14.4	C14.5	C15.1	C15.2	C15.3	C15.4	C15.5	C15.6	C15.7	C15.8	C15.9	C15.10	Top 10%	Top 20%	Top 30%	Top 40%
127	7	5		1						1	1		1													1				1											1	1	1	1
128	7	6																												1											0	0	1	1
129	7	7																					1			1															1	1	1	1
130	7	9														1				1								1		1											1	1	1	1
131	7	10																1	1		1									1											0	0	1	1
132	7	11																								1															1	1	1	1
133	7	12		1						1																															0	0	1	1
134	7	13		1						1	1		1							1						1		1		1											1	1	1	1
135	7	14														1				1								1		1											1	1	1	1
136	7	15		1												1				1			1					1		1											1	1	1	1
137	7	16		1									1													1															1	1	1	1
138	7	17																1	1					1						1											0	0	1	1
139	7	18																												1											0	0	1	1
140	7	19												1														1		1	1										1	1	1	1
141	7	20												1														1		1											1	1	1	1
142	7	21									1																	1		1											1	1	1	1
143	7	22												1										1						1											0	0	1	1
144	7	23		1						1	1		1	1												1				1											1	1	1	1
145	8	1																										1													1	1	1	1
146	8	2																										1													1	1	1	1
147	8	3	1		1				1																			1								1					1	1	1	1
148	8	4																										1													1	1	1	1
149	8	5																										1													1	1	1	1
150	8	6	1						1																			1								1					1	1	1	1
151	8	7	1		1																							1													1	1	1	1
152	8	8	1																									1													1	1	1	1
153	8	9	1														1											1				1									1	1	1	1
154	8	10																										1													1	1	1	1
155	8	11	1		1																							1													1	1	1	1
156	8	12	1														1											1													1	1	1	1
157	B7	1	1																									1													1	1	1	1
158	B7	2	1																									1													1	1	1	1
159	B7	3																										1													1	1	1	1
160	B7	4																										1													1	1	1	1
161	B8	1		1							1			1																											0	1	1	1
162	B8	2																1	1		1		1					1													1	1	1	1
163	B8	3								1	1		1													1					1										1	1	1	1
164	B8	4																										1													1	1	1	1
165	B9	1					1	1	1														1						1													1	1	1	1
166	B9	2	1						1					1	1																					1							1	1	1	1
167	B9	3	1																									1													1	1	1	1
168	B9	4						1	1														1		1			1													1	1	1	1
169	B10	1	1				1																				1				1	1		1		1	1			0	1	1	1
170	B10	2																										1			1										1	1	1	1

##	Table	Factor	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12.1	C12.2	C12.3	C12.4	C13.1	C13.2	C13.3	C13.4	C13.5	C13.6	C13.7	C13.8	C14.1	C14.2	C14.3	C14.4	C14.5	C15.1	C15.2	C15.3	C15.4	C15.5	C15.6	C15.7	C15.8	C15.9	C15.10	Top 10%	Top 20%	Top 30%	Top 40%
171	B10	3				1		1	1													1						1			1	1		1	1	1	1			1	1	1	1
172	B10	4						1	1													1						1			1	1			1	1	1		1	1	1	1	1
173	B11	1		1						1	1		1													1														1	1	1	1
174	B11	2		1			1	1	1	1			1									1				1	1		1											1	1	1	1
175	B11	3		1						1	1		1													1														1	1	1	1
176	B11	4		1						1																1		1												1	1	1	1
			C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12.1	C12.2	C12.3	C12.4	C13.1	C13.2	C13.3	C13.4	C13.5	C13.6	C13.7	C13.8	C14.1	C14.2	C14.3	C14.4	C14.5	C15.1	C15.2	C15.3	C15.4	C15.5	C15.6	C15.7	C15.8	C15.9	C15.10	125	161	172	175
			38	25	12	16	24	43	45	23	33	12	47	22	10	16	13	12	12	14	10	21	5	10	6	51	15	58	28	32	36	26	19	13	7	18	10	11	2	6				
Top 10%			38	25	12	16	24	43	45	23	33	12	47	22	10	16	13	12	12	14	10	21	5	10	6	51	15	58	28	32	36	26	19	13	7	18	10	11	2	6	71%			
Top 20%			38	25	12	16	24	43	45	23	33	12	47	22	10	16	13	12	12	14	10	21	5	10	6	51	15	58	28	32	36	26	19	13	7	18	10	11	2	6		91%		
Top 30%			38	25	12	16	24	43	45	23	33	12	47	22	10	16	13	12	12	14	10	21	5	10	6	51	15	58	28	32	36	26	19	13	7	18	10	11	2	6			98%	
Top 40%			38	25	12	16	24	43	45	23	33	12	47	22	10	16	13	12	12	14	10	21	5	10	6	51	15	58	28	32	36	26	19	13	7	18	10	11	2	6				99%

1.2. Description

All the green cells with “1” indicates the mapping of factor with the countermeasure. Coloured cells in Top 10%, 20%, 30%, and 40% rows indicate the most influential countermeasures.

Cell value “1” in Top 10%, 20% 30%, and 40% columns indicates that the factor is addressed either directly or indirectly by the most influential countermeasures in respective %age.

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APPENDIX 2 STRESS FACTORS

2.1. Introduction

2.1.1. Table 1 – Lack of Knowledge, Skills and Competency.

Table 1: Factors that affect the job performance due to the lack of KSA, Competency in coping up with the successive induction of modern technologies	
1	Preparing technical specification for a new system without knowing the local government guidelines and latest technology available.
2	Deleted
3	No clear job description, roles and responsibilities are varying after each movement, deployed at non-core areas.
4	Lack of opportunity for developing and or retaining core competencies due to deployment in non-core areas for a prolonged period before and after equipment training.
5	Lack of equipment training even after years of deployment in the unit.
6	Lack of KSA and Competency to manage complex modern equipment.
7	No clear demarcation of technical and managerial responsibilities among the junior ATSEP and senior ATSEP.
8	Improper training (Training, assessing and evaluation) for the required competencies. There is a gap in the training provided and the practical work environment.
9	Deleted
10	Lack of skills and competencies in managing the CNS/ATM automation systems (Configuration, adaptation, replacement and upgrading the network devices, operating systems, shared storage devices, firewalls, and device drivers etc..,) due to lack of OEM documentations.
11	Forced to do tasks even without qualification (attending power lines of UPS and working at heights etc..,)
12	Compromising qualities, essential OEM documentations, training and after acquisition supports on new systems against the cost (L1).
13	Procedural delays and extended file works on spare procurements.
14	Deployment of competent persons in right place after equipment training.
15	Lack of job rotation and equal opportunities.
16	Lack of knowledge in handling emergencies and disastrous situations.
17	Requirement of diversified expertise (Cyber security, Information technology, interface devices, data convertors, communication lines and links) other than core equipment for maintaining the service level.
18	Lack of project management skills and competencies at the same time, simultaneous operation and projects tasks given with unrealistic timelines.
19	Unable to resolve external interference problems and other typical problems not covered in the training.
20	Managerial or higher responsibilities without proper training.

21	Lack of knowledge in managing the available scarce human resources for maximum performance due to lack of soft skills.
22	Lack of operational training to develop competency on the old generation equipment even after service life expansion program in place.
23	Lack of opportunity to develop expertise on networking, operating systems, cyber security, project management etc. due to lack of in-house expertise instructors and training infrastructure.
24	Lack of external training, workshops, and seminars to keeping up-to-date knowledge on modern technology and systems well before the systems getting inducted.
25	Lack of involvements of frontline experts in policies designed for improving the performance of frontline experts.
26	ATSEP desire for recognition on all the facilities (CNS/ATM Automation) and on different makes and models.

2.1.2. Table 2 – Lack of proper workload distribution.

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Table 2: Factors that affect the job performance due to improper workload management within the available scarce competent human resources.	
1	Less human resources for core jobs but deployment in non-core areas like terminal management, security systems, airport systems, administration works, commercial, and general stores.
2	Too many additional facilities added into ANSP like RADARS, CNS/ATM automation facilities, Nav-Aids at new airports and new RWYs in the last decade, without augmenting the human and other resources.
3	No alternate/standby operational team to share the workload even at emergency.
4	Single man shift.
5	Simultaneous project supervision and maintenance activities without additional manpower.
6	Manhours spent in Cargo, Customs clearance, without proper expertise or supporting staff instead of spending time on critical maintenance works and project works.
7	Innumerable, unspecified, and unpredicted works assigned to selected ATSEP preventing their attention from core maintenance tasks.
8	Permanent combined duties due to shortage of manpower increases workload and reduces the attention in all the combined units.
9	Too many unclassified additional works in smaller airports. Essential maintenance tasks skipped.
10	Where there is electronics, there shall be an ATSEP – Belief of airport in-charges.
11	Improper and unbalanced work distribution with undue over burden and undue over leniency.
12	Additional tasks assigned by regional and or corporate head quarter in addition to local airport works. (QR preparation, tender evaluation, course development, etc..,)
13	Acceptance of inefficient manpower by management without any mitigation.
14	Lack of OEM documentation increases the workload in preparing the maintenance procedures in-house.
15	Non-utilization of technologies and machines for the installation and maintenance works and planning.

16	Managing the procurement tasks and maintenance tasks of multiple airports in addition to the local.
17	Multiple jobs of diversified nature in quick successions without notice or planning.
18	No clear demarcation of competencies so spending more time on KSC update on all areas without even having the access to the equipment and facilities. (Too many make and models)
19	Frequent failures and outages of out-lived equipment and facilities.
20	Sudden failures of the systems due to natural calamities and power supply issues.
21	Lack of training and documentation increases workload and time.
22	Approval of projects without looking into the resource's requirements like human, vehicles, and other support. Workload increases on coordinating for essential supporting resources and prevents the concentration on core project activities as well as to skip the maintenance activities of ongoing operational facilities.

2.1.3. Table 3 – Lack of proper procedures, information, tools and practices.

Table 3: Factors that affect the job performance due to improper procedures, information, tools, and practices.	
1	Poor OEM documentation on system, diagnostic procedures, site adaptable parameters and on HMI.
2	Lack of readily available spare parts and poor supply chain management makes the recovery delays after emergencies and disasters.
3	Lack of planning before maintenance works. Not adhering to the schedules if planned.
4	Too much of file works for a low-cost but immediate and essential spare procurement.
5	Insufficient logistics support and communication infrastructure to support ATSEP works, those at remote site/area.
6	Inaccurate procedures, lack of tested and validated SOPs leads to corrective maintenance delays.
7	Lack of document control and missing acknowledgement on new update on regulations and operational procedures.
8	Age and condition of supporting equipment like generators, electrical installations, air conditioners etc…,
9	Delayed flight calibration due to poor preparation and planning.
10	Delayed annual and other planned preventive and corrective maintenance due to non-availability of time for maintenance actions.
11	Non availability of calibrated working test equipment as required for the preventive as well as for the corrective maintenance.
12	Continuous changes in the scope and requirements on complex projects from the user point of view, without proper consideration from the maintenance point of view.
13	In compatible interfaces and data formats among different makes and models for integration and extending the data and voice to other ACC or APP airports.
14	Little or no-hands on training
15	Faulty equipment design and or faulty alert mechanism. Mis-leading front panel indications and irrelevant documentations. Unknown bug and or hidden deficiencies cropping up after the warranty and service agreement.
16	Frequent failures of OFC and leased lines connectivity. Non availability of near perfect cable or line diagrams for OFCs and power lines in the operational area.

17	Improper Complaint reporting mechanism by user, which do not convey the key information required for the early rectification of the equipment.
18	Annual plan for ATSEP training and development in line with the operational and competency requirements.
19	Lack of effective coordination procedures for men material movements inside the operational areas of private operator owned airports.
20	Lack of effective annual spare and capital procurement plan and related budget provisions.
21	Lack of update in the maintenance procedures, operating procedures, and maintenance philosophies in line with the technologies.
22	User requirements defined not met with the supplied system.
23	Mismatching in course development that does not make the ATSEP competent enough to address the practical field issues.

2.1.4. Table 4 – Duty duration, cycles of shifts and extended work hours.

Table 4: Factors that affect the job performance due to duty duration, cycles of shifts, late night calls and other late hour maintenance works without breaks and rests.	
1	No standardized duty pattern, duration, breaks and rest periods
2	Extra shift duties are forced due to shortage of manpower
3	Sleep loss due to irregular shift pattern or fast rotating shift pattern
4	Lack of time to family
5	Late hour calls and frequent calls after duty hours even during weekly OFFs
6	Irregular duty calls without any pattern due to shortage of manpower
7	Must report again by 0930AM even after late night breakdown calls and late-night project works.
8	Deleted
9	Deleted
10	No clear OFFs before shift pattern changes
11	Leave requests not approved
12	Forced to carryout major maintenance works only during late night and need to return to duty next day by 0930AM.
13	No refreshment breaks
14	Lack of attractive compensation for extra shift works performed
15	Odd hours and on field shift duties for women ATSEP without basic rest room facilities in the operational sites.
16	Stressful 12 hours night shift without breaks and rests
17	Continuous works including weekends during the demanding situations for meeting the special maintenance and project works along with routine operational works.

2.1.5. Table 5 – Continued stress, fatigue, and pressure.

Table 5: Factors that affect the job performance

due to continued stress, fatigue, pressure, time pressure and deadlines on multiple tasks.	
1	24H operations with stringent regulatory compliance.
2	Mostly corrective maintenance work conducted at night.
3	Repairing critical modules of the facilities that are under NOTAM
4	Safety consciousness in keeping the facilities available all the time.
5	Timeline pressure from boss, management, ATCOs, and other stakeholders.
6	Sense of expectation on out-lived equipment failures even while conducting preventive maintenance.
7	Extraordinary file work delays in getting approvals for proceeding to next stages.
8	Deleted
9	Frequent movement to and from in between ATC complex and different operational sites especially in case of ASMGCS, ILS sites and multiple RADAR sites for daily checks and maintenance work.
10	Deleted
11	Peer pressure due to evaluation and comments from colleagues who are not accountable
12	Poor workload distribution makes few carries stress, pressure, fatigue, and timeline pressure throughout without any relief.
13	Being helpless in rectifying the unit after knowing inherent flaws in the design of the equipment and its unreliability
14	*Often project deadlines are set without freezing the scopes and augmenting with necessary resources.*
15	Trouble shooting in busy working environment on live interconnected systems.
16	Always under pressure to give back the facilities within the EST of NOTAM
17	Expectations on making quick decision, in less reactive time with zero error tolerance and on fixing the system immediately.
18	Constant mind switchover between old and modern technologies, procedures, tools etc.., within the same service facilities. Different aged, make and model of equipment within a single service facility like VHF, Nav-Aids, and surveillance.
19	Unrealistic timelines due to poor planning and coordination with ATCOs before making maintenance activities.
20	Lack of knowledge and expert support while trying to fix an unfamiliar technical glitch.

2.1.6. Table 6 – Lack of knowledge sharing, leadership and team work.

Table 6: Factors that affect the job performance due to poor leadership, lack of knowledge sharing, lack of communication, and lack of teamwork.	
1	Lack of mutual performance assessment as per the roles and responsibilities assigned.
2	Lack of leadership in building relationships and establishing communication or coordination frameworks with internal as well as external stakeholders.
3	Frontline ATSEP views ignored, and not recognized as experts.

4	Lack of professional communication or poor communication on technical terms to approving authority, who is mostly a non-ATSEP.
5	Lack of mutual respect and common values among internal stakeholders. (ATCOs, ATSEP, Engineers)
6	Lack of leadership in ensuring the safety conscious among sub-ordinate, instead of being reactive and blaming.
7	Impact of changes not communicated, and individuals are reluctant to adopt.
8	Frequent changes in the team members or team lead prevents better teamwork and communications.
9	Lack of leadership in managing conflicts and ensuring team goals and safety objectives over individuals interests and goals.
10	Lack of brainstorming on handling unfamiliar situation and regular interactions for knowledge sharing.
11	Lack of leadership in handling professional disagreement with internal and external stakeholders and pass it to frontline ATSEP.
12	Lack of knowledge sharing on latest developments in local airport level and in ANSP level to frontline ATSEP.
13	Lack of delegation or poor overlapping delegation and preferences towards frontline tasks not on managerial or leadership tasks.
14	Lack of mutual respect and mentorship for knowledge and experience sharing among the generations.
15	Lack of self-learning tools
16	Lack of corrective measure in addressing the commitment levels and contributions of ATSEP.
17	Lack of guidance, information exchange, and non-participation in the discussion make the freshers isolated.
18	Lack of knowledge on critical maintenance aspects of the equipment outsourced.
19	Lack of teamwork, more dependency on individuals and collective inputs not taken by team lead for decision.
20	Lack of leadership in communicating the priorities to sub-ordinates.
21	Inhibition of valuable suggestions and ideas due to the overload of works.
22	Deleted

2.1.7. Table 7 – HRM policies.

Table 7: Factors that affect the job performance due to poor selection, human resource management policies and other organizational policies affect the motivation levels.	
1	Lack of support on career development and career plan.
2	Payment delays.
3	Deleted
4	Lack of fresh recruitments, but more retirements and induction of new equipment.
5	Uncertainty on future roles and responsibilities.
6	Sense of being unheard by management
7	Lack of competitive colleagues. People with substandard knowledge and skills are getting selected.

8	Deleted
9	Lack of motivating compensations for extra manhours spent in general maintenance, VVIP movements, project works, additional works, and additional shifts.
10	Lack of opportunity and fund provisions for innovation and carry station level smaller projects.
11	Selection criteria for inducting various levels of ATSEP for ensuring more competent people recruited in the higher levels.
12	Lack of regulatory requirements for complying standardized trainings and licencing to ATSEP
13	Lack of pride as not recognized as expert in particular field and transferred anywhere without considering the competencies acquired.
14	Salary and allowances not at par with the industry standards for the level of stress and workload.
15	Lack of scientific annual performance assessment and rewarding scheme considering the unique working environment and expected level of performance of ATSEP.
16	Lack of job rotation.
17	Lack of involvements in the discussion sessions and feedback sessions on major policy decisions.
18	Mandatory transfers
19	Lack policies and practices towards the human factors of ATSEP.
20	Behind the curtain profession
21	Gender bias and equal field works not assigned to women ATSEP.
22	No say of ATSEPs in HR policies being set for them.
23	Difference in stated corporate Mission/Vision and the ground reality.

2.1.8. Table 8 – Lack of workplace facilities and environment.

Table 8: Factors that affect the job performance due to lack of workplace facilities and environment.	
1	Lack of basic workplace facilities like parking, canteen, fixtures, rest rooms, vending machines, common transport for pickup and drop from employee quarters to workplace, etc..,
2	Lack of specific workplace facilities for women like identified rest rooms in the operational areas, Creche, childcare leave, etc…,
3	Lack of protection and guidelines while attending equipment during heavy lightning and abnormal weather conditions.
4	Below par and uncomfortable residential facilities at faraway places instead of provisions of comfortable nearby quarters with reasonable rent.
5	Travelling long distance from home to workplace as green field airports are situated at outer part of the cities and no provision of common transportation facility.
6	Lack of guidelines and provisions of PPE to ATSEP for protecting them while working at highly polluted with noise and dust, heights, closer to high power radiating radars, X-rays, etc..,
7	There is a long wait and no provision of comfortable and appropriate mode of commute to approach remote sites even though during scorching summer days.
8	Frequent exposure of high outside remote site temperature and less inside equipment room temperature in a shift.

9	Narrow space around equipment racks filled with too many wires and connections, making difficulties in accessing and replacing the modules.
10	Congested or no desk / table. Too many items placed in the control and monitoring room. No space for keeping important manuals, procedures, SOPs in most visible and accessible manner.
11	Installations at very remote places, and high mountains preventing regular visits due to resources.
12	Difficulties in trouble shooting behind the ATC consoles in general and at late night hours due to poor lighting at the behind the console.

2.1.9. Most significant issues.

Factors that affect the health
B.7.1. Frequent (change of) exposure to too low temperature in the server or equipment room and too high outside temperature.
B.7.2. No access of fresh air and sunlight for long duration.
B.7.3. Working under severe dust pollution during the project work.
B.7.4. Working under noise pollution in the airfield.
Factors that affect the attention
B.8.1. Diversified tasks during duty.
B.8.2. Monotonous monitoring for a long time.
B.8.3. Combined project and operational tasks.
B.8.4. Working in lower temperature in equipment room.
Factors that affect the response time
B.9.1. Fear on consequences of failure while trouble shooting in live system.
B.9.2. Inadequate first-hand information given by user.
B.9.3. Non availability of vehicle to reach the remote site.
B.9.4. Short of ideas; being alone.
The training that are most preferred by manager level ATSEP
B.10.1. Planning (for replacement of obsolete system) and procurement.
B.10.2. Stress and fatigue management.
B.10.3. Project management.
B.10.4. Contract management.
Most significant roadblock that prevents ATSEP in developing their competencies and expertise
B.11.1. Expected competencies in all domains of CNS/ATM systems.
B.11.2. Different make and model for each facility / system.
B.11.3. Deployment in non-core activities for longer duration.
B.11.4. Compulsory movements within the nation during service life

APPENDIX 3 COUNTER MEASURES

3.1. Introduction

C.1. Reviewing maintenance philosophies, utilizing technologies, and bringing innovation to supervise CNS/ATM systems for reducing paper works, physical visits and saving manhours.
C.2. Improving the safety job performance of ATSEP by restricting their deployment within the scope defined in DOC 10057
C.3. Pre-planning the pre-monsoon, annual and other major preventive maintenance tasks well in advance and carrying out the tasks as planned. So that sudden or total failures and long corrective maintenance works prevented
C.4. Roadblocks on procurement process can be reduced by training selected ATSEP on government compliance requirements by experts having background on the financial regulation. ATSEP those who participate in the major or repeated procurement process can be permitted to have consultants on these areas
C.5. Pro-active procurement and replacement policies in managing the out-lived equipment will reduce the stress among the key stake holders of ANSP due to their safety commitment
C.6. ANSP level scientific knowledge management on operations, maintenance, projects, and emergencies will reduce the stress significantly as ATSEP are continuously learning the latest problems and solutions and be ready with the proven techniques
C.7. By providing only optimum number of verified and validated SOPs without redundancy, the stress of restoring facilities in brief time, will reduce significantly
C.8. By limiting their stream of competency among CNS/ATM facilities, higher levels of expertise and competencies can be developed and retained.
C.9. By defining the roles and responsibilities clearly along with accountabilities, individual job performance of ATSEP will increase and in-turn over all safety performance of ANSP will also increase.
C.10. By ensuring necessary OEM documentation and support on spare that suits the maintenance philosophies of the ANSP, overall effectiveness of corrective maintenance will improve.
C.11. With regular optimum augmentation of human resource based on the existing tasks, expected retirements, and expected additional facilities, the stress and fatigue levels of ATSEP can be brought to a minimum and safety goals can be assured.
C.12. To ensure the fullest commitment of all the ATSEP on safety tasks, ANSPs must encourage the safety work culture in the working environment of ATSEP to make sure that no ATSEP is left out. ANSPs can improve safety work culture by taking the following measures:
C.12.1. Sensitizing all the stakeholders on the role of ATSEP in ATM service delivery and contributions to air safety
C.12.2. Imparting human factors training to ATSEP and explaining the safety impacts from the perspective of human factors
C.12.3. Rewarding the safety performance
C.12.4. Encouraging them to voluntarily disclose the errors committed before major shutdown to find the root causes.
C.13. To prevent the ATSEP to be complacent and getting bored on repeated tasks, ANSPs must try to engage them during shift duties constructively so that they remain engaged and remain alert to handle the unexpected. ANSPs can improve the engagement of duty ATSEP by taking the following measures.

C.13.1. Encourage innovation on routine tasks.
C.13.2. Promote research groups within the ANSP
C.13.3. Rewards and promotion based on contribution and effort
C.13.4. Assign dedicated small assignments based on the specific talents and skills.
C.13.5. Provisioning online based self-learning tools
C 13.6. Random Fault Simulation (Mock drills) and performance assessment of ATSEP based on this exercise.
C 13.7. Innovative ideas should be welcomed through brainstorming sessions with the frontline experts before making major policies and procurements of new systems.
C 13.8. By limiting their stream of competency and developing higher level expertise and competencies, national level backup team can be formed for emergency, disaster, and pandemic situation.
C.14. To keep the motivation level of ATSEP to progress continuously upward, ANSPs need to adopt the best practices in their work environment. It is a human nature to benchmark their organization and work environment with that of others. So, ANSPs need to keep adopting the best practices into the working environment. Some of the best practices that can be adopted are
C.14.1. Assessing optimum manpower requirement, recruit competent people, train, deploy and promote accordingly.
C.14.2. Following procurement policies that facilitates buying quality systems.
C.14.3. Providing working environment, with consideration to human factor issues of ATSEP
C.14.4. Conducting seminar on best practices adopted at different airports within ANSP.
C.14.5. Following HR policies that encourages recognition, appreciation, and suitable compensations.
C.15. Knowledge, skills, attitude, and competencies of ATSEP are very essential for their safety job performance. ATSEP job performance is essential for meeting the safety goals of any ANSPs. The following are among the essential competency developments on which ANSPs can focus in developing on their ATSEP.
C.15.1. Train ATSEP in human factors as per DOC 10057 in various levels that suits their technical and managerial accountabilities
C.15.2. Train ATSEP on Engineering module as per DOC 10057 that suits the ANSP roles on projects and procurements
C.15.3. Developing competency for preparing upcoming complex CNS/ATM systems' specifications.
C.15.4. Developing Communication skills for effective communications with internal and external stakeholders.
C.15.5. Developing skills for preparing detailed project reports and technical reports
C.15.6. Developing skills for analysing the external interference, external interfaces, data formats, communication protocol and communication links associated with CNS/ATM facilities.
C.15.7. Training on infrastructure as per DOC 10057.
C.15.8. Training on factory and site acceptance tests of major systems for verifying the performance of the system compliance of user requirement and tender terms and conditions.
C.15.9. Training on handling emergency and disaster situations.
C 15.10 Soft skill development to increase the productivity – project management, contract management, Teambuilding, and other relevant skills.

APPENDIX 4 ATSEP DUTY TIME LIMITATION

4.1. Introduction

As humans, we each have a unique living, breathing set of capabilities. We also have an innate set of fears: at the workplace, this can translate to fear of criticism, fear of uncertainty, and fear of harming one's career. Organizations that prioritize and strengthen employee development not only enable their workers to realize their full career potential but also foster an organizational culture of innovation.

It is no longer a surprise that people seek more from their employers than just a paycheck and a safe place to work. A preponderance of evidence suggests that "good work" also means satisfying employees' psychological needs. (Meet the psychological needs of your people--all your people | McKinsey).

"Duty working hours" means the period during which an employee is available for employment. "Duty working Hour" is an integral part of the workspace environment and a crucial factor in determining the psychological needs of an ATSEP.

There have been incidents of traffic diversions, partial or full closure of airport operations due to non-availability of safety critical Air Navigation Facilities. Accidents cannot be ruled out if the stress and fatigue issues of ATSEP are not addressed. Better workspace environments are key factors in reducing their stress and fatigue

4.2. Definitions

- Period of Duty - The period during which the ATSEP is required to carry out any task associated with the CNS/ATM service provider, includes breaks and any extension of duty.
- Operational duty - the period that an ATSEP is really using their knowledge of equipment for providing CNS/ATM service to end users.
- Night duty - A period of duty of not less than four hours between 2200 hours and 0700 hours next following in local time.

4.3. Background

Throughout the operation and maintenance work profile, an ATSEP must be vigilant and effective, prepared to handle any unanticipated circumstances that may arise, such as the effects of degradation of equipment, equipment failure due severe weather or visit to a remote place without any support. Ergo, Extreme anxiety and stress arise.

A Survey was conducted across various ANSP to analyze prevailing working hours and shift pattern which may assist us in defining the best policies and practices around the globe to make ATSEP work environment better and efficient.

From the following three graphs, it is clear that ATSEP worldwide work under difficult working environments due to a lack of duty time guidelines, which results in poor job performance due to duty duration, shift cycles, late-night calls, and other late-hour maintenance work without breaks and rests.

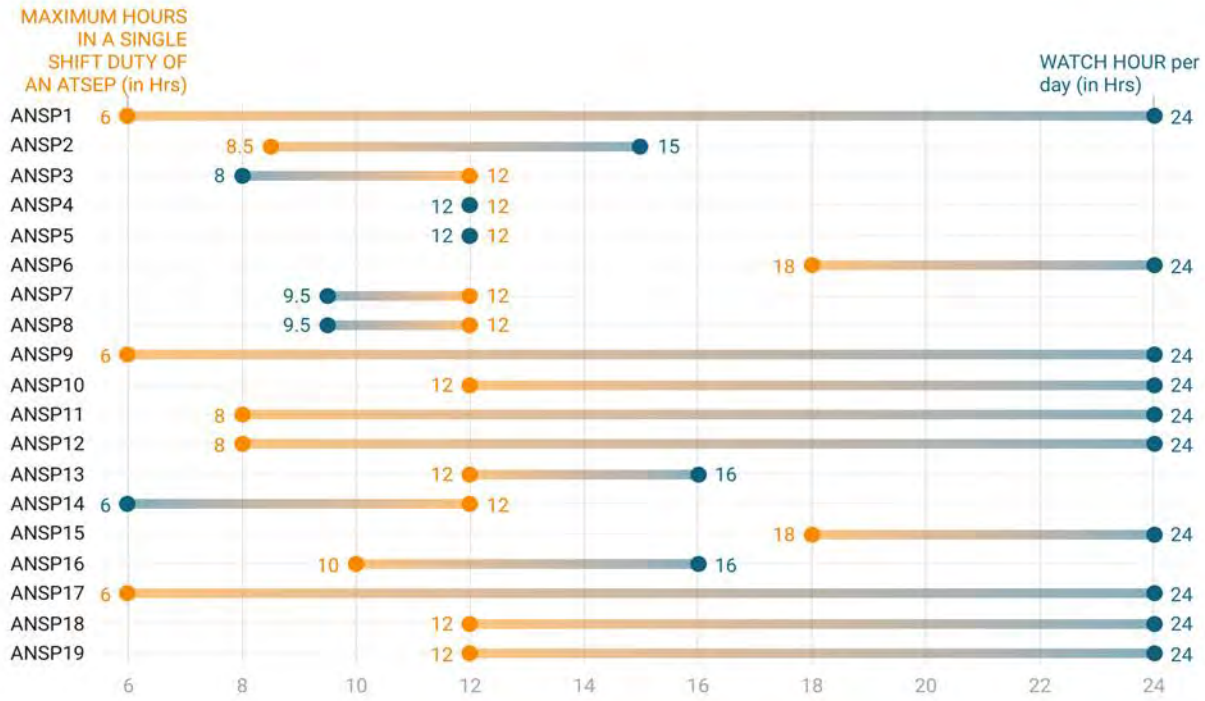


Figure 3 Plot is between "Total Watch Hour in a day" vs "Maximum Hours in a Single Shift duty for an ATSEP"

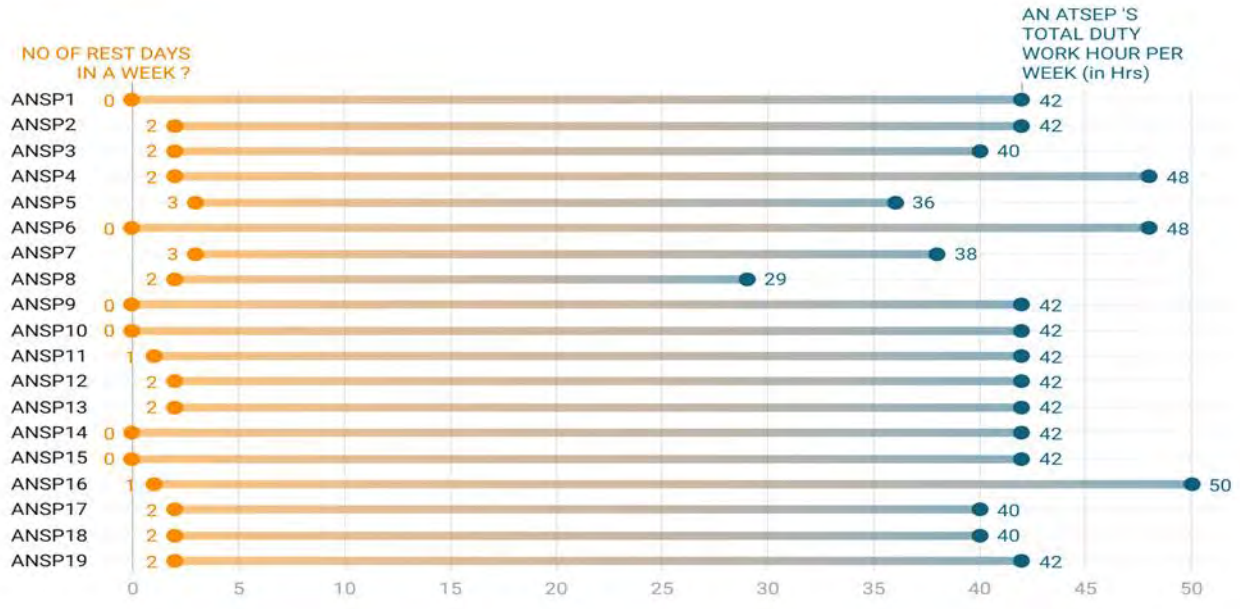


Figure 2 Plot is between "Maximum Hours in a Single Shift duty for an ATSEP" vs "Break duration during the shift" (in hours)

The Survey study found that the human performance management maturity levels of ANSPs with respect to handling ATSEP are in the exceedingly early stages and here are scopes for improvement. This global study conducted through different stages of interactions with ATSEP from different parts of the world, found significant factors that add stress and fatigue and effective countermeasures.

ICAO's Human factors training manual was taken as a fundamental reference and SHELL model and REASON's model were taken for presenting the study to all participants. PEAR model and DIRTY DOZEN models were referred for further analysis of the inputs received.

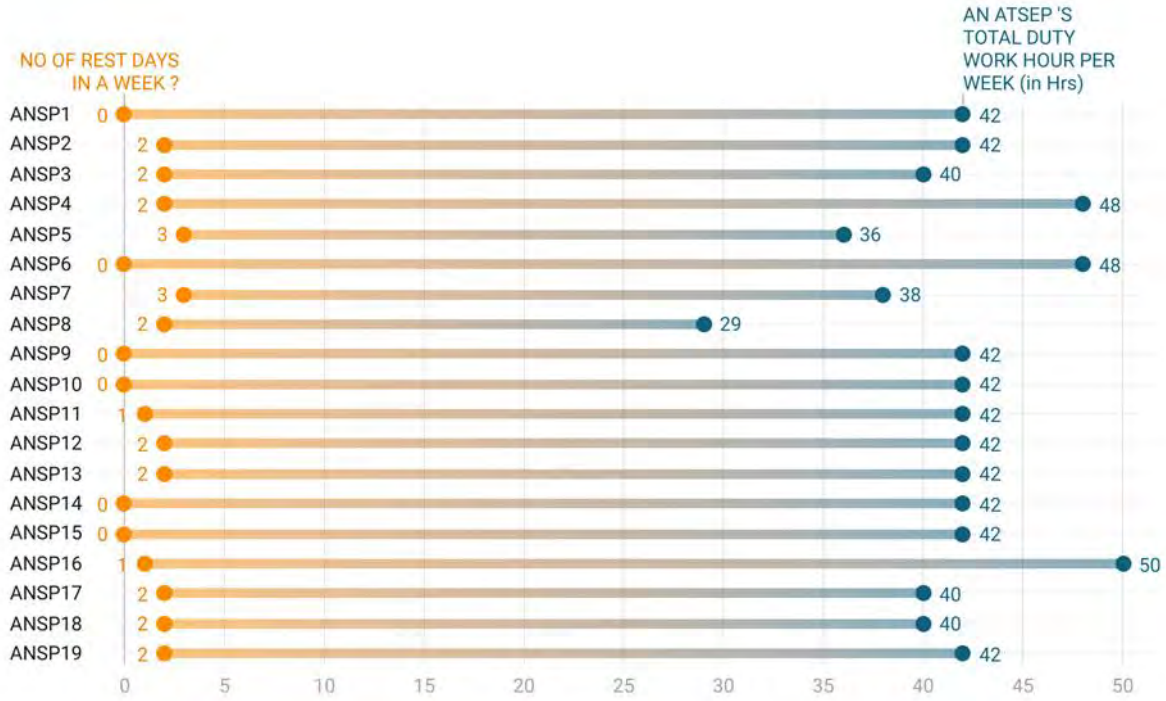


Figure 4 Plot is between "Total work hour in a week for ATSEP" vs "Number of Rest Days in a week"

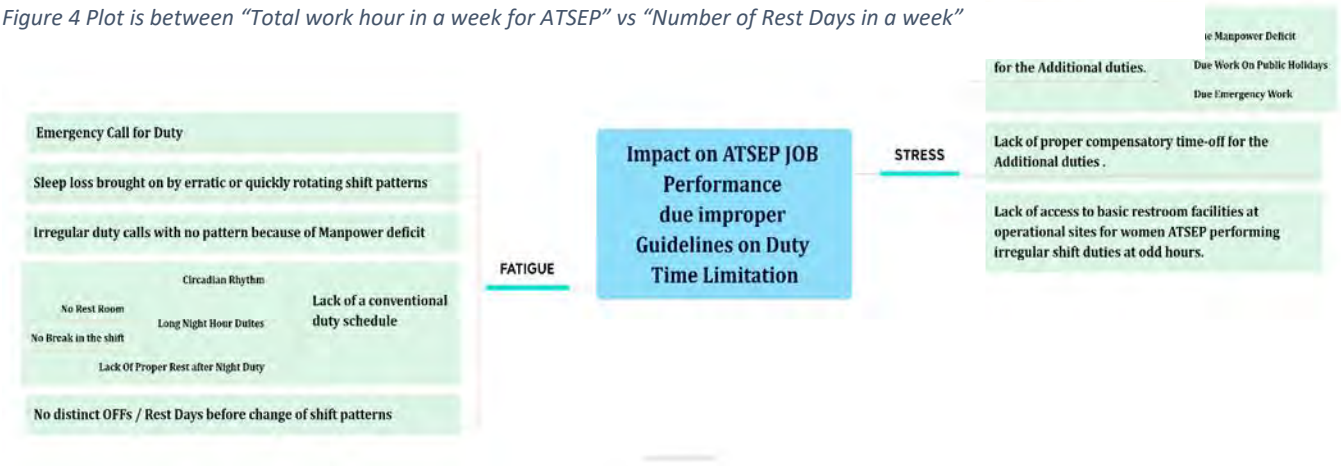
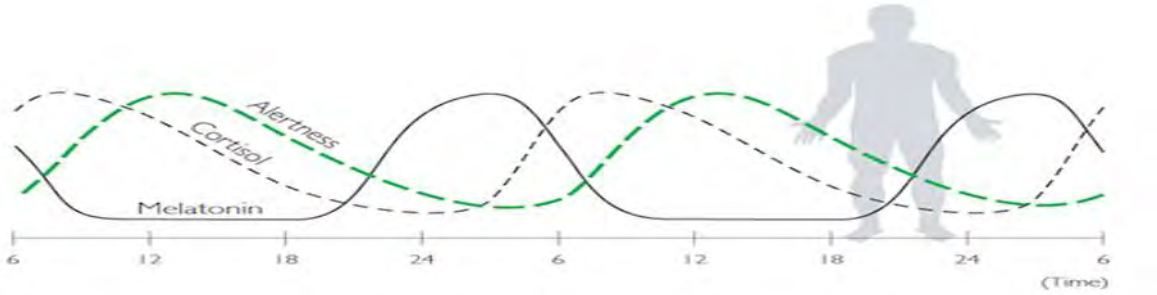


Figure 5 Impact on ATSEP Job Performance

4.4. Best Shift duty pattern

1) Circadian systems need to be considered in relation to three differing levels of organization of information and operation. First is the way in which the physical environment communicates (or 'Inputs') key information, particularly related to differentiation of night from day, to the internal 'master' clock (located in the brain's suprachiasmatic nucleus (SCN)). Second are the 'Intrinsic' brain factors, consisting of the master clock and its linked regulatory systems (notably secretion of melatonin from the pineal gland). These contribute to sleep onset, sleep architecture, sleep-wake cycles and other central nervous system (CNS)-dependent behavioral changes. Third is the way in which the circadian system coordinates all other

hormonal, metabolic, immune, thermoregulatory, autonomic nervous and other physiological processes to optimize the relationships between behavior and body functions (that is, the 'Outputs') (reference : Manipulating the sleep-wake cycle and circadian rhythms to improve clinical management of major depression).



2) The human organs are orchestrated to work in harmony with each other, generating a body rhythm that is set everyday by daylight. This rhythm is called the circadian rhythm and includes production and secretion of hormones to regulate functions such as body temperature, awareness, and immune system activity.

3) Because of the reduced traffic volume or no traffic, maintenance of CNS facilities is frequently performed at night. We are aware of this reality, but we also need to take into account factors like human factor, safety concerns

3) The most common maintenance systems/practices in use are planned, predictive, scheduled, corrective and emergency.

- Planned maintenance - Planned maintenance refers to any strategy where you plan and perform maintenance tasks before a fault occurs. Preventive maintenance is more specific.

- Predictive maintenance - Predictive maintenance is a strategy that keeps tabs on equipment's performance while it's in use using condition-monitoring technologies and methods.
- Corrective maintenance - Corrective maintenance (CM) involves the replacement or repair of equipment after it fails.
- Emergency maintenance - Emergency maintenance, also known as breakdown maintenance, is maintenance required when an asset or piece of equipment suffers an unexpected breakdown.

4) Shift work with ATSEP performance and Aviation safety

Number of successive night shifts

- The chance of errors and accidents rises with the number of subsequent night shifts; the risk is 13% greater on the second night, 25% higher on the third, and 45% higher on the fourth.
- Up to a shift cycle of seven consecutive shifts, the risk for each shift block increases with the length of the blocks and is dependent on the number of consecutive nights.
- The results agree with findings about performance reduction due to fatigue.

Shift length

- Vernon (1921, 1940) was the first to note that working twelve instead of eight hours raised the chance of an accident by a factor of 1.5 to 2
- Studies have shown that in extended shifts:
  1) Fatigue and the risk of incidents is increased
  2) Productivity is decreased
  3) Employees are longer exposed to higher stress levels
- However, Twelve-hour shifts are highly preferred by employees since they allow them more spare time by reducing the number of trips to the workplace.

Night shift

- The ability of employees to work at night is fundamentally constrained by their biological clocks and levels of activation during the day, respectively.
- Significantly decreased productivity and performance from 7 p.m. to 7 a.m.
- Human Performance found to be lower, especially between midnight and six in the morning. (2003's Folkard and Tucker).
- However, alternative and occasionally less dangerous duties are regularly carried out at night.

Shift work and productivity

- Productivity in the field of economics is defined as the ratio of the quantity and quality of units produced to the labor per unit of time
- In CNS/ATM, productivity is usually seen in safety, low amount of delays due less number of missed approaches, communication failure, equipment failure .
- Productivity is not only dependent on the right amount of arousal, but also on the number of hours worked, night work, allocation of breaks and type of roster.

Shift work and efficiency

- The term efficiency means an ability to perform well or achieve a result without wasted energy, resources, effort, time or money.
- The following are the main shift work impacts on efficiency:

  a. Shift length-varied, contained or extended,

  b. Shift starting time-staggered or rigid, matched or circadian rhythm or not,

  c. Overlapping shifts-single shifts overlap each other

  d. Break times-fixed or varied according to traffic demand,

e. Break facilities-exercise, relaxation, meals,

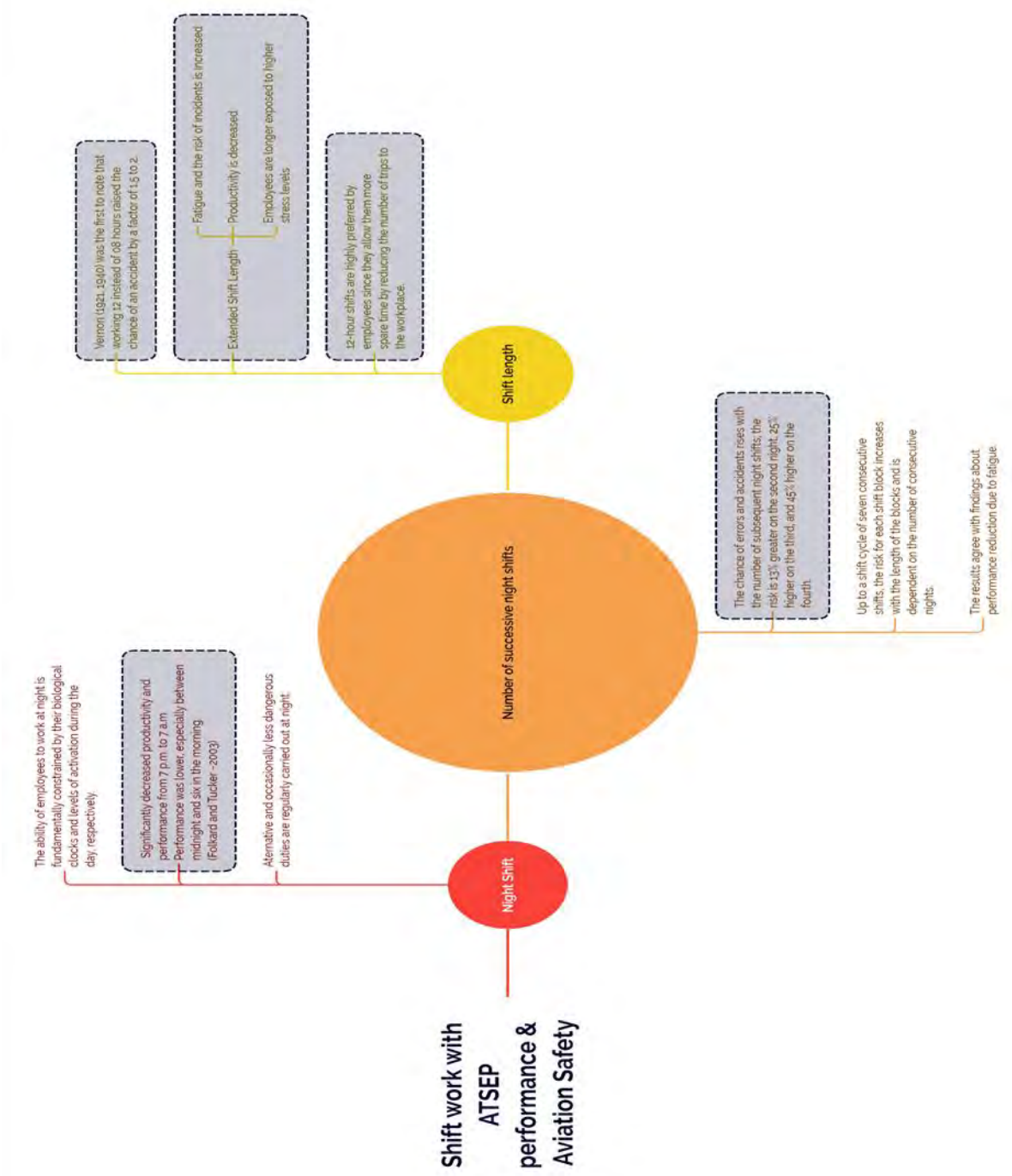


Figure 6 Shift work with ATSEP performance and safety

f. Roster cycle-short or long,

g. Roster organization-individual or team,

h. Advance notice of duty-short or long,

i. Management of time leakage

j. Management of overtime

5) Shift work design

1. Shift system design calls for a high level of expertise, knowledge, and experience on the part of the designer.

2. The design of shift systems aims to create a working-time organization that considers the company's interests (safety, productivity, and efficiency), health-affecting factors, social impairments, as well as individual preferences.

3. The specific circumstances of the work situation, the workload, its spatial and temporal distribution, the individual conditions, such as age, attitude, and social support, as well as the organizational frame, play a crucial role in the design of shift systems.

4.5. Guidelines for best shift duty pattern

Since the Air Navigation Conference held in 2012, ICAO has been exploiting a global roadmap in the aviation system block upgrades (ASBU) under its Global Air Navigation Plan (GANP), with a focus on harmonization and interoperability leading to a global air traffic management (ATM) system.

4.5.1. Guideline 1-Successive night shifts.

The number of successive night shifts should be as low as possible; it should not exceed three-night shifts in a row.

Explanation

1) Many shift workers having a schedule of five or more successive night shifts feel that their body has adapted, there is genuine adaptation of the body functions to working at night.

2) Working successive night shifts causes an accumulation of sleep deficiency with reduced sleep quality. To health damages the risk of accidents is increased due to the increasing fatigue.

3) The number of night shifts does not only affect health, but also social relations.

4) Working at night means working against the body clock. Therefore, the night shift period should be as short as possible.

5) The number of the successive night shifts should be as low as possible to avoid an accumulation of sleep deficiency and negative social consequences respectively.

4.5.2. Guideline 2 - Rest period between night shifts.

After a night shift, the rest period should be as long as possible. The resting time should not be less than 24 hours.

Explanation

1) Scientific research has shown that working night shifts carries an additional risk on top of the tasks involved in the profession. In light of this, workers ought to be given additional downtime following their night shift.

2) The ideal recovery period is 48 hours. Unfortunately, it is difficult to always keep this advice in mind when putting it into reality.

3) Night shift work is regarded as an added risk. As a result, the time spent relaxing following a night shift needs to be increased. It's important to take into account the features of cohesive leisure time.

4.5.3. Guideline 3-Coherent blocked free time at the weekends.

Coherent, 'blocked' free time at the weekend is to be preferred to single days off during the weekend),

Explanation

1) Even though the structure of the workweek is diversifying, the weekend still occupies a prominent position.

2) Most workers place a much higher value on free time on the weekends than they do during the workweek.

3) Coherent weekend free time is defined as two consecutive weekends with at least one Saturday and one Sunday being completely free. For instance, Friday and Saturday, Saturday and Sunday, or Sunday and Monday are all possible combinations.

4.5.4. Guideline 4-Number of free days.

Shift workers should have more free days per year than employees on day duty.

Explanation

1) Working on the weekends and on holidays should be compensated with leisure time even with a continuous production method.

2) Additionally, compensating for the added stress brought on by working night shifts.

3) The payment should be made in the form of free time. Additional free days are to be offered based on the number of night shifts.

4.5.5. Guideline 5-Shift rotation pattern.

Unfavourable shift sequences are supposed to be avoided. Forward rotation is preferable.

Explanation

1) According to ergonomic research, workers who rotate their shifts forward (early, late, and night shifts) generally experience less health problems than those who cycle their shifts backward (night, late, early, shift).

2) In systems with a forward rotation, the rest periods between shifts are typically longer.

4.5.6. Guideline 6-Early shift.

The early shift is not supposed to start too early.

Explanation

1) The early shift is not intended to be only a portion of the night shift. They must wake up at 3:30 in the morning in order to begin their shift at 5:30 in the morning because many employees today frequently have long commutes to work.

2) It has been observed that workers who work the early shift do not often retire much earlier. Many people also worry about not waking up on time.

3) This causes a significant sleep deficit, particularly in long-rotated systems.

4.5.7. Guideline 7-Night shift length.

Night shifts should finish as early as possible.

Explanation

1) This advice is based on the discovery that the times of daytime sleep are related to the time of sleep onset.

2) The likelihood of sleeping for a longer period of time increases with earlier sleep onset.

3) Due to their body clocks, most employees awake around midday after night shift.

4) The length of their sleep varies depending on when they first fell asleep.

4.5.8. Guideline 8-Concentration of working hours restriction.

The concentration of working days or working hours on one day is supposed to be restricted.

Explanation

1) Experience has shown that shift arrangements with a significant amount of free time are quite appealing to the workers.

2) The concentration required during work hours must be sacrificed in order to have extended periods of free time.

3) Many shifts must be completed without a break on days off in order to obtain extensive free leisure periods.

4.5.9. Guideline 9 - Notification of rosters.

1) Employers must provide the roster at least seven days' advance.

2) Prior to the start of a shift, an employer must give employees at least 48 hours' notice of the start time due change in roster.

3) Employees should receive financial compensation if prior notice is not possible with at least 48 hours' notice.

4.5.10. Guideline 10 - Rest in Night Shift / Single Shift.

1) An employee shall be allowed periods of rest from operational duties in accordance with occupational health and safety principles (fatigue risk management assessment and screen-based work).

2) The ANSP shall monitor the occupational health and safety element of shift lengths and operational duty requirements for the provision of breaks on safety and risk assessments in circumstances when only single-person staffing is offered or on night shifts

4.5.11. . Guideline 11 - Emergency Duty.

1) Emergency Duty: employees may be required to work emergency duty, that is, work in circumstances where they are recalled to work in order to meet an emergency at a time when the employee would not ordinarily have been on duty and notice of which was not given prior to an employee's ceasing duty on the previous shift.

   Proper rest should be given to the employees

4.6. References

1) The circadian rhythm in balance (parans.com).

2) Manipulating the sleep-wake cycle and circadian rhythms to improve clinical management of major depression | BMC Medicine | Full Text (biomedcentral.com).

3) Human Factor of ATSEP.

4) IFATSEA Mastermind group discussion.

5) ICAO Asia Pacific meeting for preparation of human factor guidance material for ATSEP.

APPENDIX 5 MEASURES DURING PANDEMIC

5.1. Introduction

Coronavirus disease, often known as Covid-19, is an infectious & contagious disease, that took the world in its grip like a wildfire. The virus (Corona Virus) was initially discovered in Wuhan, China, in 2019. Covid-19 was declared a global pandemic by the World Health Organization in March 2020. True to the nature of Pandemics, Covid-19 swept the Civil aviation off its feet and in turn threatened to destroy the world economy by sheer disruptive impact. No doubt that, it was a devastating year for the aviation industry. Since then, the International Civil Aviation has been trying to limp back to normalcy. Considering the current dependence of world economy on aviation, it can be safely said that the sooner Civil Aviation acquires normalcy the better it will be for Global economy. However, seeing the crisis from only Economic perspective and ignoring the Human angle may generate a wrong perception. Such erroneous perception may lead to mitigation methods that are bereft of Human factors.

The Civil aviation is supported by the Pilots, ATCOs, AMEs and the common binding force connecting all of them: the ATSEP. Needless to say, that there should be measures taken in order to preserve this workforce to enable it to operate at full efficiency and in turn ensure Safe, Timely and Efficient Civil Aviation. We have to also consider the fact that Covid-19 may not be the last pandemic to hit mankind. That means that we have to be on a lookout for the minute symptoms and remain in a state of preparedness to ensure that the Covid- induced glitch remains an isolated phenomenon.

5.2. Backdrop of the Paranoia: Fear psychosis behind Covid- 19

In the case of COVID-19, it has been a suffering on the part of ANSPs and the ATSEPs as well. Whereas for ANSPs the pandemic has meant considerable loss on the economic front as well as on the Personnel front. So many precious lives have been lost and many others have been scarred for life.

1. Fear of Contracting the Disease while performing Operational duties. In order to cover the Medical, Cargo, Repatriation flights ATSEPs had to be on active duty, however the atmosphere of fear was always there.

2. Airline staff/ Traffic hands coming with Physical FPL, NOTAM Broadcast messages etc. This is an interaction which has been unavoidable due to the existing methods of operation. But at the same times, such methods mean that the Covid-19 protocols were to be ignored at times.

3. Being alone on duty- No one to share load/ feelings etc, giving rise Negative Emotions & thoughts. ANSPs resorted to Single person duty in order to ensure maximum Physical separation. However, this move resulted in personnel performing duties alone and hence battling negative emotions.

4. Worry about risk to family members. Every operational duty person was worried about the possible risk to family members especially when the Office atmosphere was not totally risk free.

5. Reduction in Opportunity for knowledge/ skill enhancement- especially in Classroom environment. Technical personnel are more used to classroom trainings and physical interaction with Instructors/ Mentors.

6. Reduction in Salary and continuous fear of Layoffs. ANSPs in general opted for reducing the salary of the staff in order to cut the losses in view of the economic slowdown arising out of State enforced lockdown and Pandemic situation.

7. Delay in Arrangement of Sanitization, Arrangement of Vaccines despite being Frontline workers. ATSEPs functioned as frontline workers during Pandemic. But when vaccinations were being arranged, the frontline worker tag was conveniently taken away.

5.3. The Mitigation measures to be taken during Pandemic

1. Provision of Adequate and quality preventive measures at Offices (Sanitizers, masks, PPE etc). A happy and confident worker is an efficient worker. Immediate address of safety concerns of ATSEPs with respect to contracting disease on duty can be mitigated and services be utilised in efficient manner.

2. Technical strive to reduce handling of physical papers, this will ensure suitable follow of Covid-19 protocol which very clearly mentions maintaining Physical distancing.

3. Raising Awareness among ATSEPs by displaying Posters with messages, Dos/ Don'ts etc. By suitable display of Placards/ posters, the ATSEPs can be educated about the methods to keep oneself safe and free from the disease.

4. Ensure Clean & hygienic Office Environment. A clean and hygienic office atmosphere can go a long way in ensuring mitigation of any pandemic: be it Covid or any other in future.

5. Pre-order sufficient Sanitizers, masks etc. By ensuring proper and sufficient supply of preventive supplies, fear psychosis can be dealt with.

6. Regular and mandatory Counselling Sessions for ATSEPs. Though posters and placards help to educate the personnel, it is required to carry out regular counselling of ATSEPs regarding the preventive methods.

7. Active engagement of Non-Operational staff in monitoring the situation & liaison with state/ medical organizations. Coordination with the National level Medical Organizations

8. Consider whether a Face-to-Face meeting is must or Teleconference could be sufficient.

5.4. The future course of Action

The pandemic struck and wreaked havoc all around. Now what?? We need to embark on a continuous process to mitigate and to remain prepared for any such Pandemic- like situation that may occur in future.

1. Assessing the priorities within the aviation sector. The ANSPs need to set the priorities right. In the event of any future Pandemic, the ANSP must prioritize the Physical and Mental health of the ATSEP. This will be a win-win situation for both- ATSEP and ANSP. As the ANSP would be able to sustain the critical operations by ensuring Physical and Mental well-being of the ATSEP. Since the maintenance of CNS-ATM systems is the prime responsibility of ATSEP, effort should be made to minimize the exposure of ATSEP to risky environment in Pandemic situation.

2. Identifying human factors and human performance related risks. Pandemic like situations tend to leave permanent scars in the mind of the survivors. It may also result in loss of confidence of the personnel who have gone through these situations. It is important to address such issues by carrying out confidence building methods.

3. Identifying potential indicators for monitoring the COVID-19 situation and Monitoring of occurrences and trends. Proactive monitoring may be a domain of the State health agencies, but by suitable liaising with the State agencies, the preparedness condition can be enhanced.

4. Reporting systems and documenting lessons learned. Once the effect of Pandemic has been dealt with, it becomes very important to prepare for any such eventuality in future. The pandemic has taught many humane values and critical lessons. These must be incorporated in Human factor considerations.

5. Planning for the restart of operations. This step involves many sub-plots that work towards ensuring a proper restart of aviation after the ill effects of the pandemic:

- Design a restart/ relaunch framework.
- Take steps to build confidence among the end users and the technical experts (ATSEPs).
- Safeguarding the health of personnel.
- Review of the demand-supply chain. How much to start full fledged and how much to operate at a degraded level.
- Handling the restart with a Human touch.
- Sustaining the values learnt from pandemic crisis and planned investing in recovery

5.5. References

1. Human factors of ATSEP: Factors & Counter measures.

2. https://www.icao.int/covid/cart/Pages/CART-Take-off.aspx

3. Brainstorming sessions of Mastermind group.

4. Brainstorming sessions of APAC workgroup of HF guidance material preparation.

APPENDIX 6 PROGRESSIVE TRAINING

6.1. Introduction

ATSEP (Air Traffic Safety Electronics Personnel) is the recognized terminology used for personnel competent in the installation, operation, and maintenance of a CNS/ATM system. ATSEPs are those technical specialists working to provide and support the electronics and software which enable ATS systems to function. ATSEP comprise engineers, technicians, and computer hardware and software specialists who are responsible for the specification, procurement, installation, calibration, maintenance, testing and certification of ground electronic systems used to help control aircraft movements. ANSP has the responsibility to define the scope of ATSEP activities and it must be approved by appropriate authority. A competency-based training and assessment program for ATSEP has already been established which is recommended for the training of ATSEPs by ANSPs. Lately Aviation fraternity has taken cognizance of the role played by ATSEP in delivering safety and of their role in the safety chain. At a time of increasing complexity of the air traffic system, it is important to minimise the risk arising from technical and engineered systems, and to ensure their correct functioning.

In this context, ICAO has specific documents recommended for preparation of CBTA training material for ATSEPs namely Doc 9868 (PANS- TRG) and Doc 10057 (Manual of ATSEP CBTA). ANSPs are expected to design ATSEP training programs based on the above referenced Docs.

6.2. Background of ATSEP training

1. The scope of activities performed by ATSEPs is of a wide variety: knowledge skills and aptitude required in fields of Electronics, Computers, and network, however not limited to these. At the same time level varying from Technician to maintenance engineer and going up to High level engineering. Working in such varied CNS/ATM systems requires a wide Range of competencies and expertise.

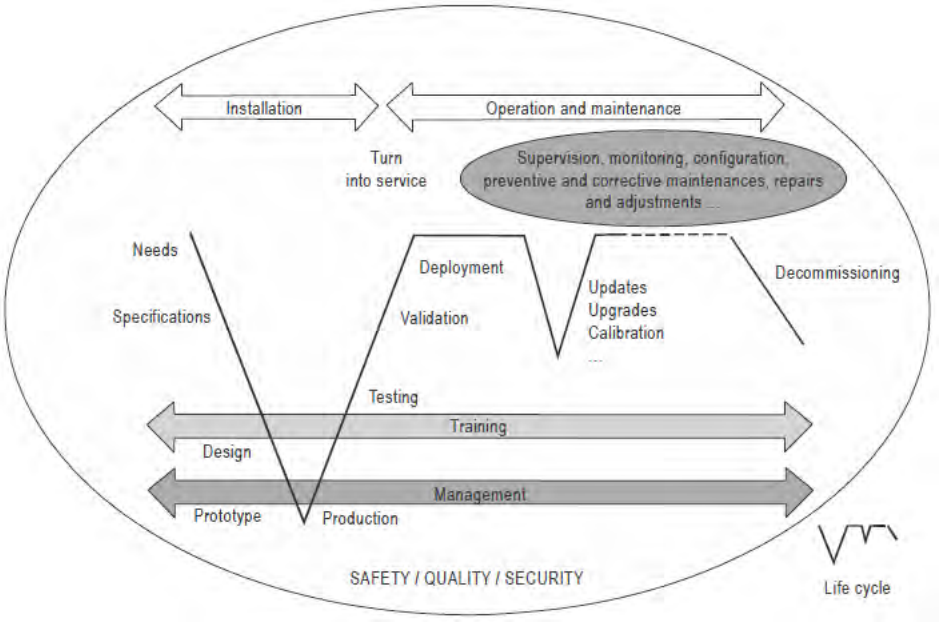


Figure 7 ATSEP scope of work

2. The Training Phases of ATSEPs can be organized into five phases namely: Selection, Initial Training, Unit Training, Continuation training, and Development training.

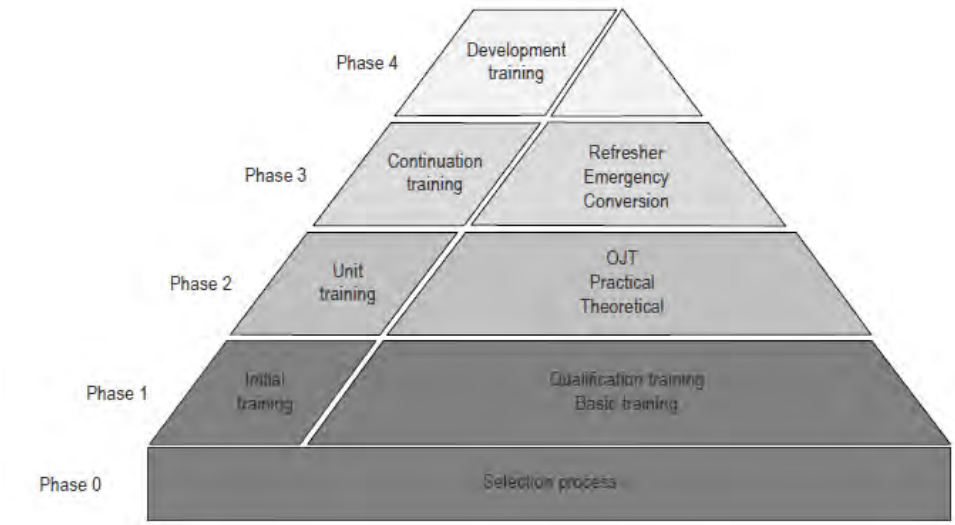


Figure 8 Phases of training

3. The ATSEP training path and its progression is also well taken care of by the Doc 10057. It defines the training requirements in the event of Change within the system; Change of domain; Change of activities, and inclusion of any additional system. The ATSEP training progression can be depicted through the appended figure.

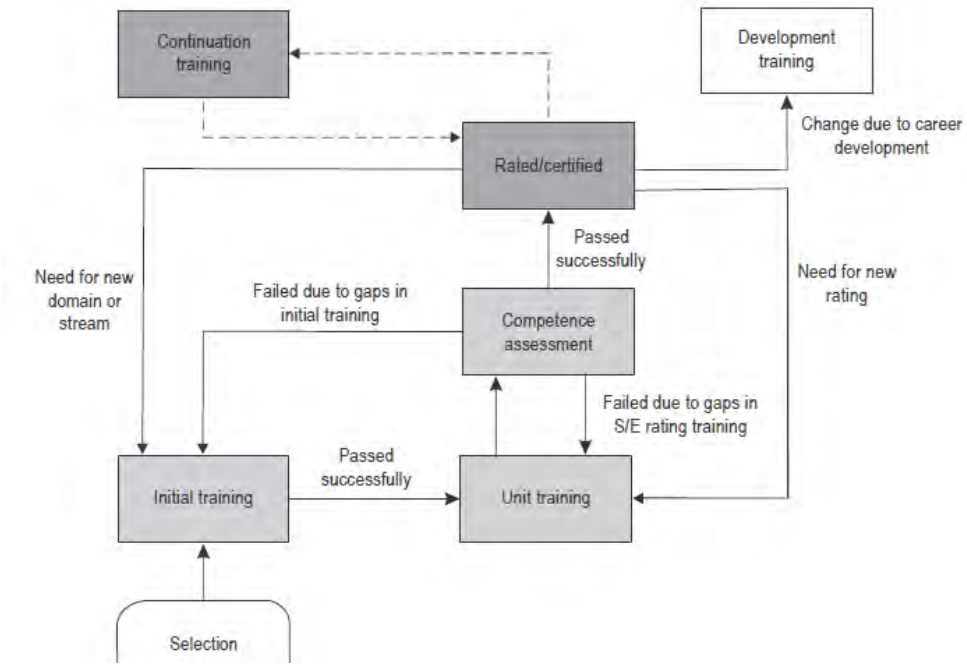


Figure 9 ATSEP training path

6.3. The Roadblocks to complete adoption of the Docs 9868 & Doc 10057

1. Trainee is required to be taken out from normal duties for imparting training.

2. Exorbitant Training Cost in terms of infrastructure and training Man-hours as well.

3. Maintenance perils of Training on live equipment (at centres other than Dedicated training Centres).

4. Communication gap between ATSEP, ATCO and Pilot in terms of facilities being available for Operation or withdrawn for training purposes.

5. Lack of awareness regarding Airborne equipment and its functions.

6. Maintain the competency by continuous assessment and measurement of the performance criteria

6.4. How can these roadblocks be addressed

1. Simulation and real-life based experiments with the live systems.

2. Build a repository of questionnaire and update frequently to have a training infrastructure which is not system- dependent.

3. Maintaining centralized general log and fault logs.

4. System wide information management- Access to all kinds information from OEM to all levels of ATSEP i.e. CNS/ATM system issues from installation to commissioning, operational and maintenance issues, faults and their solutions. Seamless access to procedures, standards and recommendations of CNS/ATM related information.

5. ATSEP should have a knowledge of ATM operational environment and the exact application of facilities being provided.

6. Unit level training on operational equipment and on a backup system.

7. Collection and analysis of the system logs from time to time.

8. Refresher courses and proficiency checks.

6.5. References

1. Doc 10057.

2. Doc 9868

3. Brainstorming sessions of APAC workgroup of HF guidance material preparation

3. Brainstorming sessions of Mastermind group.

APPENDIX 7 STRESS MANAGEMENT

7.1. Introduction

Stress is the psychological and physical state that results when the resources of the individual are not sufficient to cope with the demands and pressures of the situation. Thus, stress is more likely in some situations than others and in some individuals than others. Stress can undermine the achievement of goals, both for individuals and for organizations.

Stress at workplace, changes in the work environment has led to a change in the balance between physical and mental activity. Technological developments have reduced the amount of heavy physical work. Mental and emotional strain have increased in new working environments that are characterized by lack of time, more uncontrollable factors, background distractions, lack of space, general uncertainty, and more administrative work.

Stressors are the agents which trigger the various stress reactions. Today's environment provides physical, emotional, and mental stressors that set off the initial alarm reaction. Physical stressors in factories are usually linked to noise and physical and chemical hazards. Emotional or mental stressors can be unpleasant or pleasant. A promotion can be just as stressful as the loss of a position. Stressors are additive and can build up. The way in which people are affected depends on their values, experience, and adaptability. A single stressor can become compounded if elements of the established support system fail-for example, if a car breaks down on the way to an important meeting.

7.1.1. Process of stress – Three stages

7.1.1.1. Alarm reaction.

This is the immediate response to a challenge or threat. Mobilisation of the autonomic nervous system triggers the stress response ("fight or flight" response). The various body systems involved coordinate the readiness for action, influencing mood (limbic system), the regulation of the cardiovascular system, breathing, muscle tension, and fine motor activities.

7.1.1.2. Resistance stage.

The alarm reaction cannot be maintained indefinitely, and longer exposure to stressors causes people to reach the resistance stage. In this phase people develop a "survival" strategy and a way of fighting against the response the stressor has initiated. Coping mechanisms may be adequate or inadequate. People tend to prefer short term relief to long term solutions and try to escape uncomfortable situations with a quick remedy. Unfortunately, most easy, short term measures are inadequate because they usually lead to secondary problems such as long-term reduction in performance. People need help to identify measures that can lead to long term benefit.

7.1.1.3. Exhaustion stage.

The stress response is healthy in origin and is necessary to keep a person motivated and adaptable. It is when the demands on body and mind are too high or cannot be met in an appropriate way that the person becomes "distressed." Prolonged stress can lead to chronic problems, ultimately an exhaustion of all reserves and energies and even frank depression.

7.1.2. Causes of stress at working situations.

Stress is often related directly to the job specifications and working environment or to relationships with people at work, or a combination of both. Conflicts with managers, subordinates, or colleagues may increase as work becomes more pressured. Smaller workforces

are expected to do the same or more work, and there is a widespread lack of training in communication and interpersonal skills. Some of the stress also relates to the identification of a person's role.

7.1.2.1. Stressors in the working environment.

- Uncertainty and lack of control (low job discretion)
- Lack of support from others including co-workers
- Extreme demands of working environment-long hours, high responsibility, commitment
- Very low demands leading to boredom, lack of meaning in work
- Workstation-noise, poor lighting, lack of space, extreme temperatures poor ergonomics
- Chemical hazards, fumes, passive smoking
- Repetitive tasks

7.1.3. Consequences of stress.

Table 4 Consequences of stress

Physical disorders	**Emotional disorders**	**Mental dysfunction**
Tension headaches, migraines irritable bowel syndrome Impaired resistance-Colds and other "viral" illnesses Potentiation of asthma, dermatitis, psoriasis, backache "Gastritis" High blood pressure	Depression Suicidal ideation Anxiety syndrome	Accidents or near accidents Loss of clarity of thought Reduced performance Difficulty in concentrating- "Small" but important things are forgotten or mislaid Increase in mistakes and excuses Increase in misunderstandings at work and at home Sudden loss of short-term memory

7.1.4. Symptoms of Stress.

Frequent headaches, jaw clenching or pain	Excess anxiety, worry, guilt, nervousness
Gritting, grinding teeth	Increased anger, frustration, hostility
Stuttering or stammering	Depression, frequent or wild mood swings
Tremors, trembling of lips, hands	Increased or decreased appetite
Neck ache, back pain, muscle spasms	Insomnia, nightmares, disturbing dreams
Light headedness, faintness, dizziness	Difficulty concentrating, racing thoughts
Ringing, buzzing or “popping sounds	Trouble learning new information
Cold or sweaty hands, feet	Forgetfulness, disorganization, confusion
Dry mouth, problems swallowing	Difficulty in making decisions

Frequent colds, infections, herpes sores	Feeling overloaded or overwhelmed
Rashes, itching, hives, "goose bumps"	Frequent crying spells or suicidal thoughts
Unexplained or frequent "allergy" attacks	Feelings of loneliness or worthlessness
Heartburn, stomach pain, nausea	Little interest in appearance, punctuality
Constipation, diarrhoea, loss of control	Nervous habits, fidgeting, feet tapping
Difficulty breathing, frequent sighing	Increased frustration, irritability, edginess
Sudden attacks of life-threatening panic	Overreaction to petty annoyances
Chest pain, palpitations, rapid pulse	Increased number of minor accidents
Frequent urination	Obsessive or compulsive behaviour
Social withdrawal and isolation	Reduced work efficiency or productivity
Constant tiredness, weakness, fatigue	Lies or excuses to cover up poor work
Frequent use of over-the-counter drugs	Rapid or mumbled speech
Weight gain or loss without diet	Excessive defensiveness or suspiciousness
Increased smoking, alcohol or drug use	Problems in communication, sharing
Excessive gambling or impulse buying	

7.2. Stress Management

There are known effective ways how the stress can be managed. However, everyone cannot handle the stress in the same manner as their personality differs from that of the others. Let us discuss these points and the benefits of the active stress management further.

7.2.1. Human Nature and Individual Differences.

Personality psychology is partly about what makes everyone the same and partly about what makes people differ from each other. That is, personality theories are partly statements about human nature. Of the great many viewpoints that have been taken on human nature, two appear particularly relevant to stress and coping i.e. biological models and goal-based models.

Personality also concerns individual differences. Individual differences can be found on any dimension imaginable, but the five-factors widely adopted as a consensual framework. The five factors are most labelled extraversion, neuroticism, agreeableness, conscientiousness, and openness to experience.

It will also be useful to have a sense of some of the ways in which people differ and expectations of how those differences may play a role in coping

7.2.1.1. Human Nature.

7.2.1.1.1. Biological Models.

An increasingly influential perspective, not just in personality but in all of psychology, treats humans as biological entities. From this view, it is desirable to develop a clear understanding of the basic properties of animal self-regulation and of how those properties are manifested in human behaviour. We focus here on three properties: the tendency to approach desirable objects and situations (e.g., food), the tendency to avoid dangerous objects and situations (e.g., predators), and the capacity to regulate the approach and avoidance tendencies.

Biological models assuming approach and avoidance temperaments have acquired a good deal of influence over the past decade. They hold that approach and avoidance systems are supported partly by distinct brain areas, and that the sensitivity of each system (which varies among persons) influences behaviour in response to environmental reward and threat cues.

Effortful control can override impulses stemming from the approach and avoidance systems. It acts as a supervisory system, provided sufficient mental resources are available. This confers many advantages, including constraining emotions and permitting the organism to plan for the future and take situational complexities into account in behavioral decisions. Effortful control is a construct from developmental psychology, but its features closely resemble those of adult self-control: the ability to override impulses to act and the ability to make oneself undertake or persist in difficult, uninteresting, or unpleasant tasks.

Approach and avoidance systems, together with a supervisory system able to reorder the priorities they pursue, form the core of a biological model of human nature. They also form the core of a conceptually distinct but complementary view of human nature.

7.2.1.1.2. Goal-based models.

From this perspective, knowing a person means knowing the person's goals and values and the relations among them. In goal-based theories, it is important to distinguish between motivational processes aimed at moving toward goals and those aimed at staying away from threats.

A desired goal has a positive incentive value that pulls behavior to it. Looming harm or pain has a negative incentive value that pushes behavior away from it. Sometimes only approach or avoidance is engaged. Sometimes they conflict, as when moving toward a goal also increases possibility of harm. Sometimes they work together, as when attaining a desired goal simultaneously forestalls something the person wants to avoid. Goal-based models also typically incorporate an expectancy construct: a sense of confidence or doubt that a given outcome will be attained successfully.

People sometimes give up or scale back on goals they have been pursuing. It is sometimes important to relinquish goals, though the process of doing so involves feelings of sadness and despair. An alternative to giving up is scaling back. This is disengagement in the sense that the initial goal is no longer operative. It avoids complete disengagement, however, by substituting the more restricted goal. This accommodation thus keeps the person involved in that area of life, at a level that holds the potential for successful outcomes.

Issues of goals and threats are important to understanding the structure of stressors. Issues of goal engagement and disengagement are important to understanding the structure of coping, as are issues of positive and negative expectancies for the future.

7.2.1.2. Individual Differences.

7.2.1.2.1. Extraversion.

As is true of several traits, extraversion has different emphases in different measures. Sometimes it is based in assertiveness, sometimes in spontaneity and energy. Sometimes it is based in dominance, confidence, and agency, sometimes in a tendency toward happiness. Extraversion is often thought of as implying sociability.

7.2.1.2.2. Neuroticism.

The second factor, neuroticism, concerns the ease and frequency with which a person becomes upset and distressed. Moodiness, anxiety, and depression reflect higher neuroticism. Measures often include items or facets pertaining to hostility and other negative feelings, but they are dominated by vulnerability to experiences of anxiety and general distress. Neuroticism has been linked to the avoidance temperament discussed above, suggesting that anxiety and sensitivity to threat is indeed its emotional core.

7.2.1.2.3. Agreeableness.

Agreeable people are friendly and helpful, empathic, and able to inhibit their negative feelings. Agreeable people get less angry over others. At the opposite pole is an oppositional or antagonistic quality. People low in agreeableness use displays of power to deal with social conflict. Agreeableness as a dimension is often characterized as being broadly concerned with the maintaining of relationships.

7.2.1.2.4. Conscientiousness.

Agreeableness and conscientiousness appear to share an important property. Both suggest breadth of perspective. Many manifestations of conscientiousness imply broad time perspective: taking future contingencies into account. Agreeableness implies a broad social perspective: taking the needs of others into account.

7.2.1.2.5. Openness to experience.

It involves curiosity, flexibility, imaginativeness, and willingness to immerse oneself in a typical experience.

7.2.2. Relations Between Personality and Coping.

People respond to perceptions of threat, harm, and loss in diverse ways. Coping is often defined as efforts to prevent or diminish threat, harm, and loss, or to reduce associated distress.

Extraversion, grounded in an approach temperament, involves sensitivity to reward, positive emotions, sociability, assertiveness, and high energy. Strong approach tendencies and assertiveness should provide the energy required to initiate and persist in problem; positive affect should facilitate cognitive restructuring; and an orientation toward others and access to a social network should facilitate social support coping.

Neuroticism, grounded in an avoidance temperament, reflects tendencies to experience fear, sadness, distress, and physiological arousal. Given this vulnerability to distress, neuroticism should lead to emotion-focused coping and disengagement from threat. Disengagement may be reinforced through short-term relief of distress this relief may reduce motivation to return to the stressor, thus minimizing engagement coping. Furthermore, the mere presence of intense emotional arousal can interfere with the use of engagement strategies that require careful planning. Negative affect should also make positive thinking and cognitive restructuring difficult.

Agreeableness involves high levels of trust and concern for others. Because those high in agreeableness tend to have strong social networks, agreeableness may predict social support coping. Openness to experience involves the tendency to be imaginative, creative, curious, flexible, attuned to feelings, and inclined toward new activities and ideas. These tendencies may facilitate engagement coping strategies that require considering new perspectives, such as cognitive restructuring and problem solving, but may also facilitate use of disengagement strategies such as wishful thinking.

Optimism involves the expectation of good outcomes and an engaged approach to life, apparently reflecting the belief that good outcomes require some effort. These characteristics suggest that optimism will relate positively to engagement types of coping, such as problem solving and cognitive restructuring, and inversely to avoidance or disengagement coping. Pessimism involves the expectation of bad outcomes, which should promote distress and disengagement coping.

7.2.3. Benefits of active stress management.

If you're living with high levels of stress, you're putting your entire well-being at risk. Stress wreaks havoc on your emotional equilibrium, as well as your physical health. It narrows your ability to think clearly, function effectively, and enjoy life.

Effective stress management, on the other hand, helps you break the hold stress has on your life, so you can be happier, healthier, and more productive. The ultimate goal is a balanced life, with time for work, relationships, relaxation, and fun—and the resilience to hold up under pressure and meet challenges head on.

7.2.4. Steps involved in the minimization of the stress.

7.2.4.1. Identify the sources of stress in your life.

Stress management starts with identifying the sources of stress in your life. This isn't as straightforward as it sounds. While it's easy to identify major stressors such as changing jobs, moving, or a going through a divorce, pinpointing the sources of chronic stress can be more complicated. It's all too easy to overlook how your own thoughts, feelings, and behaviours contribute to your everyday stress levels. Sure, you may know that you're constantly worried about work deadlines, but maybe it's your procrastination, rather than the actual job demands, that is causing the stress. A stress journal can help you identify the regular stressors in your life and the way you deal with them. Each time you feel stressed; keep track of it in your journal. As you keep a daily log, you will begin to see patterns and common themes.

7.2.4.2. Address the unhealthy coping strategies.

Think about the ways you currently manage and cope with stress in your life. Your stress journal can help you identify them. Ensure your coping strategies healthy and helpful. If any of the following is a stress coping strategy of yours, then it is neither healthy nor helpful. Smoking, using pills or drugs to relax, Drinking too much, Withdrawing from friends, family, and activities, Procrastinating, Sleeping too much and Taking out your stress on others. If your methods of coping with stress aren't contributing to your greater emotional and physical health, it's time to find healthier ones. No single method works for everyone or in every situation, so experiment with different techniques and strategies. Focus on what makes you feel calm and in control.

7.2.4.3. Managing predictable stressors.

While stress is an automatic response from your nervous system, some stressors arise at predictable times your commute to work, a meeting with your boss, or family gatherings, for example. When handling such predictable stressors, you can either change the situation or change your reaction. When deciding which option to choose in any given scenario, it's helpful to think of the avoid, alter, adapt, or accept.

7.2.4.3.1. Avoid unnecessary stress.

It's not healthy to avoid a stressful situation that needs to be addressed, but you may be surprised by the number of stressors in your life that you can eliminate. Know your limits and stick to them. Distinguish between the "should" and the "musts". Drop tasks that aren't truly necessary to the bottom of the list or eliminate them entirely. Avoid people who stress you out. Take control of your environment.

7.2.4.3.2. Alter the situation.

If you can't avoid a stressful situation, try to alter it. Often, this involves changing the way you communicate and operate in your daily life. Express your feelings instead of bottling them up. Be willing to compromise. Try to find a balance between work and family life, social activities and solitary pursuits, daily responsibilities and downtime.

7.2.4.3.3. Adapt the stressor.

If you can't change the stressor, change yourself. You can adapt to stressful situations and regain your sense of control by changing your expectations and attitude. Try to view stressful situations from a more positive perspective. Take perspective of the stressful situation. Set reasonable standards for yourself and others.

7.2.4.3.4. Accept the things you can't change.

Some sources of stress are unavoidable. You can't prevent or change stressors such as the death of a loved one, a serious illness, or a national recession. In such cases, the best way to cope with stress is to accept things as they are. Acceptance may be difficult, but in the long run, it's easier than railing against a situation you can't. Don't try to control the uncontrollable instead focus on the things you can control. When facing major challenges, try to look at them as opportunities for personal growth. Learn to forgive. Talk to a trusted friend or make an appointment with a therapist.

7.2.4.4. Manage time and schedules.

Poor time management can cause a lot of stress. When you're stretched too thin and running behind, it's hard to stay calm and focused. Don't over-commit yourself. Prioritize tasks. Break projects into small steps. Delegate responsibility. Maintain balance with a healthy lifestyle. Eat a healthy diet. Reduce caffeine and sugar. By reducing the amount of coffee, soft drinks, chocolate, and sugar snacks in your diet, you'll feel more relaxed and you'll sleep better. Avoid alcohol, cigarettes, and drugs. Self-medicating with alcohol or drugs may provide an easy escape from stress, but the relief is only temporary. Don't avoid or mask the issue at hand; deal with problems head on and with a clear mind. Get enough sleep. Adequate sleep fuels your mind, as well as your body. Feeling tired will increase your stress because it may cause you to think irrationally.

7.2.5. Assistance under stressful situation.

The best way to get assistance from others under stressful situations is to have better connection with others. There is nothing more calming than spending quality time with another human being who makes you feel safe and understood. In fact, face-to-face interaction triggers a cascade of hormones that counteracts the body's defensive "fight-or-flight" response. Its nature's natural stress reliever, it also helps stave off depression and anxiety. So, make it a point to connect regularly and in person with family and friends.

Keep in mind that the people you talk to don't have to be able to fix your stress. They simply need to be good listeners. And try not to let worries about looking weak or being a burden keeps you from opening up. The people who care about you will be flattered by your trust. It will only strengthen your bond. Of course, it's not always realistic to have a pal close by to lean on when you feel overwhelmed by stress, but by building and maintaining a network of close friends you can improve your resiliency to life's stressors.

Some of the tips for building relations through which the assistance can be obtained or offered during the stressful situation. Reach out to a colleague at work, help someone else by volunteering, have lunch or coffee with a friend, ask a loved one to check in with you regularly, accompany someone to the movies or a concert, Call or email an old friend, go for a walk with a workout buddy, Schedule a weekly dinner date, meet new people by taking a class or joining a club, Confide in a clergy member, teacher, or sports coach.

7.2.6. Effects of shocking and stressful situation

A critical incident is any situation that causes a person to experience unusually strong stress reactions that the person perceives as disturbing or disabling.

Few examples of such traumatic events are, earth quacks, tsunami, aviation accidents, terrorism, major air traffic collision, failed rescue attempts, hostages type events.

Critical incidents produce characteristic sets of psychological and physiological reactions or symptoms (thus the term syndrome) in all people, including emergency service personnel. Typical symptoms of Critical Incident Stress include: Restlessness, Irritability, Excessive Fatigue, Sleep Disturbances, Anxiety, Startle Reactions, Depression, Moodiness, Muscle Tremors, Difficulties, Concentrating, Nightmares, Vomiting, Diarrhea and Suspiciousness.

The physical and emotional symptoms, which develop as part of a stress response, are normal but have the potential to become dangerous to the responder if symptoms become prolonged.

Signs of Critical Incident Stress as per Center for Disease Control of USA are given below.

Physical	Cognitive	Emotional	Behavioral
Fatigue	Uncertainty	Grief	Inability to rest
Chills	Confusion	Fear	Withdrawal
Unusual thirst	Nightmares	Guilt	Antisocial behavior
Chest pain	Poor attention	Intense anger	Increased alcohol
Headaches	Poor concentration	Apprehension	consumption
Dizziness	Poor memory	Depression	Change in communications
	Poor problem solving	Irritability	Loss/increase in appetite
	Poor decision-making ability	Chronic anxiety	

7.3. References

DOC 10057 (first edition), Learning objectives of Topic 7 Stress.

8. SAFETY CULTURE

8.1. Introduction

8.1.1. Safety Importance in Aviation.

Safety and security are of paramount importance in aviation. A safe aviation system contributes to the economic development of states and their industries. For all ANSPs regardless of whether they are operated by a state or by a commercial organisation, safety must come first when delivering communications, navigation, surveillance/air traffic management (CNS/ATM) services. In the present technology centric air-ground CNS/ATM systems, ATSEP role in the safety chain is crucial to seal all the holes in the last layer of defence.

8.1.2. Safety: The Foremost Strategic Objective of ICAO.

A specialised agency of United Nations, the International Civil Aviation Organization (ICAO) is constantly working in close collaboration with the entire air transport community to improve the aviation safety and standard. Aviation safety is the fundamental objective of ICAO. This strategic objective aims to enhance global civil aviation safety and focuses primarily on a state's effective safety oversight and its capabilities in the management of safety.

Aviation industries and service providers operate in an open system that remain exposed to many external variables which requires highly vigilant and constant monitoring to ensure that the higher levels of aviation safety can be realized. To offer this safety assurance, ICAO has mandated in November 2006 that all member states shall implement formal Aviation Safety Management Systems (SMS).

Annex 19 of ICAO requires that both the states and service providers promote a positive safety culture with the aim of fostering effective safety management implementation through the SSP/SMS.

8.1.3. Safety Work Culture.

By definition, Aviation safety work culture is the set of enduring values, behaviours and attitudes regarding safety, shared by every member at every level of an organization. It has been described as "how people behave in relation to safety and risk when no one is watching". Attitude, awareness, behaviour, commitment – these are the primary tenants of safety culture as these ensure safety success which.

- Reflects the attitudes in an organization;
- Needs safety awareness to be successful;
- It is exemplified by behaviour of employees at all levels of an organization; and
- Indicates future commitment and safety performance.

Attitude, awareness, behaviour, commitment – these are the primary tenants of safety culture.

A safety culture is the natural consequence of having humans involved in the aviation system. It is an expression of how safety is perceived, valued and prioritized by management and employees in an organization, and is reflected in the extent to which individuals and groups are:

- aware of the risks and known hazards faced by the organization and its activities;
- continuously behaving to preserve and enhance safety;
- able to access the resources required for safe operations;
- willing and able to adapt when facing safety issues;
- willing to communicate safety issues; and

- consistently assessing the safety related behaviours throughout the organization

8.1.4. Safety Culture and Safety Performance.

Safety Culture has a direct impact on safety performance. Here are some ways to show how aviation safety culture leads directly to safety performance.

8.1.4.1. Quality safety culture entails considerate safety behaviour.

A safety culture is something that happens on an organizational level and individual level. A successful and a quality aviation safety culture always entails considerate safety behaviour. Alternately it can be inferred that this behaviour demonstrates a commitment to the aviation SMS.

What is difficult about safety behaviour is how to measure it. Consider the following as quantifiable and trackable ways of measuring safety behaviour, where each point requires specific action on the part of ATSEPs and management in order to achieve safety success.

Figure 10 Quantifying safety behaviour

8.1.4.2. ATSEP perform even when not under safety supervision.

There can be two possibilities if management is not supervising the safety behaviours of ATSEP.

- What the managerial authority does when ATSEPs are not under safety supervision of management? Or,
- What the ATSEPs are doing when management isn't watching?

In most organizations, individuals only loosely follow policies and procedures when management isn't around. This is especially true when management doesn't take an active role in its relationship with front-line ATSEP.

One of the financial incentives in building a safety culture and thereby supervising the safety behaviour, besides saving money due to workplace injuries, is that ATSEPs become more productive because their work is consistent. This productivity does not come at the cost of safety. Rather, ATSEPs:

- Are set back by safety issues less often;
- Maintain working standards and adherence to company policy most of the time; and
- Are better at monitoring and responding more quickly to their work environment.

On the management side, managers can devote more time to important safety tasks, and less time to micromanaging employees and other managers. Good safety culture removes the burden of "authority" inherent in the top-down structure of aviation SMS implementations. Employees better manage themselves, and the top-down structure remains important for guidance rather than discipline.

8.2. Safety Culture Development and Benefits.

8.2.1. Developing A Positive Safety Culture.

A positive safety culture has the following features:

- managers and frontline ATSEPs, individually and collectively, want to make decisions and take actions that promote safety;
- individuals and groups continually critique their behaviours and processes and welcome the critique of others searching for opportunities to change and improve as their environment changes;
- management and individuals share a common awareness of the hazards and risks faced by the organization and its activities, and the need to manage risks;
- individuals act and make decisions according to a common belief that safety is part of the way they do business;
- individuals value being informed, and informing others, about safety;
- individuals trust their colleagues and managers with information about their experiences, and the reporting of errors and mistakes is encouraged to improve how things are done in the future

8.2.2. Safety Culture as Safety Enabler of Safety Management.

Safety values are incorporated into practices by management and personnel directly affects how key elements of the State Safety Plan (SSP) and Safety Management System (SMS) are established and maintained. As a consequence, safety culture has a direct impact on safety performance. If someone believes that safety is not that important then workarounds, cutting corners, or making unsafe decisions or judgements may be the result, especially when the risk is perceived as low and there is no apparent consequence or danger. The safety culture of an organization therefore significantly influences how their SSP or SMS develops and how effective it becomes. Safety culture is arguably the single most important influence on the management of safety. If an organization has instituted all the safety management requirements but does not have a positive safety culture, it is likely to underperform.

When the organization has a positive safety culture, and this is visibly supported by upper and middle management, front-line ATSEP tend to feel a sense of shared responsibilities towards achieving the organization's safety objectives. Effective safety management also supports efforts to drive towards an increasingly positive safety culture by increasing the visibility of management's support and improving active involvement of personnel in managing safety risk.

8.2.3. Safety Work Culture benefits.

When leadership actively endorses safe practices, it becomes the normal way of doing things. The ideal situation is a fully implemented and effective SSP/SMS and a positive safety culture. Hence, an organization's safety culture is often seen as a reflection of the maturity of its SSP/SMS. Effective safety management empowers a positive safety culture and a positive safety culture empowers effective safety management.

8.2.3.1. Safety work culture benefits to ANSPs in case of adoption in ATSEP domain.

- Safe, efficient, effective and economic provision of air navigation services
- Reduced incidents/injuries
- Increased productivity
- Reduced costs
- Supports safe environment and workplace ergonomics.

8.2.4. Benefits of Safety Management.

The advantage of having a positive safety work culture will invariably results in the benefits derived from implementation of the effective safety management system in any ANSP.

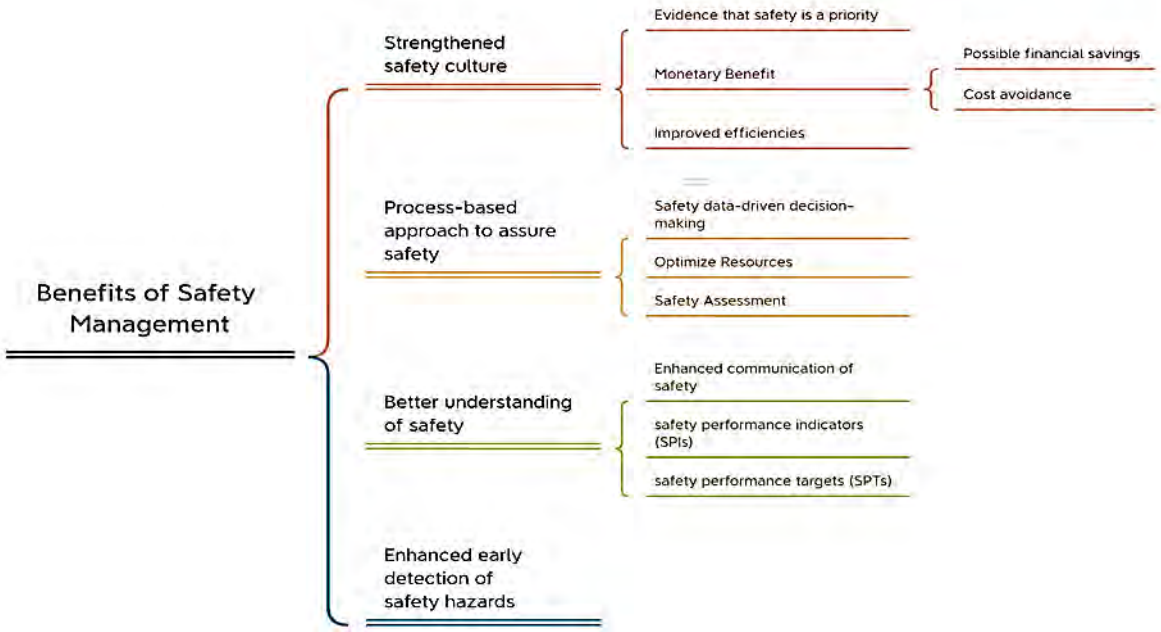


Figure 11 Benefits of safety management

8.2.5. Safety Culture Enablers and Disablers.

Actions by management and employees can help drive their safety culture to be more positive. Table- 1 provides examples of the types of management and employee actions that will enable or disable a positive safety culture in an organization. Organizations should focus on providing enablers and removing any disablers to promote and achieve a positive safety culture.

Element and its General Description	Enablers	Disablers
Commitment to safety Commitment to safety reflects the extent to which senior management within the organization have a positive attitude towards safety and recognizes its importance. Senior management should be genuinely committed to achieving and maintaining a high level of safety and give employees motivation and the means to do so also.	• Management leads safety culture and is actively motivating its employees to care for safety, not only by talking but by acting as role models • Management provides resources for a range of safety related tasks (e.g. training) • Continuous safety management oversight and governance is established	• Management is actively demonstrating that profit, cost reduction and efficiency come first • Investments to improve safety are often made when required by regulations or after accidents • Neither oversight nor governance with regard to safety management is established
Adaptability Adaptability reflects the extent to which employees and management are willing to learn from past experiences and are able to take action necessary in order to enhance the level of safety within the organization.	• Employee input is actively encouraged when addressing safety issues • All incidents and audit findings are investigated and acted upon • Organizational processes and procedures are questioned for their safety impact (high extent of self-criticism) • Employee input on safety issues is not sought from all levels of the employees	• Actions are often taken only after accidents or when required by regulations • Organizational processes and procedures are considered adequate as long as no accident occurs (complacency or lack of self-criticism) •A clear proactive approach to safety is demonstrated and followed • Even when an accident occurs the organization is unwilling to question itself. • A reactive approach to safety is demonstrated and followed.

Element and its General Description	Enablers	Disablers
Awareness Awareness reflects the extent to which employees and management are aware of the aviation risks faced by the organization and its activities. From a state perspective personnel are aware of both the safety risks induced by their own activities and the organizations they oversee. Employees and management should be constantly maintaining a high degree of vigilance with respect to safety issues.	• An effective way of hazard identification has been established • Investigations seek to establish the root cause • The organization stays abreast of important safety improvements, and adapts itself accordingly as necessary • The organization systematically evaluates if safety improvements are implemented and working as intended • Where appropriate members of the organization are well aware of the safety risks induced by their individual actions and company operations / activities	• No effort is spent on hazard identification • Investigations stop at the first viable cause rather than seek the root cause • The organization does not stay abreast of important safety improvements • The organization does not evaluate if safety improvements are implemented properly • Where appropriate members of the organization are not aware of the safety risks induced by their individual actions and company operations • Safety data is gathered but not analysed and acted upon
Behaviour with respect to safety Behaviour with respect to safety reflects the extent to which every level of the organization behaves such as to maintain and improve the level of safety. The importance of safety should be recognized and processes and procedures needed to maintain it should be put in place.	• The employees motivate themselves to act safely and by acting as role models • Continuous monitoring of safe behaviour is practised • Employees are not punished for intentional unsafe behaviour to the benefits of their own or other interests • Intentional unsafe behaviour is not tolerated by management and colleagues	• The working conditions support aviation safety at all times • The working conditions provoke behaviour and work arounds that are detrimental to aviation safety • No monitoring of aviation safety within the organization’s products or services is practised • Constructive criticism to the benefit of aviation safety is not welcomed

Element and its General Description	Enablers	Disablers
Information Information reflects the extent to which information is distributed to all necessary people within the organization. Employees should be enabled and encouraged to report aviation safety concerns and receive feedback on their reports. Work information related to aviation safety has to be communicated meaningfully to the right people in order to avoid miscommunication that could lead to hazardous aviation system situations and consequences. The State is open to share aviation safety related information to all service providers.	• An open and just safety reporting environment exists. • Employees are provided with safety-relevant information in a timely manner in order to allow for safe operations or decisions to be made. •Management and supervisors regularly check whether safety relevant information is understood and acted upon • Knowledge transfer and training with regard to aviation safety is actively practiced (e.g., sharing of lessons learned)	• A blaming safety reporting environment is evident • Safety-relevant information is withheld • Safety communication is not monitored for its effectiveness • No knowledge transfer or training is provided
Trust Employee contribution to safety thrives in a reporting environment that fosters trust – trust that their actions or omissions, commensurate with their training and experience, will not be punished. A workable approach is to apply a reasonableness test – i.e., is it reasonable that a person with the same level of experience and training might do the same thing. Such an environment is fundamental to effective and efficient safety reporting. Effective safety reporting systems help to ensure that people are willing to report their errors and experiences, so that States and service providers have access to relevant data and information that is necessary to address existing and potential safety deficiencies and hazards. These systems create an environment in which people can be confident that safety data and safety information will be used exclusively for improving safety.	• There is a distinction between acceptable and unacceptable behaviour, which is known to all employees. • Occurrences (including accidents and incidents) investigations consider individual as well as organizational factors. • Good aviation safety performance is recognized and rewarded on a regular basis. • There is willingness among employees and operational personnel to report events in which they have been involved.	• There is no identifiable distinction between acceptable and unacceptable behaviour. • Employees are systematically and rigorously punished for human errors. • Accident and occurrence investigations focus on individual factors only. • Good safety performance and safe behaviour is taken for granted.

8.3. Safety Reporting and Just Culture.

8.3.1. Safety Culture and its influence on Safety Reporting.

SSPs and SMSs are sustained by safety data and safety information that is necessary to address existing and potential safety deficiencies and hazards, including safety issues identified by personnel. The success of a reporting system depends entirely on the continuous flow of information from, and feedback to, organizations and individuals. The protection of safety data, safety information and related sources is essential to ensure continued availability of information. For example, in voluntary safety reporting systems, this may be realized through a system that is confidential, and not used for purposes other than maintaining or improving safety. The benefits are twofold. Often personnel are the closest to safety hazards, so a voluntary reporting system enables them to actively identify these hazards and suggest workable solutions. At the same time, the regulator or management is able to gather important safety information and build trust with the organizations or operational personnel who are reporting the information.

Whether organizations or individuals are willing to report their experiences and errors is largely dependent on the perceived benefits and disadvantages associated with reporting. Safety reporting systems may be anonymous or confidential. In general, in an anonymous reporting system a reporter does not provide their identity. In this case there is no opportunity for further clarification of the report's contents, or the ability to provide feedback. In a confidential reporting system, any identifying information about the reporter is known only to a designated custodian. If organizations and individuals who report safety issues are protected and treated in a fair and consistent manner, they are more likely to divulge such information and work with the regulator or management to effectively manage the associated safety risk(s).

States are expected to adopt laws to adhere to the provisions outlined in Annex 19 for the protection of safety data, safety information and related sources. In the case of a voluntary reporting system, confidentiality should be ensured and the reporting system operated in accordance with safety protection laws. Further, organizations need to have an appropriate disciplinary policy, which is accessible to all and widely understood. A disciplinary policy should clearly indicate what behaviours are considered unacceptable and how the organization will respond in such cases. The disciplinary policy needs to be applied fairly, reasonably and consistently. Finally, organizations and individuals are more likely to report their experiences and errors in an environment where they will not be judged or treated unfairly by their peers or their employer.

Overall, organizations and individuals must believe they will be supported when reporting in the interest of safety. This includes organizational and personal errors and mistakes. An increase in confidential reports and a decrease in anonymous reports is usually indicative of the organization's progress towards a positive safety culture.

8.3.2. Safety Reporting

Writing a report after having been involved in an incident often seems to be and feels like an inconvenient, time-consuming, and worthless action. However, it is way more than that – and important and helpful in at least two different ways.

8.3.2.1. Why should we report?

Writing a report after having been involved in an incident often seems to be and feels like an inconvenient, time-consuming, and worthless action. However, it is way more than that – and important and helpful in at least two different ways.

- Safety

Reporting enables the company and your colleagues to understand what happened, to learn from past events and to make things safer. This means, it is about procedures, rules and standardisation and the potential difference between 'work as done' and 'work as imagined' (which is shaped by 'work as prescribed' in rules and procedures). But it is also about revealing the double binds, tensions and conflicting goals that are played out within the system day in and day out and which are hidden to those who can make the difference by adapting or changing your working environment accordingly.

- Law

Reporting is compliant with applicable law and hence enables the company to support you. By law any incident with a safety-relevant aspect has to be reported. In other words, failing to report will place you in breach of the law and a committed offence. It will not be regarded as a mistake and, in case of detection, you will be prosecuted regardless of the actual event/ incident, as it is a breach of criminal law – and you will be treated as such.

- Double bind situation

We are highly interested in a continuously improved and safer working environment, which is why we fully supports the established reporting processes and asks you to keep on reporting any safety-relevant event. Furthermore, we does not want to be confronted with any legal issues based on non-compliance with law.

On the other hand, we are well aware that reporting may raise questions about accountability and possible legal proceedings, but none of these issues may be solved by non-reporting.

There is no way out of this so called "double bind" situation, where opposing interests of safety and judiciary have to be served and satisfied.

It is not about convenience. Reporting is not only important for safety but also a legal requirement and therefore compliant with applicable law. Reporting shall be a normal routine after having been involved in an incident.

It is not about time. Reporting is about your very own, your colleagues' and your company's safety and reputation.

It is not worthless. Reporting enables the whole ATM system to get safer.

It is about content. Reporting can be done in many different ways, from a very short, factual and static report to a very descriptive and safety-wise helpful, but possibly self-incriminating report of the occurrence.

8.3.2.2. What to write and what to avoid?.

This is a crucial point. As an operator involved in an incident and required to report accordingly, you will find yourself in the double bind situation mentioned above. It is to emphasize, that

- the language used in filing a report shall be neutral,
- no names shall be stated (neither first/last names nor initials),
- the information provided shall be kept short and factual in order to protect yourself, especially from unintentional and unconscious self-incrimination,
- the information provided shall be fact-bound, non-emotional and refrain from finger pointing,

- judgments, assumptions and/or interpretations shall not be part of an OIR,
- wording such as e.g. – "I forgot…" – "I assumed…" – "I was not aware…" – "I was sure the aircraft…." – "I thought it might…" – "The pilot promised to…", etc. shall be avoided.
- From a safety point of view, it is best to provide as much information as possible. From a legal point of view, it is best to keep the information as short and factual as possible.

8.3.3. Just Culture.

8.3.3.1. Definition.

A Culture where front-line operators or other personnel are not punished for actions, omissions or decisions taken by them that are commensurate with their experience and training, but in which Gross Negligence, Wilful Violations and Destructive Acts are not tolerated. Just Culture Policies that distinguish wilful acts of misconduct from inadvertent errors, providing for an appropriate punitive or non-punitive response (a disciplinary policy), are essential to ensure the effective reporting of systemic safety deficiencies. [European Commission, Eurocontrol & IFATCA.

8.3.3.2. What Just Culture is.

Just Culture is about safety. It is a question of mindset, about fostering a constructive environment by which individuals can share their accounts to add to our knowledge of how the ATM system works. In doing so, Just Culture is a mechanism that allows to uncover pertinent aspects of the operation that are traditionally hidden.

The concept of Just Culture represents the fundamental recognition that both aviation safety and the administration of justice would benefit from a carefully established equilibrium, moving away from fears of criminalisation, balancing and satisfying the interests of two unique and basically not compatible worlds: The world of safety and the world of justice.

8.3.3.3. What Just Culture is Not.

Nothing quick or unambiguous

Just Culture is not about quick fixes, clear rules, strict guidelines or a set of given norms. It is about a constant interaction

- between Safety and Judiciary to satisfy both needs,
- with internal, organisational justice processes.

No absolution, no "no blame culture"

Just culture does not mean complete protection of front-line operators in the event of aviation incidents and accidents. Particularly, it does not offer protection in case of gross negligence, wilful misconduct and/or destructive acts, severe and serious disregard of an obvious risk and/or profound failure of professional responsibility. E.g.: Just Culture covers a reported incident – but not the omission of reporting!

No valid term in the legal world

FOCA, STSB, the Swiss Legislator and the EU have all acknowledged the importance of Just Culture, even though implementation of its principles is still lagging behind, especially in the criminal law. As Judiciary is bound to the law – with little to no scope to deviate from it for the benefit of Just Culture and/or the accused – it is subject to a case-by-case appreciation by the competent judicial authority.

8.3.4. No one-way Street.

Just Culture is not a given concept from the outside world. Based on a mindset, a way of thinking and behaviour and a constant give-and-take, it is fair to expect a just and fair treatment from the outer world. But at the very same time we have to be just and fair towards the outer world, too. Otherwise, this two-way road will come to a dead end. The same is valid for the internal world. If the above-mentioned exclusions (i.e., gross negligence, etc.) are given, there is no reason to blame colleagues. Emotions during or right after an incident are normal reactions to an abnormal situation. But we do and will not accept continuous, unfounded blaming of colleagues after an incident. 7 Technically, in some circumstances, not reporting becomes a crime If the company reveals doubts about the mentioned exclusions from protection, even internal Just Culture might come to an end.

8.3.5. Safety Culture and Cultural Diversity.

National culture differentiates the characteristics of particular nations, including the role of the individual within society, the manner in which authority is distributed, and national priorities with respect to resources, accountabilities, morality, objectives and legal systems.

From a safety management perspective, national culture influences organizational culture and plays a large part in determining the nature and scope of regulatory enforcement policies, including the relationship between regulatory authority personnel and industry personnel, and the extent to which safety information is protected. These, in turn, impact on peoples' willingness to report safety issues.

The majority of organizations today employ people from multiple cultural backgrounds, which may be defined by their nationality, ethnicity, religion, and/or gender. Aviation operations and safety rely on effective interaction between different professional groups, each with its own professional culture. Hence, the organization's safety culture may also be significantly affected by the variety of cultural backgrounds of the members of its workforce.

Managing safety within the aviation system therefore requires interaction with, and management of, culturally diverse personnel. However, when implementing safety management, managers should be capable of moulding their culturally-diverse workforce into effective teams. Eliminating differences in safety risk perceptions that may derive from different cultural interpretations and enhancing other safety-related aspects, such as communication, leadership styles and interaction between supervisors and subordinates is key. The degree of success will depend on management's ability to promote a common understanding of safety and each individual's role in its effectiveness. Regardless of an individual's cultural background, effective safety management relies on a shared safety culture, with everyone in the organization understanding how they are expected to behave in relation to safety and risk "even when no one is watching".

8.4. Challenges and Addressing the Roadblocks.

8.4.1. Loss of Upper Management Support.

- Without having the top management support, we can never think of an aviation SMS. Loss of top or upper management support can be attributed to:
    - Change in top-level leadership;
    - Changing attitudes toward the Aviation SMS due to other prevailing strategic opportunities/challenges; or
    - Safety management team not performing their jobs regarding regular communications with upper management.

- To regain top/upper management support, the safety manager (accountable for safety) will need to start at the very top and open a dialog with the accountable executive. Topics to enforce include:
    - Requirements of the aviation safety work culture and SMS;
    - Benefits of the aviation safety work culture and SMS;
    - Importance of top/upper management support;
    - Methods to demonstrate top-level support of the aviation safety program

8.4.2. Lack of Safety Accountability.

The second most significant reason for aviation safety work culture implementation failure is the loss of the sole safety manager. Safety managers are the key personnel and if the corporate knowledge leaves the organisation, the safety program will collapse.

- Strategies to minimize this risk include:
    - Having another "part-time" safety manager who understands how the safety program functions;
    - Requiring 30-days prior notice before key personnel leave the organisation to be "eligible" for rearrangement.
    - Training department should head in safety program activities.
- An excellent alternative to role of safety manager is to actively involve department heads in the workings of the SMS. There will be additional benefits, including:
    - Increased involvement and buy-in to the safety program; and
    - Improved responsiveness toward risk management activities.

8.4.3. Lack of leadership commitment.

A positive safety culture relies on a high degree of trust and respect between personnel and management. Time and effort are needed to build a positive safety culture, which can be easily damaged by management decisions and actions, or inactions. Continuous effort and reinforcement are needed.

Visible demonstrations of leadership support towards safety program are paramount to the success of service provider's safety program. Common displays commitment of top-level support include:

- Newsletter articles from the accountable executive detailing the importance of the Safety;
- Offering regular (weekly or bi-weekly) meetings with the safety manager; and
- Occasionally walking through the area of operations with the safety manager to demonstrate that the safety team has upper management's support

8.4.4. Lack of resources for safety success.

The situations where there is a lack of

- Improved tool and workplace architecture to match the fast pace of change of technological development
- or inadequate safety training and well equipped ATSEPs,

may lead to inability of the ATSEPs to fulfil the safety objectives as set by the ANSPs.

Safety Training /Education programs to improve the knowledge and skill of ATSEPs to handle the safety challenges should be included in SMS/SSP and necessary resources and guidance should be provided to ATSEPs to adapt to changing work environment. Also provision of environmental and equipment safety skills to ATSEP like equipment and material storage and disposal or general office hygiene or handling equipment with high radiation.

8.4.5. Ageing workforce.

ATSEPs with more years of services may sometimes feel reluctant to adapt to changing work environment and fast pace of technological developments and in turn may follow the safety work culture demands. Aged and senior executives may also avoid knowledge sharing to lower subordinates due to some superiority complex.

Sensitizing the ageing workforce about safety aspects and knowledge sharing to improve the positive safety culture among all levels of workforce.

8.4.6. Rise in the recruitment of young and less experienced ATSEPs.

It's no secret that newly joined ATSEPs by far may pose the greatest risk to safety in the aviation industry and beyond if not guided properly. For an instance, nearly one-third of all nonfatal occupational injuries that involved time away from work were suffered by workers with less than one year of service (Bureau of Labour Statistics).

New ATSEPs generally pose a greater risk as they are:

- Unfamiliar with the work environment;
- Impressionable to existing norms in the work environment; and
- Unfamiliar with existing policies/procedures.

A strong aviation safety culture successfully mitigates a considerable amount of risk involved with new ATSEPs because of strong safety culture which:

- Requires Teamwork that acts as a natural monitor and guide for new ATSEPs;
- Exhibits very little negative norms that could potentially lead a new ATSEP into dangerous action;
- Almost always has a strong precedent of safety training (induction and recurring); and
- Will surely have strong leaders to keep new ATSEPs "on track" in terms of behaving safely.

8.4.7. Loss of safety-related data.

Safety-related data like databases, spreadsheets, safety reporting documents are critical to the organisation. During any Safety breaches like Cyber security attacks, leakage of such critical information may pose serious threat to the aviation industry.

Mitigation strategies for loss of safety-related data include:

- Utilizing in-house centralized databases and file systems;
- Using cloud-based, professionally designed aviation safety management system solutions; and
- Enforce regular backup strategies for all safety-related data.
- Imparting Cyber security.

8.4.8. Safety Feedback problems.

This problem may arise due to-

- Not collecting feedback
- Doing nothing with collected feedback

Proper way of collecting safety data and safety feedback builds up trust between the ATSEPs and the management ensuring positive safety and just culture in the organisation.

8.4.9. Safety culture and organizational change.

Safety management requires that organizations manage the safety risks associated with organizational and operational changes. Staff concerns about workload, job security and access to training are associated with significant change in organizations and can have a negative impact on safety culture. The degree to which staff feel involved in the development of change and understand their role in the process will also influence the safety culture.

8.4.10. Economic unpredictability.

This situation may arise due to any unprecedented situation like COVID-19.This can be addressed is SMS/SSP includes preparedness during emergency situations.

8.5. Monitoring and Measuring Safety Culture Effectiveness

8.5.1. Safety Culture Assessment.

Safety culture is subject to many influences and organizations may choose to assess their safety culture to:

- understand how people feel about the organization and how importantly safety is perceived;
- identify strengths and weaknesses;
- identify differences between various groups (subcultures) within an organization; and
- examine changes over time (e.g., in response to significant organizational changes such as following an accident, a change in senior management or altered industrial relations arrangement).

There are a number of tools which are used to assess safety culture maturity, usually in combination:

- questionnaires;
- interviews and focus groups;
- observations; and
- document reviews.

Measuring the effectiveness of safety work culture:

- By reviewing the programs and procedures in place for upgradation to suit the requirement
- Communication between management and ATSEPs for active culture assessment to be handled with care and empathy.
- Assess the safety training which gives the clue about the organisation’s commitment to safety.

Assessing safety culture maturity can provide valuable insight, leading to actions by management that will encourage the desired safety behaviours. It should be noted that there is a degree of subjectivity with such assessments, and they may reflect the views and perceptions of the people involved at a particular moment only. Also, scoring safety culture maturity can have unintended consequences by inadvertently encouraging the organization to strive to achieve the “right” score, rather than working together to understand and improve the safety culture.

8.6. References.

- ICAO-ANNEX 19 Safety Management
- DOC-9859 Safety Management Manual Fourth Edition 2018

- DOC-10004 Global Aviation Safety Plan 2020-2022 Edition
- EUROCONTROL ATM Safety Framework Maturity Survey Methodology for ANSPs ESP-2009-78
- CANSO Standard of Excellence in Safety Management System.