

**14<sup>th</sup> Annual International Symposium on  
Human Factors in Aviation Maintenance  
March 28-30, 2000 - Vancouver, BC**

**Workshop Number 4  
The Tools of Safety Management**

The aim of this workshop was to share practical applications of currently accepted theories and models to derive practical solutions to real-life human performance issues from a Safety Management System perspective. The basic functions of management are: organizing and directing, allocating resources, and monitoring and controlling. Within a Safety Management System approach, the primary focus of human factors applied to aviation maintenance is error management.

There are two components to Error management:

- error prevention, and
- error containment..

Errors are prevented by designing equipment and systems to be compatible with human capabilities and limitations and by optimizing workplace conditions to minimize factors that will impair performance. Error containment measures recognize that despite our best efforts, errors will occur. Therefore, policies, systems, and procedures must be designed to isolate those inevitable errors so that they do not lead to catastrophic results.

Successful error management requires information. Systems and procedures are designed carefully, but deficiencies may become apparent only after they are in operation. We need to be able to measure safety performance, just as we need to measure financial performance in order to manage the enterprise successfully. Management needs to know:

- What went wrong/could go wrong;
- Why it went wrong;
- What is deficient in the system; and
- how to fix it.

Many early attempts at human error prevention were disappointing because traditional data base designs did not capture the type of information required to respond to management needs. This was because traditional models were not adequate to deal with the complex interrelationships of variables related to human performance in general and error inducing conditions in particular.

The workshop was presented in an expert panel forum. The panel members made short presentations detailing their experience, failures and successes in dealing with the safety management information issue. The presentation were followed by an opportunity for the audience to pose questions and share their experiences.

Maury Hill of the Transportation Safety Board of Canada (TSB) described how the TSB has progressed from a traditional approach, focusing investigative efforts on discovering the proximate cause of accident to a systems approach. The traditional approach emphasized what happened, who did it, and when. They were rarely able to address why it happened. The TSB undertook an integrated systems approach so that their new, robust investigative process is responsive to the safety information requirement and the data base supports the investigative process.

Commander John Schmidt described a similar journey undertaken by the US Navy. The Navy accident/incident investigation process has adopted a systematic approach to understand to systemic factors underlying maintenance and flight crew error called the Human Factors Analysis and Classification System (HFACS). Commander Schmidt described the system and the benefits the Navy has derived from using a scientifically sound, standardized approach.

Mr. Jerry Allen of Delta Airlines described a new programme which is still growing and developing at Delta. Delta has supported the program by recruiting key personnel with the right mix of maintenance experience and technical human factors skill and knowledge. The Delta program incorporates proven methods and is taking steps to modify the culture to make workers more aware of their vulnerability to error inducing conditions, and more proactive in identifying needed changes. The emphasis has changed from finding out what went wrong to identifying the underlying systemic deficiencies so that safety problems can be eliminated or mitigated at the source.

Dr. Gary Eiff of Purdue University described the *At Risk Safety Metric*. The traditional approach to assessing safety by counting accidents does not really tell us much about the safety health of an organization. The Purdue team worked with employees of a major airline to identify “at risk” behaviours. These are actions or omissions that could lead to incidents and accidents. They are reported and tabulated to inform management of where safety issues exist and where proactive measures might be effective in preventing occurrences. The early results are very encouraging and appear to indicate that improving safety is leading to unanticipated productivity gains.

Mr. Rene Dacier of Air Nova described AERO, a data base which is, in effect, a safety office automation tool. The programme relieves the safety officer of much of the administrative and clerical work involved in the safety office, freeing the safety officer to perform safety duties, the primary responsibilities of the office. The programme is designed with the real world of safety management in mind and anticipates the things that the safety office would want to do with the data.

Dr. John Lewko, Director of the Laurentian University Centre for research in Human development described PIECES, a software programme designed to track the costs of an accident. Based on the principles of activity based accounting, PIECES provides management with a model and computational capacity to identify and track hard and soft costs associated with a mishap, including costs of the investigation, equipment repair or replacement, opportunity costs, personnel costs, and others.