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GOVERNMENT OF INDIA  
CIVIL AVIATION DEPARTMENT  
DIRECTOR GENERAL OF CIVIL AVIATION

## AIRWORTHINESS ADVISORY CIRCULAR

Subject: Duty Time Limitation – Aircraft Maintenance Personnel (AMP)

### 1. Introduction:

- 1.1 CAR 145.A47 (b) requires that the planning of maintenance tasks and the organising of shifts, shall take into account human performance limitations. Further AMC145.A.47 (b) states that the Production planning Limitations of human performance in the context of planning safety related tasks refers to the upper and lower limits and variations of certain aspects of human performance (Circadian rhythm / 24 hours body cycle) which personnel be aware of when planning work and shifts.
- 1.2 The aviation maintenance system is heavily dependent upon people being able to perform their jobs reliably and efficiently. The advent of modern industrial processes, the globalization of the economy and the proliferation of information technology, among other factors, have contributed to the creation of a 24-hour society. As the demand for 24-hour availability of goods and services has risen over the past few decades, the prevalence of shift work has likewise increased. Further, the opportunity to work abroad and constant migration to pursue better avenues by Aircraft Maintenance Personnel (AMP) have brought a great challenge for managers to manage the shift- optimizing the available manpower resources. Managing the shift with shortage of maintenance personnel has the obvious outcome of over-stressing the individual and development of fatigue. At times, such fatigue development, if not suitably addressed, can become a contributory factor for casual approach in maintenance, which may lead to human error. Often various incident and accident investigation reports have attributed human error as the weakest link in the safety chain and without attention, can become a safety hazard. Therefore, it is appropriate that in line with Pilot and Cabin crew, every organization should frame policy for AMP Duty Time Limitations (DTL) and adequate rest period.

1.3 Whilst this AAC has been prepared primarily for those, who are engaged in aircraft maintenance certification activities, however, it is also relevant to all other personnel related with aircraft maintenance. The term Aircraft Maintenance Personnel (AMP) used in this circular is generic and beside the certifying personnel, it also includes all personnel associated with aircraft maintenance such as technicians, inspectors, supervisors, managers, planners and persons working in the maintenance control centres.

## **2. References:**

CAR 145

FAA AC 120-115: Maintainer Fatigue Risk Management

CAA UK CAP 716, Appendix P

## **3. Purpose:**

- 3.1 This AAC provide guidelines to Aircraft Maintenance Organization (AMO) to frame policy to address Duty Time Limitation (DTL) for Aircraft Maintenance Personnel (AMP).
- 3.2 While framing the policy for DTL by an AMO, the factors affecting the physical and mental performance of an individual should be considered to avoid any mistake/error in maintenance, which may jeopardize the airworthiness, safety of aircraft and the individual.

## **4. Human Performance and Degradation:**

- 4.1 The physical and mental human performance of an individual is dependent upon vision, hearing, information processing capability, attention, perception, memory, judgment and decision making ability. The physical ability could be impaired/ limited by unhealthy work environment, improper lighting arrangement and adverse environmental conditions (e.g. extremely hot hanger, rain, cold, etc.). The mental ability is also likely to degrade and eventually fall below optimal level if affected by lack of medical fitness, accumulation of stress (domestic/ work related), strict time line to accomplish the work.
- 4.2 Tiredness and fatigue can adversely affect human performance. Excessive hours of duty and shift work, particularly with multiple shifts or additional overtime, can lead to fatigue resulting in an impaired performance.
- 4.3 Some of the most critical performance errors associated with individual fatigue include but are not limited to:
  - Impaired judgement and decision making;
  - Impaired communication skills;

- Decreased attention span and ability to recall information;
- Irritability;
- Slower reaction times; and
- Increased risk-taking.

## **5. Shift work:**

5.1 Shift work can be defined as an arrangement of daily working hours that differs from the standard daytime hours. The nature of shift systems can vary widely, including the number and length of shifts, the presence or absence of night work, the length of the shift cycles, the start and stop times of each shift, and the number/ placement of days off. The impact of shift work/ shift system on an individual needs to be understood and taken cognizance of while assigning maintenance related activity.

5.2 The individual, who regularly works atypical hours is at greater risk for physical and psychological impairment or disease than typical day worker. This risk is assumed to originate from the physical and psychological stress that develops from work schedule-related disruptions of biological functions, sleep, and social and/ or family life. Considering Aircraft maintenance and servicing is a Safety Critical Occupation with a direct link in the chain of events that can lead to a major aircraft incident/ accident, relationship between shift work and health and safety should be adequately addressed by all organizations.

## **6. Factors affecting DTL for AMP and its management**

Following factors should be taken into account by all organization to avoid any fatigue related error by an AMP:

### **6.1 Effect of shift work on health:**

6.1.1 For sustaining operational requirements, many organizations maintain round-the-clock aircraft maintenance activities and therefore follow a 24 X 7 shift system. The maintenance personnel, who are working in this system have to adhere to different shift patterns/ time scales for each shift, therefore are susceptible to various physiological disorders.

#### **a) Fatigue/ Sleepiness distress:**

- (i) Circadian (around a day) rhythms are physiological and behavioural functions and processes in the body that have a regular cycle of approximately a day (actually about 25 hours in man).

- (ii) The different time schedule of shift may cause circadian rhythms and internal body clock de-synchronisation with sleep/ wake cycle and as a result, could be a contributory factor for fatigue/ sleepiness at work place.
- (iii) Sleep is the primary human function disrupted by shift work. Many bodily processes, such as temperature, blood pressure, and heart rate, are at their lowest ebb at night; so, it is not surprising that people who try to work at night and sleep during the day often report that they cannot do either, very well. Shift workers, who need to sleep during the day may have difficulty in falling asleep and remaining asleep because they are attempting sleep, when they are at odds with their circadian rhythms. And because of the conflict between work and personal demands, shift workers rarely achieve full adjustment to their shift work schedules.

**b) Psychological/ Emotional Distress:**

A common finding in shift system is that psychological and emotional distress frequently accompanies shift work although the magnitude of the effects is sometimes low. These findings are consistent with the psychological effects of shifting schedules and the resulting sleep disruption discussed previously. The psychological distress that often accompanies shift work from its onset, may be the primary factor that provokes many to leave shift work.

**c) Gastrointestinal Disorders:**

Gastrointestinal disorders are the most prevalent health complaint associated with shift and night work. Irregular bowel movements and constipation, heartburn, gas, and appetite disturbances are to name the few, which people have to manage beside their work.

**d) Cardiovascular Disorders:**

It is acknowledged fact that there exists relationship between shift work and cardiovascular disease. Various studies have reported increased risk of cardiovascular disease in shift workers. A mismatch between circadian rhythms and the timing of sleep, problems with family and social life, and the behaviour of shift workers including poor eating habits and increased tobacco and alcohol consumption are some of the ill effects of working in shift, which can increase the risk of cardiovascular disease for maintenance personnel.

**e) Other Individual Factors:**

Over the age of 45 - 50 years, shift workers increasingly encounter difficulties in altering their sleep-wake cycles. Specifically, aging people experience a decrease in %deep sleep+ and an increase in %light sleep+. Due to physiological effects of aging, it becomes more difficult to cope up with the work pressure of shift for the people over the age of 50.

**6.2 Management of fatigue and sleep disorders in shift work:**

6.2.1 Some of the measures, while managing the shift work should be adopted by every organization in order to:

- a) Minimise the build-up of fatigue over periods of work
- b) Maximise the dissipation of fatigue over periods of rest
- c) Minimise sleep problems and circadian disruption

**6.3 Daily Limits:**

As performance of maintenance personnel exponentially varies with extended period of shift work, therefore, the time schedule of shift should be scrupulously adhered to avoid fatigue related issues. Generally, shift durations are 8 to 10Hrs, which may extend due to work exigencies with the prior permission of responsible post holder-Maintenance providing adequate rest period between the extended duty hours. Working more than 12 Hrs is considered un-desirable.

- Note:**
1. While finalising the shift pattern, all Labour Laws as applicable shall be complied with.
  2. Beginning of duty time for a certifying personnel on flight duty should be calculated one hour before the flight departure and termination of the duty should be half an hour after the last certification.

**6.4 Breaks:**

The fatigue builds up over a period of work and this can be partially ameliorated by the provision of breaks. Therefore, working longer duration without any break should as far as possible be avoided. Duration of break should be planned taking into account the logistic and other constraints.

**6.5 Longer Limits:**

Some of the residual fatigue may accumulate over weeks and months despite the provision of rest days and therefore limiting the work, which can be

undertaken over longer period of time and provision of leave in reasonable time, is important.

### **6.5.1 Limits on Night Shifts:**

- a) There is significant evidence to suggest that risk increases at night by about 30% in relation to the morning/day shift. The efficiency reduces progressively during the night shift due to development of fatigue in adverse working condition. The risk becomes more prominent, when night shifts are performed successively. Therefore, number of continuous night shift should not exceed more than two and same should be followed by at least two successive days rest period.
- b) Policy for allocation of work during night shift should be framed taking into account the following:
  - (i) Adequate staffing in relation to the anticipated work load.
  - (ii) Whenever the AMP is in initial or successive night shift, complex/ critical tasks should be planned earlier leaving the lighter job for the later part of the shift. Allocation of work to AMP should match the availability of time during the shift and working overtime beyond the night shift should be avoided.
  - (iii) Work allocation to AMP involving single or multiple type of aircraft/ engines should be factored in.
  - (iv) The certification limits for an AMP in a shift should be decided depending on the size, complexity and criticality of the work to be performed.

## **7. Guidelines for Good Practices:**

- 7.1 The Organisation should consider developing fatigue risk management as part of their Safety Management System (SMS).
- 7.2 The Organisation should develop educational programme to increase AMPs awareness of the problems associated with shift-work. It is important to provide information on how to plan for night work and to give guidance on the health risks, which seem to be associated with shift work particularly at night. Educational program/ workshop should enlighten the AMP about the ill effects of fatigue and how to recognize them for self/ others.

- 7.3 AMP should report for duty after being adequately rested. AMP should be counselled for sufficient uninterrupted sleep to minimize stress and to dissipate fatigue during the rest period.
- 7.4 Wherever work allocations involves multiple aircraft/ engines in a shift, due consideration should be given about the complexity/ criticality of the task and quantum of work should be decided accordingly.
- 7.5 The finish time of the night shift should not be later than 08:00 hours.
- 7.6 Usually morning or day shift should not be scheduled to start before 06:00 and wherever possible, should be delayed to start between 07:00 and 08:00. Where ever if a shift starts before 06:00 Hrs, the duration of shift should be decided with due consideration to the fatigue involved to AMP.
- 7.7 A minimum rest period of 11 hours should be allowed between the end of shift and the beginning of the next, and this should not be compromised by overtime.
- 7.8 A break should be planned every four hours of work.
- 7.9 Scheduled work hours should not exceed 48 hours in any period of seven successive days. Total work including overtime, should not exceed 60 hours for seven successive work days before a period of rest days. In fact, it is desirable that work and rest period should match each other for effective dissipation of fatigue, which builds up over the period of work. Work duration for any individual should also have consideration of their mental condition/stress level during the work and complexity/criticality involved.
- 7.10 Wherever possible AMP should be given at least 15 days notice for their work schedule.
- 7.11 AMP should not be permitted to work for other organizations on their rest days in order to maintain DTL.
- 7.12 Vigorous campaign should be made for avoidance of working under the influence of Alcohol / psychoactive substances to cope up with stress / fatigue by AMP.
- 8. Documentation for ensuring compliance**
- 8.1 In order to ensure effective compliance with these guidelines, all organisations should document their scheduled shift pattern(s), system and procedure in their MOE/ Procedure Manual/ CAME etc. for effective fatigue management of their AMP.
- 8.2 The system/ procedure should also define the roles and responsibilities of personnel entrusted with managing duty time limitations for AMP.

- 8.3 The procedure should be audited by Quality Division of the organisation to ensure effective implementation.

This supersedes the AAC 01 of 2012.



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