

Stress, Pressure and Fatigue on Aircraft Maintenance Personnel

Luis F. F. M. Santos^{1,2}, R. Melicio^{2,3,4}

Abstract – This paper focuses on an analysis of the stress, the pressure and the fatigue as part of the Dirty Dozen and Human Factors procedures. An online international survey has been carried out to ascertain the professional levels of the fatigue, the stress and their pressure exposure. This work is a contribution to the aeronautical safety in order to alert authorities about the stress, the pressure and the fatigue that aircraft maintenance personnel suffers. Safety is the main driver in aviation related professions. Maintenance related personnel is constantly subjected to several external circumstances that might originate errors in the performance or evaluation in maintenance related tasks. Authorities have clearly regulated flight crew and air traffic controllers working and resting periods, but maintenance personnel regulations do not reflect the same procedures. The Aeronautical industry 4.0 with the upcoming digital transformation will increase the safety margin and it will reduce the aircraft maintenance ground time. Copyright © 2019 Praise Worthy Prize S.r.l. - All rights reserved.

Keywords: Maintenance, Human Factors, Stress, Fatigue, Pressure, Aviation, Annex 19, Dirty Dozen, Part-145, Part-M, Safety

Nomenclature

MOM	Maintenance Organization Manual
EASA	European Aviation Safety Agency
ICAO	International Civil Aviation Organization
FAA	Federal Aviation Administration
LAM	Linhas Aéreas de Moçambique
AOG	Aircraft on Ground
SMS	Safety Management System
FRMS	Fatigue Risk Management System

1. Introduction

Air transport is considered to be the safest method of transport [1], [2], due to the close interaction between aeronautical authorities, aviation industry (aircrafts), operators and aircraft maintenance industry [3]. As aircrafts become more reliable, humans have played a progressively more important causal role in aviation accidents [4]. Hence, aviation safety is the major concern and it is one of the principal drive factors of the civil aviation industry and regulatory purposes. Since the beginning of air transport, the need of rules and regulations have driven the aviation industry towards safer, and more reliable technologies and procedures.

The aircraft maintenance is a complex system, that requires sustained coordination, communication and cooperation between different work groups and teams including the aircraft maintenance and the airline, in order to ensure safety and efficient operations (minimizing error) [5]. Aircraft maintenance is highly regulated, safety critical, complex and competitive. There is the need to develop innovative solutions to address

process efficiency without compromising safety and quality [5], particularly with regard to the work hours of maintenance personnel. It is not proper to talk about safety if the Flight Crew rests for 12 hours while the maintenance team works 16 hours or more. In [6] the aviation safety depends on minimizing error in all the facets of the system. While the role of flight deck human error has always received much emphasis, recently, more attention has been directed towards reducing human error in maintenance and inspection. Aviation maintenance and inspection tasks are part of a complex organization, where individuals perform different tasks in an environment with time pressures, sparse feedback, and sometimes difficult ambient conditions. These situational characteristics, in combination with generic human erring tendencies, result in different forms of error. In [7] a study on the mental workload in pilots is conducted. It shows a method to evaluate the mental distress and its affect on the eye pupils. This study has brought new insights to the pilot's performance during high mental workload. In [5] authors have also confirmed that aircraft maintenance is a highly regulated, safety critical, complex industry currently facing unprecedented challenges. Pressure is on aircraft manufacturers, from their customers, to design aircraft with pushed out maintenance schedules. The first key factors to improve flight safety has been introduced by ICAO, and it leads the industry to the development of methods to eliminate the accidents/incident common causes, such as the introduction of better technology, aircraft redundancies and systems compartmentalization and segregation. With these developments, together with organizational and human factors, the aviation industry has performed an

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Crane-Godreau, Eileen Mcneely, Christopher Scheibler, 2023-11-20 Aviation plays vital roles in commerce defense science and leisure travel Irrespective of the purpose of flight crew and passengers are challenged by exposure to a variety of environmental conditions that can differ widely from work and travel environments on the surface of the Earth With anticipated changes in aviation and space technology new challenges to health and safety of crew and passengers can be expected In this Research Topic we welcome contributions from those whose work and interests are relevant to the health and safety of crew and passengers This includes but is not limited to health and safety professionals FAA examiners corporate medical officers aerospace and occupational physicians physiologists military and scientific team members public health professionals as well as engineers who are tasked with crew and passenger health and safety design projects While 4 1 billion passengers fly on commercial airlines annually and this figure is even higher when taking into account privately owned aircraft and military flight for the most part aviation is safe Passengers do arrive at their destinations with little concern to their own well being and flight is generally well tolerated However older flyers people with diagnosed or undiagnosed preexisting disease and other vulnerable passengers such as young children and pregnant women may be at risk of complications and crew may be at special risk due to the frequency and duration of their many flight related exposures Health and safety issues for crew and passengers include but are not limited to potentially severe circadian rhythm disruption potential health effects of low level cosmic ionizing radiation exposure at altitude reduced oxygen delivery and tissue hypoxia at cabin pressurization cabin air contamination by engine gases toxic materials used in uniforms and some cabin seat materials occupational noise pesticides used for cabin disinsection lack of adequate crew rest on layovers or

between flights cardiovascular demands of flight and effects of flight related dehydration the current absence of screening protocols especially in the context of a rising number of elderly and vulnerable flyers lack of healthy nutrition at airports and in flight availability of food and hydration as well as adequate cabin temperature under delay conditions effects of alcohol use on flight related physiological and behavioral health risks anxiety and psychological distress associated with air travel the effects of long haul or ultra long haul flights on thromboembolic events as well as smoking cessation efforts and related psychological outcomes job related stress and harassment among crew Cosmic ionizing and non ionizing radiation exposure have drawn attention as have historic exposures of crew and passengers to second hand cigarette smoke The threat of political and interpersonal violence and altercations involving aviation cannot be overlooked On board medical emergencies run a wide gamut and the capacity to respond becomes more problematic as the duration of flights becomes longer or in the case of flight over oceans and the poles In addition in flight and post flight embolisms and myocardial infarctions are more prevalent than might be expected We hence encourage manuscripts that address in flight medical response including the capabilities on different types of aircraft on potential interventions by crew and medical volunteers In addition aviation as a vector for the carriage of disease is a significant concern to public health and security of populations world wide and we welcome submissions regarding infectious disease epidemiology and medicine as it relates to air travel Insects and occasional unplanned travel by birds and rodents can present additional public health concerns We are approaching an era where space travel may soon be increasingly common Future flights for near Earth orbit by leisure travelers and as well as travel to the moon and Mars raise a host of new questions with health and safety implications What are the proposed health and safety accommodations going to be Who will be allowed to travel Perhaps the most interesting question is who will make the rules

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