AIRCREW CO-OPERATION IN THE ROYAL AIR FORCE

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INTRODUCTION

In a recent editorial column in Air Clues, Wing Commander Spry drew attention to the fact that the standard of aircrew cooperation has been brought into question by Boards of Inquiry into a number of recent RAF accidents.[1] This trend, however, is not confined merely to the RAF, but reflective of an increasingly significant development in the world-wide operation of multi-crew member aircraft. The United States Air Force, for example, has also been affected, the Military Airlift Command (MAC) in particular having suffered in recent years from a rising incidence of aircraft accidents attributable to inadequate crew co-operation. Nor is this phenomenon an exclusive feature of military operations, since a similar trend can also be discerned in concurrent aircraft accidents sustained by commercial air carriers.[2]

Commenting on the problems affecting RAF operations, Wing Commander Spry went on to say..."The essence of crew co-operation is either up-dated or established during the preparation for flight; in the simulator, flight planning room, and pre-flight briefing. All crew members must be aware of their levels and areas of responsibility and the actions expected of them, both during normal operations and in an emergency. Regular practice followed by a critical debrief is the only foolproof way of getting the act together and ensuring that poor crew co-operation does not compound an emergency situation."[3]

These comments accurately reflect the traditional RAF approach to aircrew co-operation, but American research into recent aircraft accidents has strongly suggested that established ideas and training methods have failed to adapt to an ever-growing demand for greater crew co-operation, and a much more comprehensive approach to the problem is required if errors and accidents caused by lack of crew co-operation are to be reduced. As a result of this research, MAC, together with an increasing number of major U.S. air carriers, is introducing a new form of aircrew training designed specifically to improve crew co-operation on the flight deck. This paper describes the origin and principles of the new training, and suggests how it could improve flight safety in the RAF by preventing accidents caused by lack of crew cooperation.

EDITORS' NOTE: This paper was awarded the Royal Air Force's L.C. Groves Memorial Prize for Aircraft Safety.

[1] Air Clues, Vol 39 No 6, June 1985, p 215

[2] A NASA review and analysis of jet transport accidents worldwide during the period from 1968 to 1976 revealed more than 60 in which breakdowns of crew performance process played a significant role. (See H. Clayton Foushee, "Dyads and Triads at 35,000 Feet, Factors Affecting Group Process and Aircrew Performance, AMERICAN PSYCHOLOGIST, Vol 39, No 8, August 1984, p.885.)

[3] Air Clues, op cit.

Aim

The aim of this paper is to prevent flying accidents in the RAF by improving crew co-operation.

ACCIDENT CHARACTERISTICS

Crew Co-operation

It is highly probable that inadequate crew co-operation has always been a significant factor in accidents involving multi-crewmember aircraft. In the past, however, the critical nature of crew co-operation in determining the course and final outcome of an incident was often overshadowed by technical failures affecting the integrity of the aircraft and its associated systems. Despite the extremely high degree of technical reliability associated with modern aircraft, however, accidents have continued to happen, and there has been a consequent increase in attention on human factors and the crew process. This development has been assisted by the mandatory installation of flight data recorders and cockpit voice recorders which have enabled investigators to shed more light on crew interaction during the events leading to the accident. During the period when these developments have taken place, aircraft have also increased significantly in size, performance and complexity, a development which has placed even greater demands on the ability of the crew to perform their tasks. At the same time, the airspace has become increasingly congested, while the operation of military aircraft has been further complicated by the progressive introduction of increasingly sophisticated defensive systems. These changes in the operational environment have not only made it essential for individual crew members to function effectively as part of a team to accomplish the mission, but also ensured that lack of crew co-operation is likely to have more far-reaching consequences in the present day environment than it might have had in the past.

MAC Accidents

Like the RAF, MAC has suffered recently from a series of incidents and accidents in which lack of crew co-operation has played a significant part. Although no two accidents have occurred in precisely similar circumstances, a common pattern of human fallibility has emerged from the accident investigation process. All the crews were experienced in their particular aircraft type and well-versed in their role. Despite the relatively high competence level of the crew, however, most of the accidents occurred either through a procedural mistake, such as flying into high terrain, or because the aircraft commander pressed on beyond a prudent limit despite the fact that there was no overriding operational reason for him to do so. In almost every case, the accident investigation showed that these failings resulted from a lack of communication, poor crew co-operation, or a complete breakdown of crew discipline in the cockpit. These shortcomings, when exacerbated by adverse circumstances or the abrupt and unexpected imposition of a high cockpit workload, resulted in a fragmentation of the group process and a corresponding and catastrophic decline in crew performance.

U.S. Commercial Aviation Accidents

A breakdown in crew co-operation has also been a critical factor in a high proportion of recent accidents involving U.S. commercial jet aircraft.[4] Experiments conducted by the NASA Ames Research Center have determined that one of the principle causes of these accidents was a failure by the flight crew members to use effectively all of the resources available to them during flight operations.[5] The NASA research team also concluded that, in large part, this failure was due to inadequate training in leadership, command, and cockpit management.[6] These significant findings have led in recent years to a progressive change in airline training methods whereby the traditional emphasis on high levels of individual skill has been supplemented by a positive effort to improve crew effectiveness and group performance.

GROUP PERFORMANCE

Group Skills

The well-documented difficulties experienced by MAC and the U.S. commercial air carriers in the area of crew co-operation suggest that the recent problems encountered in RAF operations are neither unique, nor amenable to easy solution. Notwithstanding the excellent work carried out by NASA and academic institutions in the U.S., the group process by which the crew manages the mission is, at best, only imperfectly understood. Meanwhile, the lack of a sound theory of cockpit management has inhibited the development of effective training in crew co-operation. Most corporate training organizations and all regulatory agencies place a high premium of the development and acquisition of individual knowledge and flying skill, but hardly any formal training is given or required in "group skills". In this context, the term "group skills" refers to the continuous process of communication, interaction, and decision-making through which the crew manages the progress of the flight.

The Group Process

Despite a lack of formal training, most crew members eventually develop through observation and intuition a rudimentary grasp of the group skills necessary to perform effectively in the cockpit. The lack of effective training programs, however, leads to a haphazard and uneven distribution of group skills among individual members of the crew force and leaves many crew members without a real understanding of the interpersonal and group skills they need to perform effectively as members of a team. The absence of formal training also inhibits the spread of ideas and the development of better cockpit management techniques. Furthermore, without the insight that education brings, crew members are unable to articulate or resolve problems relating to poor resource management and lack of co-operation in the cockpit, while the failure to develop a lexicon of group skills hinders the evaluation of individual contributions to the team

[4] H. Clayton Foushee, op cit.

[5] John Lauber, "Resource Management in the Cockpit", Airline Pilot, September, 1984, p 20.

[6] Ibid.

effort and precludes effective remedial action when deficiencies are observed. It has been the identification of these problem areas through research which has led to changes in the traditional approach to aircrew co-operation training in the U.S.

AIRCREW CO-OPERATION TRAINING

Academic Training

A common starting point for all aircrew co-operational training which is currently being carried out in the U.S. is the development of a formal academic program. The purpose of this academic training is to change aircrew attitudes towards co-operation by highlighting the shortcomings and limitations of present training methods and introducing new concepts of group skills. Academic training gives crew members a better understanding of group dynamics and the interactive nature of the decision-making process. It can also demonstrate that effective groups will normally arrive at higher quality decisions on complex problems than an individual acting in isolation--a process known as "synergism". Finally, academic training provides a solid foundation for subsequent practical training in aircrew co-operation.

Academic Training Programs in the U.S.

One of the better-known academic training programs in the U.S. is a Cockpit Resource Management course which was developed for United Airlines by Scientific Methods Incorporated, a Texas-based management consultancy group. The course consist of a three-day seminar-based training program designed to develop effective group skills in aircrew members. To provide a simple but effective starting point for the development of complex ideas on synergism and the group process, the course utilizes a widely-known and well-understood American training concept, the Blake-Mouton managerial grid. Through analyzing their own performance in terms of grid concepts, and by assessing the contributions of other members of the group in a similar way, crew members gain insight into the group process and the development of synergism. Over 5000 United Airlines crew members have now attended the Cockpit Resource Management course, together with many crew members from other airlines and corporate flying organizations who have been trained under contractual arrangements. Several other academic training programs have also been developed in the U.S., but while they may differ in form, content and style, their underlying purpose remains the same as the United Airlines course--that is, to improve crew co-operation by fostering and developing group skills in individual crew members.

Theoretical Training in the RAF

Although RAF aircrews are given general training in management and leadership during their initial induction into the service, there is no subsequent formal program to transform these basic skills into the highly developed group process which is required to perform effectively in a modern, multi-crewmember aircraft In view of the high demands which are now placed on individual crewmembers, and the rising incidence of accidents in which lack of crew co-operation has been a significant factor, there is an urgent need

for the RAF to develop an organic academic program to teach group skills. This training should be given not only to aircraft captains, but to every crew position, so that each individual in the aircraft can relate effectively to the group process. The concept of functional leadership, would make an ideal starting point for an academic training program in aircrew group skills. Appropriate elements of the program should also be written into the basic flying training manuals. The academic phase of aircrew co-operation training should take place during initial aircrew training so that crew members are indoctrinated from the outset in the concept of group skills; it should then be developed and reinforced at appropriate intervals throughout their flying careers. A well-developed academic training program would not only provide greater insight into the concept of group skills, but also provide a solid foundation for subsequent practical training.

Practical Training

Because of the dynamic and transitory nature of group interaction, progress in devising practical training programs in crew co-operation has been relatively slow. The advent of the modern flight simulator, however, has provided a highly suitable environment for training crew members to particate more effectively in the group process. Unfortunately, the limited realism and fidelity of the early simulators obscured their potential for training crew members in group skills, and led to the reinforcement of previous training doctrine based on the development of individual pilot skill (known in the U.S. as "batting practice"). It has been a slow evolutionary process to overcome the "batting practice" mentality associated with simulator training and supplemental programs designed to develop individual skill with the more complex scenarios required to promote group skills.

Mission-Orientated Simulator Training

Following the development and introduction of modern, high-fidelity flight simulators, several U.S. commercial airlines have supplemented their traditional approach to aircrew training with a new program known as Line-Orientated Flight Training (LOFT). Following a comprehensive briefing on the purpose of the exercise, each crew flies a standard route sector in the simulator. During the flight, the crew is presented with several structured problems which can best be solved not in isolation, with each individual crew member acting independently, but through the cooperative effort of the entire crew acting in concert. No assistance in solving the problem is given by the simulator instructor, who merely records the various reactions and responses of members of the crew. Crew actions are also recorded on a videotape, which is used in the debriefing and discussion period which follows the simulator flight to illustrate significant points arising during the mission. As part of the debriefing, the instructor encourages crew members to analyze their own performances and learn about the group process from their collective experience during the training session. The LOFT training program, which has been favorably received by aircrews flying for commercial airlines, has also been suitably adapted to the military environment as Mission-Orientated Simulator Training (MOST). The MOST system is now an integral and successful part of continuation training on all the major MAC weapon systems.

Practical Training in the RAF

Since many RAF multi-crew aircraft are also supported by modern flight simulators, the MOST system could be readily adapted to provide practical training in crew co-operation. The principles of MOST should be introduced at the OCUs during initial conversion to type, and included as an integral part of subsequent continuation and upgrade training. The introduction of MOST would require the research and development of suitable training scenarios and appropriate indoctrination and training for the simulator instructors. However, in view of the relatively small outlay in terms of material and training development, and the potential advantages which improved crew co-operation would bring, the introduction of MOST into the RAF training syllabus would be extremely cost-effective.

Feedback

In addition to theoretical and practical training in aircrew co-operation, an effective system of feedback is also required for a healthy and successful development program. By obtaining feedback through its Aviation Safety Reporting System (ASRS), the NASA Ames Research Center has established a considerable data bank on human factors in the cockpit. Under this system, commercial aviation pilots are encouraged to report human errors through a guarantee of anonymity and immunity from disciplinary action. Data from ASRS is used to facilitate research into the cockpit group process. MAC, too, has an "Accident Waiting to Happen" (AWTH) reporting system similar to ASRS, which also provides useful data on human factors in the military cockpit. In the same way, the RAF's own confidential flight safety reporting system, "CONDOR", could be readily used in conjunction with the normal flight evaluation process to support a crew co-operation training program.

MOTIVATION AND MORALE

Risk-Taking

The lack of balance between the emphasis on individual skill and the need for group skills, which is a feature of aircrew training in the RAF today, not only increases the risk of flying accidents by inhibiting crew from achieving maximum cohesion and effectiveness, but produces other adverse side effects as well. Since individual crew members seek job satisfaction and personal development through the acquisition of professional knowledge and skill and gain self-esteem and fulfillment from the approbation of their peers, they are likely to turn to risk-taking and "press-on-itis" to seek recognition and reward if too much emphasis is placed on the attainment of individual skill. In extreme circumstances, a natural desire for enhanced self-esteem can result in the suspension of prudent judgement and induce crew members to attempt maneuvers which are either beyond their level of skill or outside the safe operational limits of the aircraft. This phenomenon has been well documented by past RAF boards of inquiry into aircraft accidents.

Job Satisfaction

Lack of proper emphasis on group skills at all levels in a crew member's chain-of-command also inhibits the achievement of job satisfaction through a meaningful contribution to the team effort. Inability to participate effectively in the group process leads to frustration, poor motivation, and a progressive decline in morale. By adversely affecting motivation, these factors have a significant impact on retention rates, an area presently of considerable concern to the RAF. Conversely, a positive training program in group skills would not only reduce aircraft accidents by improving crew co-operation, but also have a highly beneficial effect on motivation and morale.

CONCLUSION

The progressive introduction of modern, high-performance aircraft, coupled with a significant increase in the complexity of the operational environment, has highlighted crew co-operation as a critical factor in aircraft safety. Investigation into recent MAC aircraft accidents supports the conclusion reached by NASA and other U.S. research institutions that a positive training program is required to improve resource management in the cockpit and prevent a breakdown under stress of the crew process. Past training and regulation has concentrated on the attainment of individual flying skills, but group skills have been neglected through lack of knowledge and understanding of the group process. This long-standing deficiency is now being addressed in the U.S. by the progressive and widespread introduction of theoretical and practical training programs to improve crew co-operation. The RAF should provide similar training for its aircrews through the adaptation and development of existing training resources. Better crew co-operation would not only reduce the number of RAF aircraft accidents but also improve the morale of the Service.

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