

Leaflet 11-50 Maintenance Error Management Systems

(Previously issued as AN 71)

1. 1 Introduction

1.1. In January 2003, JAR 145 amendment 5 (subsequently incorporated into EASA Part-145) introduced paragraph 145.A.60 – Occurrence Reporting, to require organisations to “establish an internal occurrence reporting system...to enable the collection and evaluation of such reports, [which have resulted, or may result, in an unsafe condition]. This procedure shall identify adverse trends, corrective actions taken or to be taken by the organisation to address deficiencies and include evaluation of all known relevant information relating to such occurrences and a method to circulate the information as necessary." CAA seeks to provide an environment in which such errors may be openly investigated in order that the contributing factors and root causes of maintenance errors can be addressed using a system that would complement, not supplant, the two current systems for reporting maintenance errors (MORS and CHIRP).

NOTE: Square brackets [] denote CAA insertion.

1.2. Mandatory Occurrence Reporting (MOR) scheme exists in order that significant safety issues are brought to the notice of the CAA. However, the MORs scheme is not intended to collect and monitor the normal flow of day-to-day defects/incidents etc. which, in remaining an industry responsibility (CAP 382 Mandatory Occurrence Reporting System, paragraph 5.4.5), forms an important part of the overall operational safety task. This Leaflet concerns, primarily, those events which fall below the MOR criteria but which, nevertheless, are important for an organisation to understand and control. However, the principles described in this Leaflet may also be applied by an organisation to their own internal investigation of incidents meeting the MOR criteria

NOTE: Organisations will still be required to report MORs to the CAA.

1.3. The Confidential Human Factors Incident Reporting Programme (CHIRP) scheme provides an alternate reporting mechanism for individuals who want to report safety concerns and incidents confidentially. However CHIRP should not be considered as an alternative to implementing a Maintenance Error Management System (MEMS) scheme. MEMS and CHIRP perform different functions albeit acting towards the same ultimate aim, i.e. improved flight safety.

1.4. Maintenance errors with serious consequences such as accidents or incidents are routinely investigated by organisations, Air Accident Investigation Branch or CAA. Other operationally significant events (e.g. technical delays, cancellations, etc.) may not be legally required to be reported externally but are frequently investigated by organisations albeit too often only to apportion responsibility for the event, rather than to determine cause. Below these levels are events without operational significance which may rarely be investigated (e.g. the omission of an oil filler cap which, by chance, is noticed and corrected before flight). In order to gain a better understanding of the problems and factors which contribute to errors it is necessary to investigate these and operationally significant events before they possibly contribute to or cause an incident or accident in the future.

1.5. It is important to examine not just *what* happened, but *why* it happened, in order to determine the root causes and problems.

2. Maintenance Error Management System

- 2.1. AN 71 Issue 1 (2000) set out CAA policy on MEMS and, prior to the requirements introduced by JAR 145.60 and Part 145.A.60, encouraged maintenance organisations, in particular those maintaining large commercial air transport aircraft, to adopt MEMS concepts. Subsequently, the JAA Maintenance Human Factors Working Group incorporated very similar guidance into their report published in May 2001 (reproduced in CAP 716 issue 2, 18/12/2003), with the key elements being incorporated into EASA Part 145.A.60(b) and AMC 145.A.60(b). Both key, and more detailed, elements are described below, in particular the importance of a 'just culture' for the successful functioning of a MEMS.
- 2.2. Prevailing industry best practice has shown that a MEMS should contain the following elements:
 - Clearly identified aims and objectives
 - Demonstrable corporate commitment with responsibilities for the MEMS clearly defined
 - Corporate encouragement of uninhibited reporting and participation by individuals
 - Disciplinary policies and boundaries identified and published
 - An event investigation process
 - The events that will trigger error investigations identified and published
 - Investigators selected and trained
 - MEMS education for staff, and training where necessary
 - Appropriate action based on investigation findings
 - Feedback of results to workforce
 - Analysis of the collective data showing contributing factor trends and frequencies.
- 2.3. The aim of the scheme is to identify the factors contributing to incidents, and to make the system resistant to similar errors. Whilst not essential to the success of a MEMS, it is recommended that for large organisations a computerised database be used for storage and analysis of MEMS data. This would enable the full potential of such a system to be utilised in managing errors.
- 2.4. For the purpose of this Leaflet a maintenance error is considered to have occurred when the maintenance system, including the human element, fails to perform in the manner expected in order to achieve its safety objectives. The human element includes technicians, engineers, planners, managers, store-keepers – in fact any person contributing to the maintenance process. The foregoing definition differs from that of a human error as it demands consideration of the system failings (e.g. inadequate staffing, organisational factors, tooling availability, ambiguous manuals etc.) as well as the error committed by a person.

3. 3 CAA Assurances

- 3.1. It is recognised that the success of a MEMS programme is dependent on full and free investigation without fear of action by the CAA. Accordingly, the CAA gives the following assurances:
 - 3.1.1. The CAA will be checking, as part of its approval audit process, that the organisation's internal occurrence reporting and investigation process is functioning as described in the procedures approved by the CAA and in line with the objectives of the programme as explained in CAP 716

Issue 2. The CAA audit may involve the review of disidentified MEMS investigations such that the foregoing can be satisfied. However, the CAA makes the following assurances that it will:

- a) subject to b) not disclose the name of the person submitting the MEMS report, nor of a person to whom it relates, nor pass on a MEMS report to a third party, unless required to do so by law or unless the person(s) concerned authorises such disclosure.
- b) take all reasonable steps possible to avoid disclosing the identity of the reporter or of those individuals involved in the occurrence, should any follow-up action arising from a MEMS report be taken.
- c) not, as its policy, institute criminal proceedings in respect of unpremeditated or inadvertent breaches of the law or requirements which come to its attention only because they have been reported under the MEMS scheme, except in cases involving dereliction of duty amounting to gross negligence or recklessness. Such an assurance is similar to that provided under the MOR scheme.

3.2. As examples of what the CAA might require, as evidence that an organisation has a working MEMS programme in accordance with Part 145.A.60(b), a surveyor may ask to see the following documents and evidence, and in order to satisfy himself, he may wish to speak to individual members of staff at any level within the organisation:

- a) A copy of the company's safety and disciplinary policy and determine that staff are aware of this policy, and believe that it will be, and has been, applied fairly.
- b) The procedure describing the company's process for reporting and investigating incidents and errors, and the types of occurrences that would normally be investigated.
- c) Evidence that occurrences meeting the criteria detailed above have been reported, and to assure himself that occurrences are not frequently going unreported.
- d) Evidence that occurrences meeting the criteria detailed above have been investigated, and to assure himself that occurrences are being, and have been, fairly investigated. It is hoped that an organisation would cooperate with a surveyor in putting him in touch with individuals who have been party to investigations, but only with the agreement of the individuals concerned.
- e) Within a large company, evidence that MEMS investigators had received appropriate training.
- f) Evidence that the organisation had acted, or was acting, upon results of MEMS investigations, based on risk assessment. This may mean that no action had been taken if a risk assessment has deemed that the causes were unlikely, in isolation or in combination, to result in a hazardous event in the future. A surveyor would expect to see evidence of action(s) to prevent root causes, and/or to mitigate the effects of error where appropriate.
- g) Evidence of feedback to the workforce, on both occurrences and their investigation, and remedial action taken, would also be expected.

3.3. For a small organisation, the surveyor would expect evidence as described above, but on a less structured basis.

3.4. If an organisation has no evidence to offer in the form of reported and investigated occurrences, the surveyor may wish to talk to staff to assure himself that there have been no such occurrences, as opposed to occurrences going unreported and uninvestigated. The surveyor would respect staff confidences in seeking such evidence.

4. MEMS Code of Practice

4.1. The CAA encourages organisations to adopt the following code of practice regarding a MEMS:

4.1.1. Where an occurrence reported via MEMS indicates an unpremeditated or inadvertent lapse by an employee, as described below, the CAA would expect the employer to act reasonably, agreeing that free and full reporting is the primary aim in order to establish *why* the event happened by studying the contributory factors that led to the incident, and that every effort should be made to avoid action that may inhibit reporting.

4.1.2. In the context of error management it is considered that an unpremeditated or inadvertent lapse should not incur any punitive action, but a breach of professionalism may do so. As a guideline, individuals should not attract punitive action unless:

- a) the act was intended to cause deliberate harm or damage.
- b) the person concerned does not have a constructive attitude towards complying with safe operating procedures.
- c) the person concerned knowingly violated procedures that were readily available, workable, intelligible and correct.
- d) the person concerned has been involved previously in similar lapses.
- e) the person concerned has attempted to hide their lapse or part in a mishap.
- f) the act was the result of a substantial disregard for safety.

“Substantial disregard”, for this purpose, means:

- In the case of a certification authorisation holder (e.g. licensed engineer or Certifying Staff) the act or failure to act was a substantial deviation from the degree of care, judgement and responsibility reasonably expected of such a person.
- In the case of a person holding no maintenance certification responsibility, the act or failure to act was a substantial deviation from the degree of care and diligence expected of a reasonable person in those circumstances.

The degree of culpability would vary depending on any mitigating circumstances that are identified as a result of the MEMS investigation. It follows that any action taken by the organisation would also be on a sliding scale varying from corrective measures such as retraining through to dismissal of the individual.

4.1.3. In the case of incidents investigated via a MEMS, irrespective of whether or not such incidents were brought to the knowledge of the CAA, the CAA expects an organisation to address the problems which contributed to these incidents. The organisation should, where possible, implement appropriate measures to prevent the problem from re-occurring, or alternatively monitor future occurrences, according to the degree of risk and likelihood of re-occurrence. A supporting database is useful in these circumstances in helping to assess the frequency of occurrence and any associated trends.

4.1.4. The CAA would expect that identified safety issues would be acted upon. If the CAA becomes aware, by whatever means, that a significant safety problem existed and was not being addressed, it reserves the right to take appropriate action.

NOTE: The statement by an organisation that an incident is undergoing, or has undergone, a MEMS investigation, without any additional information provided to explain why the incident occurred, would not normally be an adequate basis for an MOR closure.

- 4.1.5. Organisations are encouraged to share their MEMS results with the CAA and with other maintenance organisations. It is hoped that by sharing such data the CAA and industry can jointly develop a better understanding of maintenance error causation and develop more focused human factors strategies. However, it is appreciated that some information in a MEMS may be considered sensitive to the organisation affected, and may need to be dis-identified before being shared with other organisations.
- 4.1.6. To support the sharing of MEMS results between organisations, members of the UKOTG (UK Operators Technical Group) and EIMG (European Independent Maintenance Group) in conjunction with the CAA and CHIRP have established a MEMS Review Board and a shared dis-identified database. The Board's role is to facilitate, develop and guide this process. The CAA encourages UK maintenance organisations to participate in the programme and join the MEMS Group. Further details about the MEMS Review Board and how to join the MEMS Group can be found at the following website: <http://www.chirp-mems.co.uk/MEMS/Index.htm>

5. Further Information

- 5.1. More detailed guidance information, including where to obtain free MEMS software, is included in CAP 716 Issue 2.
- 5.2. Maintenance Organisations requiring further information or advice on how to establish a Maintenance Error Management System should contact their CAA Survey Department local Regional Office;

or:

Survey Department,
Chief Surveyor's Office,
CAA
Aviation House
Gatwick Airport South
West Sussex
RH6 0YR
Tel: 01293 573366
Fax: 01293 573984