

Bureau of Air Safety Investigation

AN INVESTIGATION OF SYSTEMIC FACTORS UNDERLYING AIR SAFETY OCCURRENCES IN THE BRISBANE AREA APPROACH CONTROL CENTRE

INVESTIGATION REPORT

BS/930154

ABBREVIATIONS

AACC	Area Approach Control Centre
AGM	Assistant General Manager
AIG	Accident Investigation Group
ATS	Air Traffic Services
ATC	Air Traffic Control
AVR	Automatic Voice Recorder
BASI	Bureau of Air Safety Investigation
CAA	Civil Aviation Authority
FIR	Flight Information Region
FL	Flight Level
FPC	Full Performance Controller
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IRDS	Interim Radar Display System
km	kilometre
OASIS	Occurrence and Analysis Safety Information System
QA	Quality Assurance
SID	Standard Instrument Departure
TAAATS	The Advanced Australian Air Traffic System
VFR	Visual Flight Rules

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EXECUTIVE SUMMARY

The air traffic control safety net fails when human errors go undetected and uncorrected. These operational errors are generally more likely to occur in circumstances such as very high or very low workload situations, or events involving complex coordination. Predisposing or underlying factors relating to the ATC operational environment can influence the frequency, and the consequences, of operational errors. System safety can be improved by the identification and rectification of these predisposing factors.

Information from air traffic controllers from each sector within the Brisbane AACC together with the results of interviews with the management from the Northern District and Central Office Air Traffic Services Division formed the basis of this investigation.

The investigation identified a number of local factors associated with the task and the environment which may increase the probability of errors by individual controllers. Task related issues included the operation of VFR aircraft in the Brisbane Terminal Area, and the relationship between the AACC and Brisbane and Archerfield Control Towers. Also highlighted within the AACC was what is referred to in the report as the 'service ethos', or the tendency for air traffic controllers to provide an individualised service to aircraft at the expense of a regularised traffic flow. The level of awareness of human performance capabilities and limitations among the controllers interviewed was found to be minimal.

At the time of the investigation, training was under way for the implementation of teams and for transition to ICAO airspace (which was deferred shortly after interviews with the controllers were completed). This placed a considerable training burden on the AACC and there was a strong view among the controllers that too many changes were being introduced into the ATS system in too short a time frame. In addition, it was apparent that the management view of what the changes involved differed markedly from the understanding held by the controllers. It seemed that the human factors aspects of the change process (i.e. those involving the controllers) were not addressed by management to the same extent as were the "mechanical" aspects such as procedural and technical changes. Consequently, the recommendation is made that ATS Division devotes more attention and resources to the processes and mediums by which it leads its workforce employees through the change cycle.

The effective two-way flow of information within a system is an important determinant of the "safety health" of that system. The introduction of teams at the Brisbane AACC in early October 1993 was a major step in facilitating improved information flow to and from the workforce. Nevertheless, at the

middle management level, significant deficiencies were identified in the communication network. These were the geographic separation of the office of the Manager AACC from the AACC itself, and a similar separation between the third and some of the fourth level management officers. This latter aspect will largely be overcome in April 1994 when the city office relocates to the airport. However, a lack of suitable building space has prevented the Manager AACC from being co-located with the AACC and there are currently no plans for such a move. The investigation concludes that this aspect should be reassessed as a matter of urgency.

Communication was also identified as an issue at the corporate level. Liaison between the various managerial levels seemed to work effectively with regard to local and national initiatives formulated in Central Office. However, feedback to the workforce concerning projects in which controllers were involved usually occurred at the conclusion of a project. This may result in controllers feeling they have little commitment to development, despite the involvement of district office representation.

Commitment of the workforce is a prerequisite to successful change. Evidence seems to indicate that in some respects this has been lacking despite the resources committed by management to the orientation of controllers. Change in the Australian ATS environment is inevitable and ATS Division therefore needs to re-examine the processes and mediums through which it educates its employees with particular reference to the implementation process for TAAATS.

CHAPTER 1

BACKGROUND

1.1 INTRODUCTION

In the period 1 June to 31 December 1993, there were 10 air safety incidents involving controller error at the Brisbane Area Approach Control Centre (AACC). These involved breakdowns in coordination, loss of separation standards, incorrect annotation on flight strips, and failing to obtain level readbacks from both aircraft and other sectors. In its investigations of each of the incidents, BASI found little commonality between the local factors identified in the incident.

Following a suggestion by the Manager Brisbane AACC and consultation with Air Traffic Services Northern District Office and Central Office management, it was agreed that there could be significant benefit in BASI establishing a small team to undertake a systemic examination of organisational factors underlying the air safety incidents which had occurred in the Brisbane AACC.

At the time the investigation commenced, training for the now deferred ICAO airspace changes and "teams" was under way, enroute sectors were being consolidated to the Brisbane AACC, and the Northern District Office was acquiring responsibility for more airspace.

In November 1993, a Preliminary Report was issued which contained the results and analysis of BASI's interviews with controllers from the AACC. Fourteen Interim Recommendations to the CAA were contained in the report.

1.2 SCOPE

The investigation concerned issues related to the current work practices and equipment installed in the Brisbane AACC. The present radar displays in the AACC will be replaced in 1994 by labelled displays (IRDS). Where relevant, attention during the investigation was directed at enhancing the safety net as it relates to the current displays. Issues relating to the technical aspects of the current displays such as display quality and target labels were not addressed.

1.3 OBJECTIVES

The objectives of the investigation were:

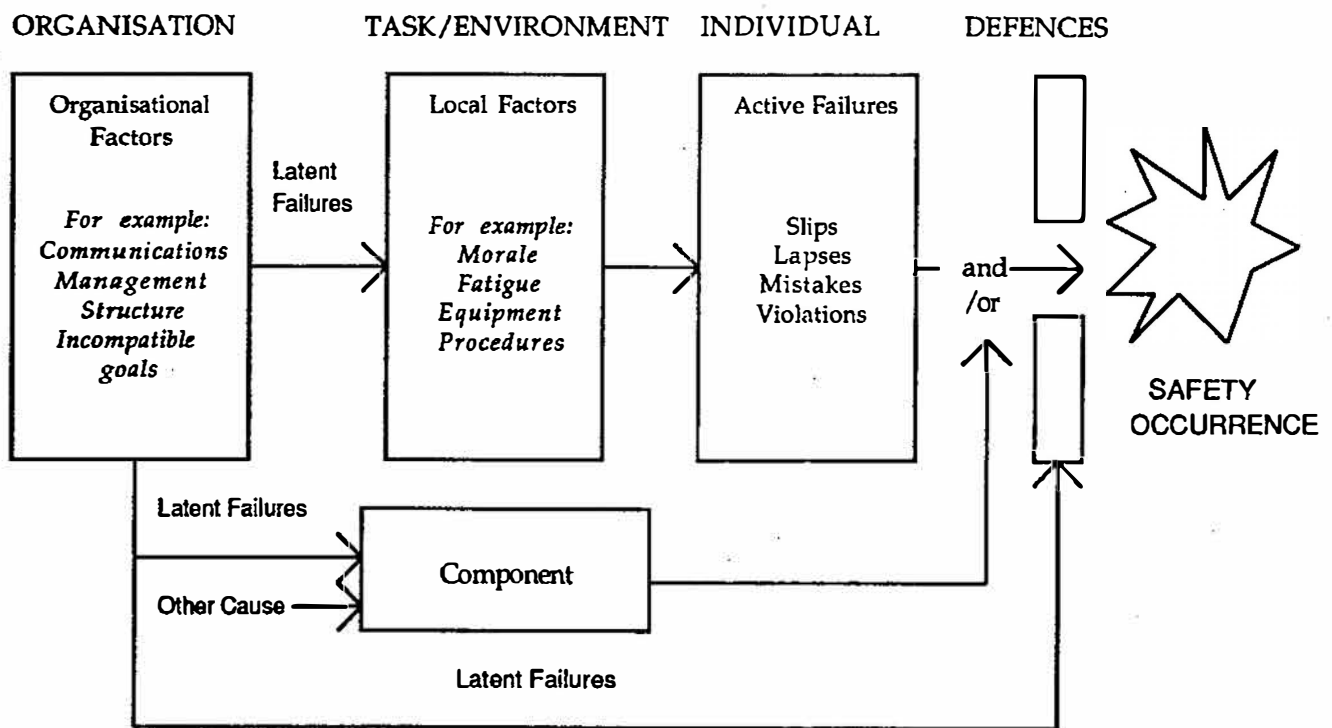
1. To determine whether there were any underlying organisational factors which had not been identified in the investigations of the occurrences involving the

Brisbane AACC;

2. To examine ways of improving the "safety net" within the Brisbane AACC;
3. To identify areas for possible human performance assistance to Brisbane ATS; and
4. To make remedial recommendations as appropriate.

1.4 ANALYTICAL FRAMEWORK

The analytical framework of the examination was that developed by Professor James Reason and recommended for adoption by ICAO. This framework distinguishes between organisational factors, local factors and active failures. The basic model is presented below.



The main points of the model are:

1. People, by their very nature, will always make unsafe acts. These acts may take the form of slips, lapses, mistakes or violations. Reason has called these errors **Active Failures**.

2. Complex systems (such as air traffic control systems) contain defences to protect them against human error. However, there will always be loop holes or **Latent Failures** in the system which may have been present long before they are seen in an occurrence.

3. Research shows that it is impossible to control or accurately predict the likelihood of a person making an error. However situations and environments, or properties of the workplace, which affect the probability of error can be identified. These conditions, which include issues such as knowledge, skills, experience, fatigue and morale, are termed **Local Factors**.

4. Similarly, it may also be possible to identify latent failures in the form of general failure types in the organisation. These **Organisational Factors** determine the natures of the local factors which directly affect performance at the workplace.

To *account* for an air safety occurrence, it could be sufficient to identify the active failures ("the controller did not correctly annotate the flight strip"). To *prevent* a repetition of the occurrence, however, this is probably the least useful aspect to identify, since it relates to the least controllable element - the human. It is of far more use to determine:

1. Whether there were any deficiencies in local factors which could have contributed to the mistake.
2. Any latent failures in the organisational factors which contributed to deficiencies in the local factors.
3. Any latent failures in the design of the system.

1.5 METHODOLOGY

The aim of the investigation was to collect information from three basic sources which align with the individual, task/environment and organisational components of Reason's model as follows:

Active Failures: Individual

An examination of recent incidents from the Bureau's OASIS database provided details of the types of active failures which had been identified.

Local Factors: Task/Environment

Local factors associated with the air traffic control task and the AACC environment were identified from:

1. Information from air safety occurrences which occurred in 1993.
2. Interviews with controllers. The initial plan was to interview 30 controllers over a three day period. However, early in the exercise, it became apparent that, if each interview was to be properly completed, only about half that number of persons could be interviewed. In the event, a total of 17 controllers from Brisbane AACC, including controllers from Sectors 1, 2, 3 and 5, Approach, Arrivals, Check Controllers, and Senior Area Approach Controllers were interviewed. The high level of consistency in responses across the sample was such that the group was considered a valid representation of the approximately 200 controllers at the AACC.
3. Interviews with Divisional ATS Management including the AGM Northern District Office, the Manager Brisbane AACC, and the Manager ATS Human Resources.

Organisational Factors

Organisational factors were identified from:

1. Interviews with Divisional ATS Management as indicated above; and
2. Interviews with Central Office ATS management, including the AGM ATS Human Resources, AGM Airways Management and Procedures, AGM Airways Transition Project, and AGM Quality Assurance. In some cases additional Branch management personnel were involved in the interviews. The organisational structure of ATS Division is shown at Appendix A.

From an analysis of this information, assessments were made regarding improvements which could be applied to the defences of the ATS system in Brisbane. Additional information considered included the recent ATS QA report on Brisbane AACC.

CHAPTER 2

ACTIVE FAILURES: INDIVIDUAL

Between 1st June and 31st December 1993, active failures by controllers resulted in 10 air safety occurrences involving the Brisbane AACC. The active failures identified from investigations of these occurrences included:

1. **Failure to correctly indicate an amended flight level on a flight strip/"shrimp boat".** For example:

On contacting Brisbane Control, the aircraft was not cruising at the expected level. Investigation found that the required co-ordination between Brisbane and Sydney had been carried out. However, the flight progress strip and the "shrimp boat" had not been correctly annotated by the Brisbane radar controller (OASIS reference number 9302327).;

2. **Failure to coordinate an amended flight level with the next sector.** For example:

The aircraft requested an amended cruising level of FL 240. and was cleared to this level by Brisbane Approach. However, the changed level was not coordinated with Sector 1 (OASIS reference number 9302545);

3. **Failure to confirm an assigned level.** For example:

The aircraft had been cleared at FL 390 but, after departure, requested FL 370. This was coordinated with Sector 1. The Sector 1 controller failed to pass the change of level to Sector 2 and during the hand-off to the Sector 2 radar controller, no reference was made to the level. The aircraft was transferred to Sector 2 and reported on climb to FL 370. The Sector 2 radar controller failed to confirm the aircraft's level and the discrepancy between the coordinated level and the pilot's report was not detected. When the traffic was coordinated with Sydney Sector 2, the level was coordinated as on climb to FL 390. Later, while the aircraft was still in the Brisbane FIR, the Sydney Sector 2 radar controller noticed that the aircraft was maintaining FL370. This was queried with Brisbane and the oversight was discovered (OASIS reference number 9302543).

4. **Clearing traffic on a track, at a level or to a level which resulted in conflict with other traffic.** For example:

Two aircraft were operating on different tracks at different levels. The higher aircraft was cleared to descend to a level which took it through the level of the lower aircraft. (OASIS reference number 9301823).

The purpose of the investigation was not to analyse active failures in depth, but to concentrate on the systemic issues which facilitated such active failures. The following chapters analyse the local and organisational factors which were identified during the investigation.

CHAPTER 3

LOCAL FACTORS: TASK/ENVIRONMENT

Local factors identified during interviews with controllers from the Brisbane AACC included aspects relating to procedures, the physical environment at the AACC, and the 'service ethos'.

3.1 Procedures

Controllers felt that there had been considerable on-going effort by ATS management towards monitoring the route structure and procedures, and developing improvements. Areas which were considered in need of further examination are outlined below.

IFR Aircraft to/from Archerfield

There had been one incident in 1993 and others in previous years which arose when IFR aircraft northbound from Archerfield, having been cleared into controlled airspace, conflicted with traffic into or out of Brisbane. Controllers were asked their views on any difficulties that existed with respect to Archerfield and improvements which might be considered. Comments included:

1. Controllers at Archerfield appeared to not fully appreciate the Brisbane Approach environment and the pressures under which it operated. Start clearances were not always adhered to. This resulted in controllers being placed under pressure to issue clearances to aircraft which had departed Archerfield, sometimes under conditions of high traffic workload.
2. There was a need for an Archerfield standard instrument departure (SID) which took aircraft well away from the Brisbane runway 01/19 centreline prior to them entering controlled airspace.
3. Similarly, the publishing of standard routes into Archerfield would also improve traffic flow. For example, two possible routes were Kilcoy-Amberley-Archerfield from the north, and Laravale-Archerfield (at a particular level) from the south.

VFR Aircraft Operating in Terminal CTA

Senior controllers felt that VFR aircraft operating within the terminal airspace and aircraft transiting that airspace substantially increased the air traffic control workload, primarily because a labelled radar display was not available. It was felt

that, as an interim solution pending introduction of the labelled radar displays, there could be merit in introducing periods of restricted VFR access and standard visual routes to designated entry and exit points, so as to better control the impact these aircraft had on the sector workload.

In one of the 1993 incidents, the air traffic picture in Approach North airspace included a VFR aircraft operating to the north-west of Brisbane and a military helicopter transiting to the south of the airport. Analysis of the AVR tape recording covering the 15 minutes prior to the occurrence showed that 81 seconds of transmission time was solely devoted to obtaining the present levels of aircraft. Of this total, 50 seconds was occupied by the VFR aircraft and the helicopter. The remaining 31 seconds covered four IFR aircraft operating either to or from Brisbane. In the same period, 22 seconds of transmission time were devoted to obtaining the levels of four aircraft on Approach South and 33 seconds for two aircraft on Arrivals. Only IFR aircraft to/from Brisbane were operating on these latter two sectors. This analysis indicates the disproportionate affect on controller workload which itinerant aircraft on "one-off" tracks can have and highlights the need for careful evaluation of workload impact before such aircraft are cleared for operations in terminal airspace.

Flow Control

A common view, particularly from controllers operating the enroute sectors, was that the metering ("flow control") of traffic outbound from Brisbane should be considered especially where traffic is destined for a procedural sector.

Controllers on the enroute sectors indicated that they frequently experienced problems in gaining the attention of the flow controller when he was on the opposite side of the control room. This involved standing up at their positions and calling across the room - thereby increasing individual workload and the noise level in the control room. It was suggested by some that equipping the flow controller with a mobile intercom system could be considered. However, others held the view that such a device would be too distracting.

Discussion

The procedural areas identified above were seen by the controllers as those which had the greatest potential to impact on their ability to perform at the highest level of efficiency. The first two areas perhaps reflect the flexibility of the ATS system at present. They are also in conflict with the 1992 Ratner Report which suggests that aircraft in a system which maximises traffic capacity and reduces the propensity for error should "run on rails" (see later 3.5). An Archerfield SID would achieve this aim.

3.2 AACC/Control Tower Relationship

There was consensus among the more senior controllers that the relationship between the AACC and the Control Tower needed improvement. It was felt that the Tower sometimes 'fired aircraft off' in rapid succession without fully appreciating the workload implications this could have on the Approach and Arrivals Sectors. A further problem involved international flights departing from runway 01 when runway 19 was the duty runway.

Discussion

It was suggested that Tower controllers should regularly visit the AACC, and vice versa, to facilitate better understanding between the two units. Also, there were current procedures which allowed a regulated traffic flow to be achieved, and perhaps these were not being utilised properly.

3.3 Air Route Structure

The air route structure in some of the sectors was complex in places. Changes were being developed which should improve traffic flow at some 'bottlenecks'. Controllers were aware that ongoing monitoring and development was continuing.

Discussion

The investigation noted that the CAA has begun a major review of air routes within Australia in accordance with Recommendation 8 and 9 of the 1992 Ratner Report. The results of this review should identify and resolve the problems in sectors where workload is increased by the complexity of the route structure. If this is achieved the potential for error will be reduced.

3.4 Physical Environment

The recent changes in the physical environment of the AACC, particularly the training annex, the tea room, and the control room itself, were acknowledged and appreciated. However, controllers indicated that there remained a number of areas which, in their view, warranted further attention. These included:

1. Air conditioning. This was described as a longstanding problem which was thought to be due to insufficient fresh air entering the building. This resulted in what was described as a general stuffiness in the room, and headaches and bronchial problems for some controllers.
2. Rest Areas. There was no quiet area available for relaxing or studying. The amenities room was somewhat noisy, close to the control room, and

generally not conducive to relaxation or study. With the longer shift periods associated with teams, there would be a greater call for such an area. The suggestion was also made that an outside sitting area would be a most welcome addition to the environment.

3. Exercise Facilities. A number of suggestions were made concerning exercise facilities such a gymnasium for the AACC. As indicated above, longer shift periods would increase the demand for such facilities.

Discussion

Depending on the timing of the proposed new AACC building, there is obviously a limit to the resources which can be devoted to improving the current building. However, consultation with the controllers as a group might be an appropriate means of allocating priorities in this regard.

3.5 The Service Ethos

There was a common view amongst the less experienced controllers that, when an aircraft requested a change to its cleared level or route, every effort should be made to comply with the request. The perception was that it was difficult to say "no" to such requests, as the provision of a 'service' was an integral part of their role. Aircraft crews commonly sought reasons if requests were not granted. This put pressure on the controllers to approve requests.

Controllers on procedural sectors indicated that they would not grant track shortening (as this was against procedures), but would endeavour to comply with level change requests, including the use of non-standard levels. The more experienced controllers indicated that they would assess the down-stream workload ramifications before amending a clearance. However, the overall view expressed was that the provision of a service to aircraft was an important aspect of air traffic control.

Discussion

There is no reason to expect controllers at Brisbane to be different to those in other centres across Australia. The 'service ethos' is therefore likely to be a nationwide phenomenon.

In his 1992 Review of the Australian Air Traffic Services System, Ratner noted that *"ATS officers have been able to cater to ad hoc user requests under most circumstances and provide a highly personalised service. Their understanding of current industry economic difficulties, interpretation of CAA's mission to "serve the users", pressure from aircrews for direct clearances and preferred altitudes, and an industrial focus on compensation rather than working*

conditions all tend to reinforce this culture of individual ATS officers providing individualised service to aircraft. This culture begins to conflict with safety when traffic grows to capacity levels and this capacity is not acknowledged. ATS officer decision making workload grows disproportionately near (workload) capacity, with greater exposure to the risk of human error.

The ATS authorities of Europe and North America have responded to this situation by regularising ATS operational procedures so as to handle similar situations similarly, that is, to regularise and standardise the way successive aircraft are handled on major flow paths across airspace sectors, and to design clearances so these flow paths are regularly used. It is appropriate for Australian ATS to move in this direction by integrating and regularising ATS procedures and route structures within and between facility jurisdictions. Such a scheme, termed traffic management by its proponents and "running the system on rails" by its opponents, aids ATS officers' decision making reliability at high workloads, reduces coordination and conflict resolution workload, and increases capacity where workload is the limiting factor. Both safety and efficiency are served, and necessary flexibility is not compromised. In addition to building understanding and acceptance among ATS officers, achieving an effective traffic management system will involve building industry understanding of the greater overall efficiencies to be gained.

Ratner Recommendation 9 Traffic Management Expedite the move to a system on traffic management whereby regular flow paths are established for major intercity and terminal movements to regularise traffic handling. This will involve consideration of preferred routes, STARs, SIDs, and airspace sector redesign."

The investigation noted that Recommendation 9 is being progressed by ATS both locally and at Central Office. However, the active failures highlighted at paragraph 2.1 of this report followed controllers agreeing to requests from aircraft or from other sectors. It would be appropriate for team leaders to place increased emphasis on the "running the system on rails" aspect during training and checks.

3.6 Human Factors Awareness

There was minimal awareness among the controllers interviewed of human performance capabilities and limitations. For example, controllers were generally not aware of the effects of workload (high or low) on performance, or how to recognise and cope with these situations.

Discussion

In his 1992 Review, Ratner noted that "ATS officers need to acquire a better

understanding of human performance limitations and mental processes. This understanding itself can be expected to reduce errors associated with human performance limitations, but not eliminate them; a safety net of backup procedures or systems is still necessary."

"Recommendation 16 ATS Training Teach ... in-service training programs for ATS officers, principles and findings regarding human performance limitations and mental processes in ATS and appropriate practices to minimise incidents associated with those factors. Include specifically the following topics:

- The capacity of airspace sectors and ATS officer performance near capacity.*
- Maintaining vigilance in low workload situations.*
- Risks associated with plans contingent on future attention requirements.*
- Expectation errors, and the readback/hearback problem.*
- Time-critical decision making and effective decision making in abnormal or emergency situations.*
- Separation assurance as distinct from achieving separation."*

The investigation noted the actions of the Human Resources Branch of the CAA in its attempts to build an integrated training regime in which human factors is an inherent part. These actions include developing ab initio selection and training with human factors components, reviewing the application of crew resource management (CRM) concepts within the ATS environment, and incorporating human factors issues into the review of the functioning of teams. BASI remains committed to providing advice and assistance in this regard as required.

CHAPTER 4

ORGANISATIONAL FACTORS

The investigation addressed a range of organisational aspects. These included organisational structure, people management, commercial and operational pressures, planning and scheduling, communication, and change. The issues addressed below are those where deficiencies were identified. No comment has been made on those organisational aspects where deficiencies were not identified.

In a dynamic organisation such as ATS, change is inevitable and necessary. Changes under way within ATS which impacted on the Northern District Office, and on the controllers at the time the interviews were conducted, included:

1. Consolidation of en-route sectors to Brisbane - ongoing.
2. The assumption of responsibility for more airspace associated with the Northern District - ongoing.
3. Implementation of staffing restructures associated with the transition to the ATS Teams structure on 4 October 1993.
4. Education and training for the transition of ICAO airspace classifications on 11 November 1993 (now deferred).

The impact and management of these changes was included as part of the examination of organisational factors.

4.1 Change and Training

Controller Perceptions

There was an almost unanimous view amongst those controllers interviewed that the AACC and its operation were having to cope with too many changes, and undergo too much training, in too short a time frame.

In terms of direct impact on local controllers, the consolidation of en-route sectors and the expansion of the Northern District's airspace had only a minor effect on the day to day operation of the Brisbane AACC. These changes, did however involve substantial workload for management.

The investigation revealed that the credibility of the team concept and many

team leaders had been undermined before the implementation of teams. Due to training commitments, a number of the team leaders could not be rated on the sectors to which their team had been allocated, nor could the prescribed compliment of controllers required to be FPC¹ be achieved prior to introduction. The controllers valued technical competence and consequently expressed a lack of confidence in the team leaders as competent supervisors, despite the fact that team leaders had been selected on the basis of their managerial rather than technical ability. This controller attitude is a further indication of a lack of knowledge/understanding of the teams concept. Whether this situation has any long term effect on the functioning and success of teams in the AACC environment cannot be assessed by this review.

Without question, however, the change which was causing most concern among controllers was the introduction of the ICAO airspace classifications. Training for this change was described as being rushed and inadequate. Interviewees expressed a low level of confidence that they would be adequately prepared for the introduction of the new procedures. There was uncertainty regarding the impact the airspace classifications would have on the functioning of the ATS system as a whole, and on the functioning of individual sectors.

An indication of the state of mind of some controllers was illustrated by their reaction to the late change introduced to the ICAO procedures concerning the notification of VFR traffic above 10000 feet. This was seen as "the last straw" and something that would "render irrelevant all the training for the ICAO procedures which had at that stage been completed". In reality, the effect of the change on the procedures was minimal, involving only a few aircraft.

Overall, the impression interviewees gave was one of fear of and/or hostility towards the changes.

Management Perception

The views from District and Central Office management concerning changes in the ATS environment included the following:

1. Many air traffic controllers resisted change and often failed to understand or appreciate that the intention of changes was to improve the ATS system.
3. Many controllers did not read the various bulletins and circulars which

¹ FPC was a result of an award restructure which introduced the concept of a multi-rated controller. The controller will be rated on all sectors for which the team has responsibility. For example, in the case of Team A in the Brisbane AACC controllers operate on both Approach and Arrivals.

were distributed regularly and which provided substantial detail on, and justification for, the changes.

4. There had been significant input from Brisbane AACC staff concerning training for the ICAO airspace changes. Field testing for the computer aided learning (CAL) program which was part of the training for these changes was undertaken at the Brisbane AACC.

5. Meetings and briefings were held at the Brisbane AACC concerning both the ICAO airspace changes and teams. Attendance was voluntary and was estimated at 50-60 percent of controllers at the AACC. However, it was recognised that, because of the shift system, it was unrealistic to expect an attendance level of 100 percent.

6. The real changes concerning procedures and workload associated with the ICAO airspace changes were not as significant or as serious as anticipated by controllers at the workplace. Management were surprised by the controllers' reaction.

Local management acknowledged that training for teams and the ICAO airspace changes had clashed. However, there had been a "window of opportunity" for teams to be introduced and, given the prospective benefits teams would bring, the decision was taken to proceed. In the event, there were delays in the selection of team leaders which were beyond the control of the Northern District Office. This resulted in teams being introduced only five weeks before the planned date for the ICAO airspace changes.

Change Management Theory

According to organisational theorists such as Miller (1992), the key to managing any change or reorganisation lies in balancing the technical and procedural dimensions with the people dimensions of the change. Managers, particularly in organisations engaged in complex roles, such as the CAA, tend to focus on the technical and procedural components of the change. This entails determining staff levels, moving functions, developing procedures, and acquiring hardware. While these tasks are important, they can overwhelm the entire change effort if the human aspects are not adequately addressed. The ultimate success of reorganisation or change is dependent on how successfully the organisation manages its people through the change process.

Miller argues that the human side of change is neither logical nor reasonable and can involve employees feeling such emotions as doubt and fear. Employees can feel frightened about surrendering old work habits and roles, and about losing the "comfort zone of competence" that they have acquired over the years. Managers can perceive these signs from employees as unwarranted resistance to

change. In turn, this can lead to employees being reluctant to openly share their feelings for fear of being viewed as troublemakers.

Some suggested strategies for successfully managing change include:

1. Providing continuing information about the change.
2. Giving visible support to all those involved with the change.
3. Being sensitive to those who are at different stages of acceptance of the change.
4. Providing a safety net when people make mistakes.

In summary, for change to be successful, it must be accepted. This implies obtaining understanding and commitment on the part of all those who will be affected by the change.

Discussion

The management of the ATS Division devoted significant resources towards educating controllers about the impact of the ICAO changes and the benefits associated with the introduction of teams. However, these messages appear not to have been fully accepted or understood by controllers within the Brisbane AACC.

There was a marked disparity between the controllers' perception of how teams and the ICAO airspace changes would affect their workload and operations compared with the views of the Northern District Office and Central Office management.

While the reasons for these differences were not clear cut, it is possible that:

1. The culture at the ATS workplace was resistant to change. This may be a reflection of the personality type attracted to a career in ATS, the lack of exposure to change over long period of time or the unwritten rules which develop within a stable workforce which mould attitudes and behaviour within the organisation. As a consequence, the group may be unwilling or unable to leave its "comfort zone of competence".
2. The effects and benefits that the changes would bring to the individual controller, the organisation, and the industry had not been adequately presented or addressed during briefings or training.
3. The effects or benefits which were presented were not accepted by the

controllers. This could relate to a variety of issues which may act in combination or isolation: the dissemination and timing of information, the credibility of the presenters in the eyes of the controllers, and the attitude of controllers, such as apathy towards management initiatives.

Change in the Australian ATS environment is inevitable. From the information gained during this investigation, ATS Division can improve the success of future changes by better management of the human side of the change process. This involves devoting more attention and resources to the processes and mediums by which it educates its employees about change.

4.2 Communications

The investigation examined management communications with the workforce at the local or District Office level and at the corporate or Central Office level.

By way of background to this section, the disposition of Northern District Office management as it relates to the AACC is as follows:

1. The AGM Northern District, and the Manager Towers and Outstations, Centre Manager (Enroute), and Human Resources, as well as support staff, are located in offices in Central Brisbane, some 18km from Brisbane Airport.
2. The Manager AACC is located in the Operations Building at the base of the Brisbane Airport Control Tower.
3. The AACC is located in a building adjacent to the southern boundary of Brisbane Airport, some 5 km from the Operations Building.

The management group currently located in Central Brisbane is scheduled to relocate to the Operations Building in April 1994. A new building which will incorporate the Brisbane AACC is scheduled for completion in 1996. This building is to be positioned adjacent to the Operations Building.

Local Communications

The investigation team gained the impression from interviews with the controllers that they viewed communications to and from management as deficient. Controllers indicated a desire to receive more regular and detailed communications from management on developments within Air Traffic Services - on both national and local issues. A frequent comment was that they did not understand the reasons for changes and decisions from above. For example, few were aware of the reasons why 'teams' were being introduced. In some respects, this manifested itself in a level of cynicism towards management.

The unanimous view of those interviewed was that the Manager Brisbane AACC should have his office located at the AACC rather than in the Operations Building. Such a move was seen as the most direct and effective means of improving communications between the workforce and management.

The management group within the Northern District office agreed that the level of communication with the workforce had been less than ideal. The situation had been made more difficult by the physical separation between management and the AACC and the lack of available office space at the AACC. Significant efforts have been made to address these shortcomings and, on present indications, relocation of Northern District Office personnel from the City to the Operations Building at Brisbane Airport should be completed by April 1994. However, the Manager AACC will continue to be located remote from the AACC.

Communications with Central Office

The interaction between Central Office and the Northern District Office Management is highly structured. Developments in all areas of the ATS Division are generated under the guidance of project teams which are coordinated from Central Office. While the project teams contain district office representation, feedback to the workforce is the responsibility of the project manager, who could be from Central Office or from a district office. This feedback is usually limited to the conclusion of the project and workforce controllers may feel they have little ownership or stake in the project despite the involvement of their representative. Ongoing feedback to the workforce is important in recognising the input and liaison which has taken place on their behalf.

Communications and Corporate Culture

An important determinant of the "safety health"² of complex information-handling systems is the effective two-way flow of information within that system. Theorists argue that the flow of information within an organisation is

² "Safety health" is an overall measure of indices such as quality of management, design, construction, operations, procedures, communication, control, maintenance etc. They reflect the organisation's intrinsic resistance to hazards.

"Safety health" is an important concept, as occurrences are too infrequent to be viewed as a measure of the success of the organisation or to support effective safety management.

dependant upon the corporate culture ³ of that organisation. Uttal (1983) has suggested that there are three basic organisational cultures - pathological, bureaucratic, and generative. How these cultures generally handle information is listed below:

Pathological	Bureaucratic	Generative
Don't want to know	May not find out	Actively seek information
Messengers are shot	Listened to if they arrive	Messengers are trained
Responsibility is shirked	Responsibility is compartmentalised	Responsibility is shared
Failure is punished or covered up	Failures (incidents and accidents) lead to local repairs	Failures prompt far-reaching inquiries leading to organisational reforms
New ideas are actively crushed	New ideas present problems	New ideas are welcomed

Discussion

The investigation demonstrates that the organisation, at present, is essentially a "bureaucratic" culture. However, given its nature and role, the generative culture is that which should best fit ATS. This emphasises the need for, and benefits which derive from, "training the messengers", developing more channels of communications, and examining the strategic or national implications of local failures.

In his 1992 Review of the Australian Air Traffic Services System, Ratner, in commenting on management communications, noted the following: *"Management communications between Central Office and field facility personnel are perceived by the field as inadequate. It would be most unusual if in a period of rapid change such as exists today there were not such feelings, especially in view of the organisational restructuring and review of resource levels that have occurred. The perceived inadequacy contributes to low morale in the field and low morale, while most difficult to pin down as a contributory factor in operational errors, is probably an underlying contributory factor in distraction and inadequate planning incidents to some extent. Real change in staff attitudes depends on improved first line management, and the team*

³ Corporate culture is defined as the shared values and beliefs which interact within an organisation's structures and control systems to produce "the way we do things around here".

concept is the best hope for that."

Given the recent introduction of teams at the Brisbane AACC, the mechanism is now in place, through the team leaders, for improved information flow to and from the workforce. There is a requirement on the part of management to provide support for the team leaders as they adapt to this managerial position. Equally, it is incumbent upon team members to participate fully in the team process and make maximum use of the expanded opportunities which the teams arrangement provides.

A key to this process is the ability of managers to attend to the concerns of workers and to be aware of the "atmosphere" within the workplace. This can only take place via effective communication. In the case of the Brisbane AACC, there are real difficulties in achieving this if the manager of the AACC is not located at the Centre and is limited to periodic visits. While some aspects of communication will be improved following the move to the airport of Brisbane Central based management, it is of concern that geographic separation will continue to impinge on communications because of the separation between the AACC and the Operations building (irrespective of whether the Manager AACC is relocated to the AACC). There are arguments for the Manager AACC to continue to be positioned in the Operations building where the remainder of the management team will be. However, there appears to be a greater need for personal contact between the Manager AACC and the controllers than there does between the Manager AACC and other District Office managers. Special consideration needs to be directed to this area to ensure more effective communications.

4.3 Organisational Structure

The higher organisational structure of the ATS Division of the CAA was seen by the third and fourth level managers (see Appendix A) as flexible and one which met the needs of the organisation. The Central Office policy and procedural units facilitate and coordinate changes and ensure standardisation throughout the organisation, with regional representatives providing specialist expertise. The only deficiency identified in this regard is that of feedback to the workforce. This issue is addressed in section 4.2.

While not a direct result of this investigation, the organisation of the Northern District Office is to be restructured after the consolidation of Townsville, Darwin, and some Sydney sectors to Brisbane. The new fourth level management structure will no longer include the Manager AACC. The posts are as follows:

Centre Manager (Enroute)

Manager, Brisbane Tower, Brisbane Approach and Arrivals Sectors (Team A) and Coolangatta

Manager, Outstations, including Townsville and Darwin Arrivals
Manager, Cairns
Manager, Human Resources
Manager, Operational Support

The first phase of the restructure is to take place on the 24th of February, 1994 when two fourth level managers assume the responsibilities of Centre Manager (Enroute) and Manager, Brisbane Tower, Brisbane Approach and Arrivals and Coolangatta.

This new structure will provide operational unit managers with a more logical and concentrated area of responsibility and should, as a result, enhance communications with the workforce. However, these potential benefits will not be fully realised if the Centre Manager (Enroute) and the Manager Brisbane Tower, Team A and Coolangatta are not located at the AACC.

4.4 Management Workload

Workload of the Northern District Office management group has been considerable and appears likely to continue at a high level for the foreseeable future. This workload, plus the geographic separation between some elements, has ensured that often the relationship between management and employees has suffered. The proposed reorganisation of the operational unit management, as outlined above, in conjunction with the introduction of team leaders may enable managers to more effectively support the workforce. This will be particularly timely given the introduction of TAAATS.

4.5 Operational Pressures and Strategic Planning

In recent years, ATS Division has adopted a client service philosophy. This, in conjunction with the acceptance of the requirement for TAAATS, has placed considerable demand on the workforce. This demand was evident in the high workload through all levels of the organisation and the rapid pace of change within the ATS environment. Managers at all levels talk in terms of "windows of opportunity" within which change can be implemented. The investigation revealed a situation in which the demands for change and the perceived benefits of such change seemed to outweigh the need for a stable work environment through which changes could be implemented. In some respects, the 'big' changes, such as the ICAO Airspace classifications, appeared to over-ride other lesser changes to the detriment of both.

While this situation reflects the operational pressures to which the management of the CAA is subjected, it also reveals an apparent lack of consideration for "small scale" change within the overall strategic planning. Considerable efforts

are made in the planning and implementation of the developments on which TAAATS is reliant, eg ICAO Airspace classifications and airspace consolidation. However, this national strategic plan seems to fail to take account of local developments which take place at a district level. Local factors need to be incorporated into the national strategic plan to ensure the effectiveness of all new programs.

In this context, the investigation noted that IRDS training at Brisbane will begin in March 1994 and extend through to the end of the year. This is a major project and involves a very heavy training load. It is important for this development to proceed unencumbered by the influence of other significant changes such as the reintroduction of the ICAO airspace classifications.

Pressures from the industry are seen at all levels - from airlines promoting the need for air routes which reduce track miles to individual pilots requesting direct tracking. The CAA plays a difficult role in the aviation system, balancing client requirements against those of safety and efficiency. This is all the more justification for comprehensive strategic planning which encompasses all the national and local factors.

CHAPTER 5

CAA ACTIONS

This chapter briefly outlines the actions taken by the CAA following briefings on the results of the initial phase of interviews with line controllers.

The manager of the AACC has approached the present Towers and Outstations manager to formalise a liaison program between relevant sections of the AACC and both Archerfield and Brisbane Tower.

The issue of an Archerfield SID has also been raised with the Manager Towers and Outstations.

The manager has also surveyed the attitudes of all Flow controllers regarding the need for a mobile intercom. The Flow controllers do not believe this is warranted.

A letter has also been sent to all controllers focusing on the service ethos (see Appendix B).

CHAPTER 6

SUMMARY

The air traffic control safety net fails when active failures (ie errors and violations) go undetected and/or uncorrected. These system failures are generally more likely to occur in circumstances such as very high (or very low) workload environments, or situations involving complex coordination. Predisposing or underlying factors relating to the AACC operational environment can influence the frequency and results of operational errors and/or violations. System safety can be improved by the identification and monitoring of these predisposing factors and the rectification of deficiencies within these factors.

In consultation with CAA ATS management a BASI team was established to investigate the systemic factors underlying occurrences in the Brisbane AACC.

At present a considerable amount of effort is being made to enhance and develop the ATS system, in most cases this is being carried out to good effect. The investigation identified a number of local factors which, singly or in concert, could potentially contribute to unsafe acts (ie errors or violations) on the part of controllers. Further, information from controllers and management highlighted issues relating to the management of change and communications within ATS which, if addressed, should enhance the safety health of the organisation. Recommendations relating to these findings are directed at the CAA.

Shortly after the series of interviews with controllers was completed, the airspace changes scheduled for introduction on 11 November 1993 were deferred. On 4 October 1993, teams were introduced into the Brisbane AACC. BASI proposes, therefore, to conduct follow-up interviews with the same group of controllers in March 1994, after 'teams' has been in operation for 6 months. The results of these interviews will be the subject of a separate report.

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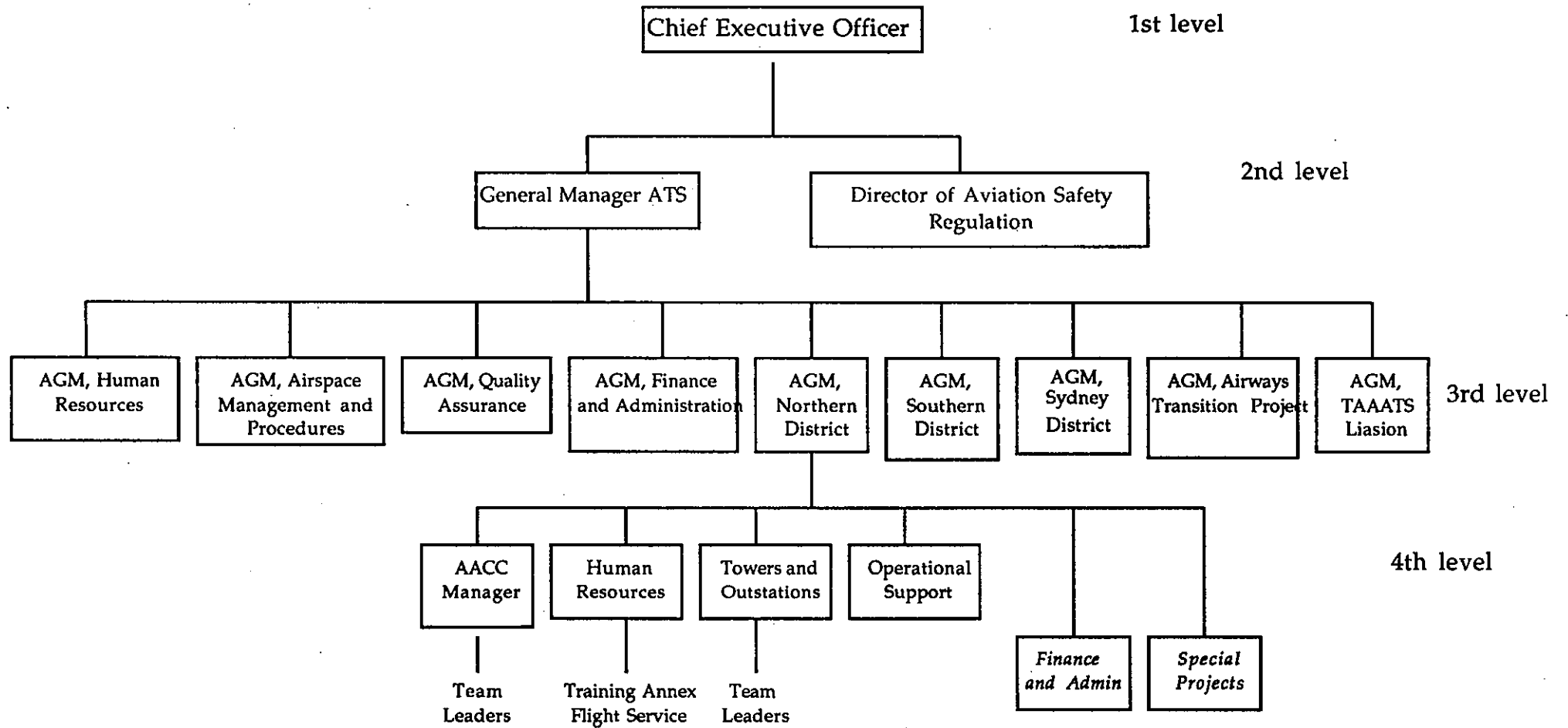
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Appendix A

CAA ATS Structure



Appendix B

Internal minute sent by the Manager AACC to Team Leaders regarding Pilot Requests

“During the investigation of various incidents in recent times one factor which has become apparent is that controllers sometimes create unnecessary complexity or workload attempting to cater immediately to every request put to them by pilots. Whilst it is commendable we recognise that we should provide a service it is sometimes more prudent to think a little longer about the possible ramifications of an instruction prior to actually issuing it.

As is the case in some controller/controller situations there is the possibility that sometimes controllers attempt to quickly respond favourably to pilot requests due the pilots inflection or tone, and pay an inappropriate price as a consequence.

There is obviously a fine balance between what various controllers or pilots perceive as competence and service or inflexibility and poor service, and in a team environment where less experienced staff are acquiring ratings in more complex, and subsequently working alongside more experienced controllers, that perception may be incorrectly magnified. Experience comes with exposure, both to more complex and higher traffic demands, as well as by observing how other controllers resolve particular situations.

One of the responsibilities of a Team Leader is to ensure that controllers are provided with appropriate guidance to enable them to progress through their “informative” years with exposure to other peoples’ experience and increased but monitored traffic demands.

We can only ask controllers to do the best they can, but at the same time provide the avenues for them to gain the experience and knowledge to do better.”

18 November 1993