

Department of Transport and Communications

Bureau of Air Safety Investigation

INVESTIGATION REPORT

RP/93/01

The Operation of
Regular Public Transport (RPT)
Aircraft in
Mandatory Traffic Advisory Frequency
(MTAF) Airspace



Released by the Director of the Bureau of Air Safety Investigation
under the provisions of Air Navigation Regulation 283

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ABBREVIATIONS

AFIZ	Aerodrome Flight Information Zone
AGL	Above Ground Level
AIC	Aeronautical Information Circular
AIP	Aeronautical Information Publication
AMATS	Airspace Management and Air Traffic Services
AMSL	Above Mean Sea Level
ARP	Aviation Regulatory Proposal
ATS	Air Traffic Services
AWK	Aerial Work
BASI	Bureau of Air Safety Investigation
CAA	Civil Aviation Authority
CAIR	Confidential Aviation Incident Reporting
CHTR	Charter
CTAF	Common Traffic Advisory Frequency
FSU	Flight Service Unit
ICAO	International Civil Aviation Organisation
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
MTAF	Mandatory Traffic Advisory Frequency
nm	Nautical Miles
NOTAM	Notice to Airmen
PVT	Private
RAS	Radar Advisory Service
RPT	Regular Public Transport
Unicom	Universal Communication
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions

EXECUTIVE SUMMARY

The MTAF procedure is designed to alert aircraft to all other air traffic in a designated area surrounding a particular aerodrome. The procedure mandates certain radio broadcasts and responses in these areas, and the pilots are then responsible for arranging their own separation.

In March 1993 BASI was informed that airline pilots had considerable concerns over the safety of RPT operations in MTAF areas. Reports stated that "Since the inception of MTAFs, [pilots] are experiencing conflict situations with unannounced, unalerted traffic, on a daily basis. This is resulting in numerous instances of immediate evasive action having to be initiated by aircraft operated within MTAFs".

BASI's records of reported air safety occurrences did not contain notification of sufficient occurrences to support these claims. This special investigation project was commenced in order to determine whether safety deficiencies exist in regular public transport air services in MTAF areas, and to examine the possible under-reporting of occurrences by RPT flight crews.

Information was gathered from RPT companies about their MTAF flight operations by means of direct interviews and observation flights. Additionally, a six week data collection period was initiated, during which all reported occurrences involving RPT aircraft in MTAF areas were investigated in depth. RPT aircrew were alerted to the project and encouraged to report all occurrences. Further information was obtained from the Confidential Aviation Incident Reporting system. CAIR reports provided an additional indication of the number and type of occurrences.

During the six week period, BASI received reports of seventeen occurrences involving RPT flights in MTAF areas. Seven of the aircraft concerned were high capacity (seating capacity greater than 38) jet aircraft, and nine were smaller turboprop aircraft. The remaining occurrence involved a light twin-engine aircraft operating a scheduled flight. Investigations of the occurrences determined that all were related to communication difficulties in obtaining proper traffic information.

Eleven of the seventeen occurrences involved either an aircraft which made no radio communications at all on the MTAF, or a pilot who failed to make appropriate responses to the traffic broadcasts of other aircraft. Two other reports concerned frequency congestion such that proper radio calls could not be made.

During the eighteen-month period from the introduction of MTAFs until 30 June 1993, one hundred and eleven occurrences involving RPT aircraft in MTAF areas were reported. In 85 per cent of these occurrences, the other aircraft involved was operating under VFR and in the majority of cases was being operated privately.

One difficulty identified by the project is that a broad mix of aircraft types shares the MTAF airspace, and responsibility for the safe separation of this traffic can often rest with the least skilled pilot within the system. A private pilot conducting operations under VFR is often required to determine whether there will be conflict with a commercial passenger flight operating under IFR. This may be compounded by a lack of traffic assessment training on the part of the VFR pilot.

The report concludes that although the operating principles of MTAF airspace are not unsound, they demand competence, sound judgement, professionalism, and compliance with communication and broadcast procedures from all pilots operating in the airspace. "See-and-avoid" is the system's only defence against a pilot's failure in any of these areas.

BASI makes four recommendations in the report. They are that the CAA:

1. Commit greater resources to surveillance and enforcement of procedural compliance by pilots;
2. Incorporate training in procedural compliance and traffic conflict recognition into the private pilot and student pilot (with passenger carrying privileges) licence syllabi;
3. Examine ways to ensure that all pilots have the operational documents necessary for the proposed flight; and
4. Mandate pilot responses to traffic broadcasts by aircraft in the same compass quadrant of MTAF areas.

Recommendation (3) was made previously, in the report of the *Violations of Controlled Airspace* study (BASI RP/92/10).

Aspects of the ICAO airspace model, which was to be implemented in Australia on 11 November 1993, have been considered in the context of their effect upon the workings of MTAF airspace.

Note: The ICAO airspace model is presently subject to review by the CAA.

1. INTRODUCTION

In March 1993 BASI received reports that airline pilots had considerable concerns over the safety of RPT operations in MTAF areas.

Reports stated that "Since the inception of MTAFs, [pilots] are experiencing conflict situations with unannounced, unalerted traffic, on a daily basis. This is resulting in numerous instances of immediate evasive action having to be initiated by aircraft operated within MTAFs".

BASI's database of reported air safety occurrences, however, did not contain notification of sufficient occurrences to support these claims. This project was commenced in order to determine whether safety deficiencies are associated with public transport air services in MTAF areas, and secondarily to examine the possible under-reporting of occurrences by RPT flight crews.

1.1 MTAF AIRSPACE

MTAF procedures were introduced in Australia with the AMATS changes of 12 December 1991. The MTAF procedure applies at specified aerodromes. It depends on pilots making mandatory radio calls, hearing calls from other aircraft, assessing this traffic information for potential conflict, and responding appropriately with radio communication and avoiding action if necessary.

A similar but non-mandatory CTAF system operates at most other aerodromes. However, it should be noted that under the proposed new airspace model, the term "CTAF" would refer to an area frequency used for communication between pilots over a larger region.

1.1.1 AFIZ PROCEDURES

Prior to the introduction of MTAFs, many uncontrolled aerodromes with scheduled air services or sufficient traffic levels were established as AFIZs. These were airspaces in which, as in MTAF areas, the carriage and use of radio was mandatory. Specified standard calls were made to an FSU established either at the aerodrome or remotely, and this FSU then directed pertinent traffic information to all aircraft within the AFIZ. On receipt of this information, pilots arranged their own separation.

In the AMATS changes of 12 December 1991, AFIZs ceased to exist and were replaced with MTAFs.

1. 1. 2 PRESENT MTAF

The policy of the Civil Aviation Authority is that Category C or higher performance high-capacity RPT aircraft, as well as certain other air services, must operate at all times in a radio environment.¹ The reason for this is that for the safety of these flights all pertinent traffic must be known, since unalerted see-and-avoid has been demonstrated to be inadequate for collision avoidance (See BASI Research Report: *Limitations of the See-and-Avoid Principle*).

For this purpose, the dimensions of MTAF areas are intended to contain the climb and descent profiles of higher-performance RPT aeroplanes. At present, standard MTAF areas extend to a radius of 15 nm from the aerodrome, up to a height of five thousand feet AGL. Some MTAF areas are non-standard so that more than one aerodrome may be included inside the area, or so that nearby controlled airspace can be accommodated.

At present an FSU provides all IFR flights with traffic information about all other pertinent IFR flights in uncontrolled airspace, including MTAF and CTAF airspace. However, RPT (and other IFR) flights depend upon pilot broadcasts for traffic information about VFR flights.

1. 1. 3 REGULATORY PROPOSAL

Further significant changes are proposed for Australian airspace. If introduced, these are likely to include alterations to MTAF area dimensions and procedures. The CAA has distributed ARP 4/93 concerning MTAFs to industry for comment.

The proposed new MTAF area dimensions would retain the 15 nm radius, but to 5,000' AMSL, which is proposed to be the base of the new Class E airspace in regions with radar coverage. In non-radar areas the MTAF area is proposed to extend upwards from 5,000 feet within a radius of 30 nm to 10,000 feet AMSL, the base of non-radar Class E airspace. (See diagram.)

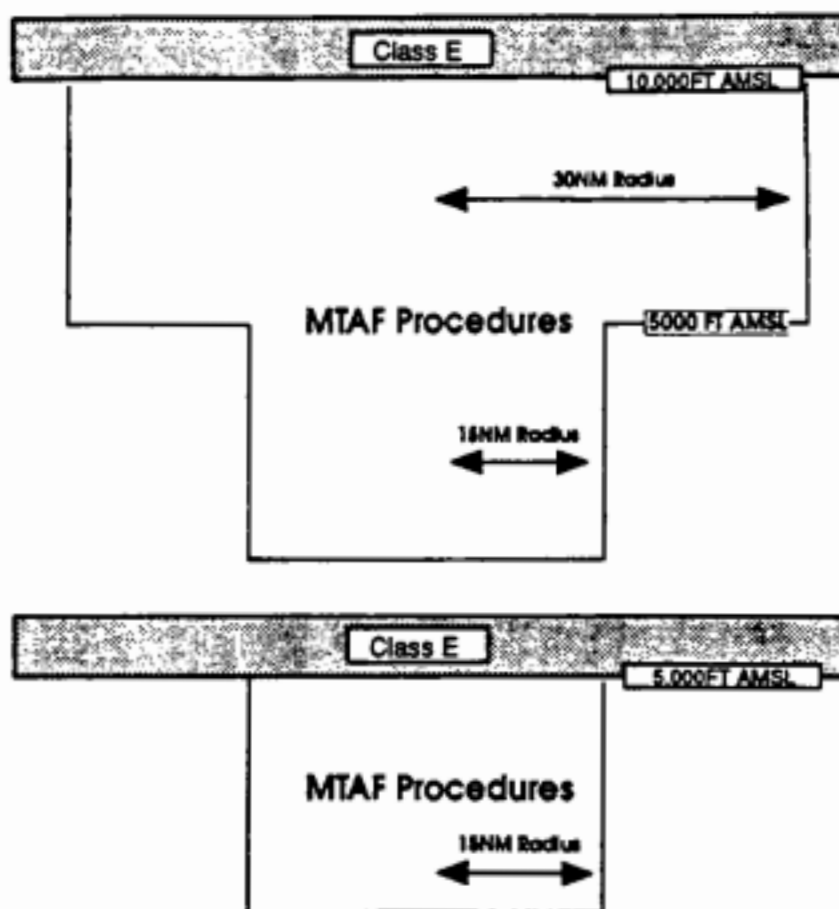
In the proposed new airspace system, which was to have been implemented on 11 November 1993, MTAF areas would be inside Class G airspace. Under this proposal, there would be no directed traffic information service in G airspace and all aircraft would be dependent upon pilot broadcasts for all traffic information. This would be different from the present system in which all IFR flights are provided with directed traffic information about all pertinent IFR flights.

¹ Category C: Vat from 121 to 140 knots. Vat = indicated airspeed at the threshold, based on 1.3 times the stall speed in the landing configuration at maximum landing weight.

Present MTAF procedures require mandatory radio broadcasts from all aircraft as they enter an MTAF area (inbound or transiting), and when taxiing for a flight within the area. The ARP proposes that additional mandatory broadcasts be made by aircraft entering the runway or commencing takeoff, and by aircraft entering the circuit or commencing an instrument approach.

The ARP includes a proposed requirement for a mandatory response to "conflicting aircraft" which are heard on the MTAF. The determination of which aircraft are in potential conflict would depend on the judgement of pilots.

Typical MTAF Dimensions



(CAA diagram)

1.2 PILOT EDUCATION

The pilot education program for the procedural changes of AMATS concluded at the implementation of the changes on 12 December 1991. AIC H9/92 was issued on 30 April 1992 to reemphasise some of the more significant changes and to address some issues which had arisen following the airspace reorganisation.

The AIC stated that "it is essential that pilots of radio equipped VFR aircraft maintain a thorough listening watch on the frequency relevant to their area of operations and self announce to arrange mutual separation when they hear aircraft with which they may come into conflict." It was further stated that "Although the emphasis for VFR pilots has been directed more towards listening, it is essential that communications are established with other pilots ... so that separation can be mutually agreed and understood."

The AIC identified some emerging difficulties associated with MTAF areas: "Because of the possibility of airborne radio failure of which the pilot is unaware, [of] more than one transmission being made at the same time, and [of] terrain or other shielding ... it is possible that some broadcast calls could go unheard, and for traffic to be in an MTAF about which others are not necessarily aware." Also "... interference may be encountered from nearby aerodromes using the same MTAF or CTAF frequency."

The AIC encouraged pilots to consider making additional broadcasts whenever it was considered necessary, or "if there is the slightest possibility of a conflict". They were also directed to include in their broadcasts the relevant MTAF name, in order to reduce confusion between different locations using the same frequency.

The AIC also mentioned a CAA review of the MTAF and CTAF systems, which examined such issues as airspace dimensions, frequency arrangements, location-specific problems, interaction with surrounding airspace, and procedures. One outcome of this review was the ARP which was placed before industry.

2. OBJECTIVES

The objectives of the project were to:

1. evaluate the MTAF airspace system;
2. identify and define any safety deficiencies associated with public air services in MTAF areas; and
3. examine the possible under-reporting of occurrences by RPT flight crews.

3. METHOD

Data were collected from five sources:

1. The BASI air safety database was searched for reports of occurrences in MTAF areas from the introduction of MTAFs until 30 June 1993.
2. Aircrew were alerted to the BASI project and were encouraged to report all occurrences in MTAF areas specifically for a six week period commencing 17 May 1993. All occurrences during this period were then investigated in detail to establish the circumstances of the occurrence and the specific effects of MTAF operations.
3. De-identified reports to the CAIR programme concerning operations in MTAF airspace were examined. The number of reports and the types of occurrences they described provided information about recurring problem areas.
4. Liaison visits were made to selected RPT companies which operated into MTAF areas. Structured interviews were developed to elicit information about the operators' experiences with MTAFs, as well as determining:
 - (a) whether operators/associations had any strategies which attempted either to increase the response of other aircraft to calls in MTAF areas or to ensure that all traffic was identified;
 - (b) which MTAFs posed particular problems, if any, and why;
 - (c) whether pilots complied with the directions in AIC H9/92; and
 - (d) why some air safety occurrences might not have been reported to BASI.

The companies which participated in the project are listed in Appendix 3.

5. Observation flights were conducted into MTAF areas which were of particular concern to pilots. These flights provided opportunities for investigators to speak with operational crews and gain a first-hand appreciation of how they handled traffic in the MTAF system. Discussions with crews also included similar issues to those covered in the interviews.

One air safety investigator from each of the BASI field offices was assigned the responsibility for the interviews and investigations in his region, reporting directly to the project manager.

4. RESULTS AND DISCUSSION

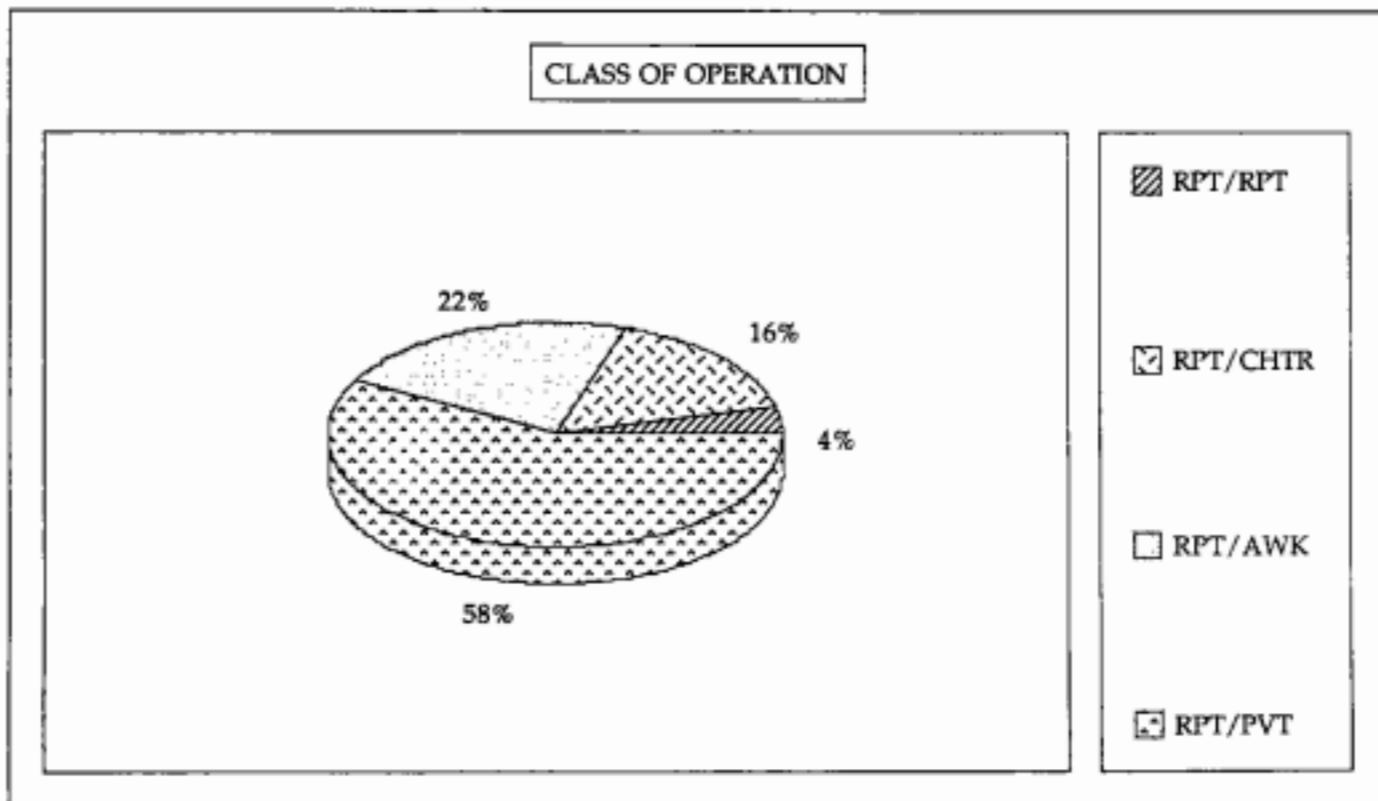
4.1 OCCURRENCES REPORTED TO BASI

4.1.1 FROM 12 DECEMBER 1991 TO 30 JUNE 1993

From the implementation of AMATS on 12 December 1991 until 30 June 1993, 170 occurrences which involved MTAf procedures were reported to the Bureau. One hundred and eleven of these involved RPT aircraft, an average of 5.9 per month. In 69 of the occurrences it was possible to identify two of the aircraft involved, however in only 50 occurrences was it possible to identify the class of operation of the aircraft which did not report the occurrence. Table 1 shows the breakdown of occurrences involving RPT aircraft according to the class of operation of the other aircraft involved. Twenty nine of the aircraft were operating privately, and two of the occurrences involved two RPT aircraft.

Table 1

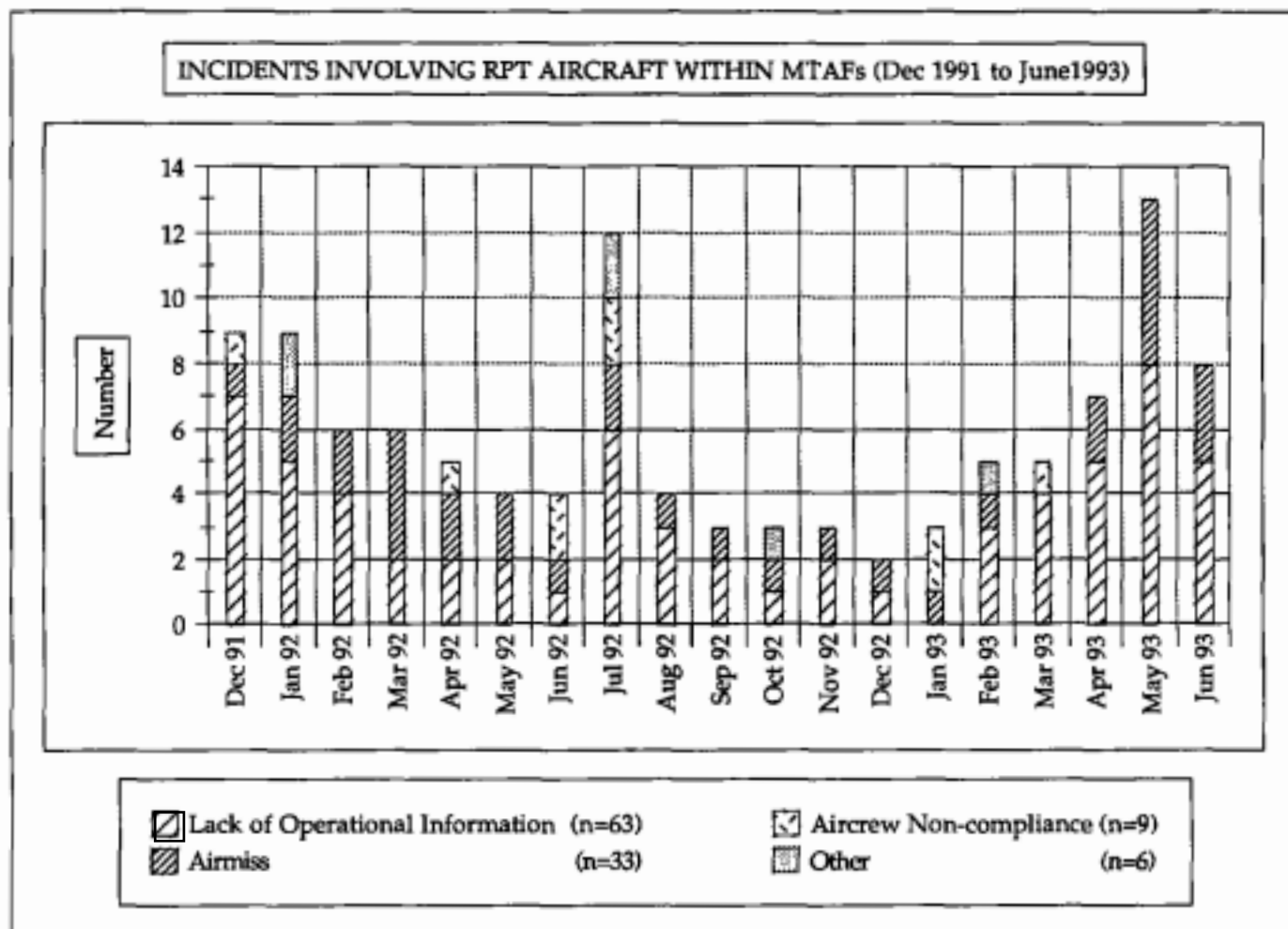
CLASS OF OPERATION
(N=50)



One of the two occurrences which involved two RPT aircraft concerned an undetected radio fault which prevented communication on the MTAF by one aircraft. The other occurrence occurred when the pilot of a low capacity RPT aircraft did not fly the correct circuit entry on arrival over the aerodrome, but flew an illegal straight-in approach to save time and made false radio calls inferring that he was flying the correct entry.

Table 2 (N=111) provides a breakdown of occurrences by month and by type of occurrence.

Table 2



Thirty three of the 111 reported occurrences which involved RPT aircraft in MTAF areas were classified as airmisses, an average of 1.7 per month. Occurrences were categorised as airmisses on the basis of reporting pilots' assessments that the risk of collision was critical (separation less than 150 metres horizontally and 100 feet vertically), or medium (separation greater than for critical risk, but less than 600 metres horizontally and 500 feet vertically).

While airmisses are probably the most serious category of occurrence which have been reported to BASI, two other classifications are of interest:

- (1) Lack of Operational Information: for example, a pilot not being aware of another aircraft on a potentially conflicting course; and
- (2) Aircrew non-compliance with procedures: for example, an aircraft not making the required broadcasts. This need not necessarily result in a conflict.

As can be seen from Table 2, these three classifications make up the majority of the occurrences within MTAF areas involving RPT aircraft. With the exception of three occurrences, the RPT aircraft were not considered to have contributed to the development of these occurrences. All of the RPT aircraft were operating under IFR while 85 per cent (40 out of 47²) of the other aircraft involved were operating under VFR.

Reliable activity data for each MTAF, from which to calculate occurrence rates, was unavailable. Thus occurrence data are presented throughout this report as the number of occurrences.

4.1.2 STUDY PERIOD

During the six week data collection period, 17 occurrences involving RPT aircraft in MTAF areas were reported to BASI. If this rate was maintained, it would equate to an average of more than eleven per month, which is approximately double the average for the total period 12 December 1991 to 30 June 1993.

The request for RPT pilots to report occurrences during the data collection period may have had an effect, and may suggest that some occurrences would usually go unreported.

The locations of the reported MTAF occurrences were as follows:

Ayers Rock	3	Ballina	3
Devonport	1	Gladstone	1
Hamilton Island	1	Kununurra	1
Mildura	3	Port Hedland	1
Port Macquarie	1	Whyalla	2

² In only 47 of the 69 occurrences involving two identifiable aircraft was it possible to determine the flight rules of both aircraft. In six cases two IFR aircraft were involved. In 22 cases sufficient information was not available to determine the flight category of the second aircraft.

The occurrence at Hamilton Island occurred outside the hours of operation of the control zone, when it had become an MTAF area. Ayers Rock had been identified by some operators as a location where the mix of jets and light aircraft could cause some difficulty in the assessment of traffic. Ballina is one of three relatively busy aerodromes in one MTAF area.

The 17 reported occurrences involved nine different RPT companies and, coincidentally, nine different types of jet, turboprop, and piston-engined aircraft ranging in size from the Boeing 737 to the Cessna 404. In two occurrences evasive action was taken by one of the aircraft involved.

The type of the other aircraft involved in each occurrence was as follows:

light single-engine aeroplane	9
light twin-engine aeroplane	3
unidentified aircraft	5

The weather in every occurrence was classed as VMC so that adverse weather played no part in the development of any of these occurrences. This infers that the occurrence became known because at least one of the crews saw another aircraft. Had the weather precluded visual contact, it is unlikely that these occurrences would have been reported. The number of possible occurrences in IMC, in which visual contact would not be made, is therefore not known.

Investigations of the occurrences determined that they were all related to difficulties in obtaining proper traffic information. Examples of the typical types of occurrences are given at Appendix 1. Eleven of the seventeen occurrences involved either an aircraft which made no radio communications at all on the MTAF, or a failure to make appropriate responses to the traffic broadcasts of other aircraft. (See examples a and b).

Two occurrences occurred when pilots arranged separation and then misunderstood or failed to comply with their arrangements (example c), and another two occurrences concerned frequency congestion so that the required radio calls could not be made. There was one occurrence where the pilot incorrectly operated the radio so that he was not receiving transmissions correctly, and one where the quantity of traffic information was too great for the pilot to process effectively.

4.2 CAIR REPORTS

In the period from the introduction of MTAFs on 12 December 1991 until 30 June 1993, the CAIR programme received 41 confidential reports relating specifically to the operation of the MTAF system. Writers of these reports described occurrences in MTAF areas, and detailed their concerns about the operation of the system.

Twenty-four of these reports were of occurrences involving known non-compliance with procedures. These reports included eight cases of failure to broadcast or respond to a broadcast, and sixteen cases of not monitoring the appropriate MTAF. There were six reports of difficulty in complying with procedures due to frequency congestion or not understanding the broadcasts from other aircraft.

Four CAIR reports concerned pilots who were unable to effectively arrange separation, despite having obtained traffic information. Another four reports were of aircraft in difficulty in an MTAF area, the pilots of which experienced problems in establishing proper communication with an FSU.

Three reports did not document any specific occurrence, but detailed some safety concerns. Matters raised in these and other reports included pilot education, flight documents, frequency congestion, the reluctance of some pilots to transmit, the responsibility carried by VFR pilots, the cases of radio calls being missed when aircraft change frequencies, and the absence of the "safety net" formerly provided by Flight Service in AFIZs.

4.3 INTERVIEWS

The results of discussions with a number of operators who fly into MTAF areas are indicated below. A structured interview form was used in order to elicit information about the operators' experiences in MTAF airspace. The information gathered from the observation flights into MTAF areas of particular concern is also considered.

4.3.1 OCCURRENCES

The flight crews and chief pilots or operations managers who were interviewed were asked to estimate the number of MTAF occurrences which their company had experienced since the introduction of the MTAF system. They indicated that occurrences where crews were unable to obtain all necessary traffic information were common in the period following commencement of the new system, but that these occurrences became less frequent as all pilots became familiar with the MTAF procedures. Estimates of the number of occurrences since the introduction of MTAFs ranged from about two per week, to only two or three in total.

From the interviews a typical occurrence scenario emerged. This was the appearance of unannounced VFR aircraft which were usually privately operated. The RPT pilots stated that the traffic was unannounced because of the improper or non-use of radio, which was due to non-compliance with procedures, lack of traffic conflict recognition, and a reluctance to speak on the radio. These comments are entirely consistent with the results of the occurrence investigations and CAIR reports.

4.3.2 OPERATOR CONCERNS

The RPT pilots' concerns were that the incidence of unannounced traffic made them dependent on unalerted "see-and-avoid", a method of separation on which BASI believes scheduled passenger services should not depend. Many pilots were concerned at the possibility of a mid-air collision under the MTAF system. They stated that greater education and surveillance was required to alert pilots to their responsibilities under the MTAF system. Many referred to deliberate non-compliance, inability to assess traffic conflict, and reluctance to transmit, which reiterates the need for greater education.

4.3.3 LOCATIONS

Some companies had concerns about the operation of MTAF procedures at particular locations. In four different interviews, the opinion was expressed that Kingscote, South Australia should have an MTAF due to the volume of private and commercial traffic. The airspace reorganisation that the CAA proposes in Australia is intended to include a "Kangaroo Island CTAF", which if implemented would satisfy these concerns by eliminating radio transmissions irrelevant to the area of the island.

Mildura, Victoria was highlighted as having had frequent problems because of training operations involving students from Parafield, Adelaide. Pilots stated that the students now tend to go to Renmark, SA instead, which reduces the traffic density at Mildura. Some locations such as Devonport were mentioned as having few MTAF occurrences because they had little itinerant traffic, and local operators had a good awareness of procedures.

4.3.4 CREW PROCEDURES

RPT companies indicated that they had modified their procedures over time in an attempt to identify all traffic. A vigilant lookout had become absolutely necessary, although this was often difficult in a relatively fast multi-engine turboprop or jet aeroplane. An attempt was made to complete checklists early so that both pilots were available to scan for traffic. Pilots ensured that all available aircraft lighting was illuminated. Several operators had adopted the policy of reducing speed early in the approach, as well as remaining high or outside the circuit area until other aircraft were clear. Traffic broadcasts in addition to those required were often made, particularly in the circuit, and the standard calls were made earlier, rather than later. Some crews stated that they had been alerted to unknown traffic by the Radar Advisory Service in some areas.

These procedures had proven to be of some assistance, but were often inconvenient or costly to the operator, especially such measures as reducing speed early. The pilots stated that these additional procedures had not solved the problem of obtaining all traffic information.

A number of RPT pilots said that they attempted to offer advice to other pilots who had not complied with the correct radio procedures. This was not always well received. Additional radio calls in an early phase of the approach were believed to encourage all aircraft in the MTAF area to announce themselves.

4.3.5 PILOT PERFORMANCE

The RPT pilots who were surveyed believed that the pilots who did not comply with the directions of AIC H9/92 (see Section 1.2) were the minority. Some crews remarked that the general quantity of radio traffic had increased, resulting in the frequency in some areas being congested with non-pertinent transmissions. It was thought that some pilots were confused by conflicting directions about when it was appropriate to use the radio.

The RPT crews identified the pilots whose compliance with procedures was poor as mainly those flying privately under VFR. The results of the investigations during the data collection period were consistent with this experience. A variety of reasons was suggested for this poor performance, including the observation that as the MTAFs are not monitored by the CAA, improper radio use might be thought acceptable. Many RPT pilots thought that private pilots were confused by the significant airspace changes of recent times and that the confusion was due to poor education.

Some of the other suggestions were that some pilots failed to broadcast in an attempt to avoid landing charges, or because they lacked the judgement to perceive potential conflicts. A few pilots were obviously unaware of correct frequencies because they had not obtained NOTAMs or referred to current flight documents.

4.3.6 REPORTING

RPT companies and crews were asked about the possible under-reporting of air safety occurrences. Many remarked that pilots were unwilling to take on additional paperwork, or to highlight their own imperfections. Some felt that the industry would disseminate within itself the accumulated knowledge it gained from occurrences. It was suggested that pilots often did not appreciate the significance of what they perceived as an isolated occurrence, not realising that these occurrences reveal trends in air safety when examined together.

Pilots also feared punitive action and did not appreciate the difference between the regulator (the CAA) and the safety agency (BASI), believing that to report was to invite scrutiny. Pilots suggested that reporting would be encouraged by improvement of their access to BASI, both through the 008 telephone number and through personal contact with investigators. Emphasis of the distinction between BASI and the CAA, and the promotion of the Bureau as an approachable, safety-oriented organisation would also assist.

4.4 SYSTEM VULNERABILITIES

According to the CAA's General Manager, ATS Division, "the [new airspace system's] procedures require every pilot to fly responsibly and professionally". CAA education material for the proposed airspace changes stated that "Safe flight in the new airspace will require thorough flight planning, use of the correct procedures, and diligent navigation."

The inference of these statements is that system safety now depends more heavily on the judgement of pilots and their compliance with procedures. This, and the removal of the safety net formerly provided in uncontrolled airspace by Flight Service, necessitates effective training and visible surveillance.

Under the CAA's airspace proposal, there was to have been no directed traffic information service for any flights within Class G (uncontrolled) airspace. This traffic information service is a system defence which may have mitigated the effects of previous failures. MTAF areas would be inside G airspace, making IFR pilots dependent on pilot broadcasts for all of their traffic information. The one exception would have been IFR flights entering an MTAF area directly from controlled airspace. In this case they would receive information about other traffic already known to have left controlled airspace for the MTAF area, or which is known to be about to enter controlled airspace from the MTAF area.

The safety weakness of the MTAF airspace system is that adequate traffic information may not always be obtained. This situation arises because:

1. Some pilots choose not to comply with, or are ignorant of, the mandatory broadcast requirements.
2. The judgement of a potential conflict and whether a response is required depends solely on the listening pilot. A misjudgment by this pilot may result in a failure of the system.
3. Frequency congestion sometimes prevents pilots from making the prescribed radio calls.
4. There is no means of determining whether a broadcast has been heard in the event of an equipment failure, incorrect frequency selection, or overtransmission on the same radio frequency (or on another frequency if more than one is being monitored).

Each of these points is now considered in detail.

4. 4. 1 NON-COMPLIANCE

4. 4. 1. 1 RECORDING DEVICES

Many operators suggested that a major reason for the disinclination of some pilots to use the radio is the knowledge that their transmissions are in many cases recorded. The MTAFs are not monitored by the CAA, but recording devices are set up by private companies at many aerodromes in order to note the callsigns of aircraft so that airfield landing charges may be levied.

A few pilots have been heard attempting to avoid charges, and still comply with broadcast requirements, by using non-identifying callsigns, eg "Blue Cessna". However, some choose not to transmit at all. This is likely to continue until all pilots are convinced that they must make the mandatory radio broadcasts.

One company which supplies the recording service is aware of this potential for its services to be undermined and has studied the prevalence of non-compliance. It estimates that the rate of correct broadcasting is approximately 90 per cent.

4. 4. 1. 2 AIRMANSHIP

It was also apparent to RPT companies and pilots that confusion exists among some pilots as to when it is appropriate to use the radio.

The debate over "affordable safety" in the Australian airspace system included the widely promulgated unofficial message that "Australia can only benefit from these efficiencies if pilots shut up"³. This was not directed at pilots in MTAF areas, nor did it suggest that rules should be broken. However, a number of interviewed pilots believed that this message contributed to the confusion among some pilots about when it was appropriate to use the radio.

Also, in June 1992, face-to-face pilot briefing offices were closed. Those interviewed felt that pilot understanding of the changing procedures would have been enhanced if these facilities had continued to operate at least until the last phase of the airspace transition period.

4. 4. 1. 3 FLIGHT DOCUMENTS

Interviewees believed that some pilots attempt to fly without adequate flight documentation. The AIP includes charts and written information identifying MTAF locations and radio frequencies. These publications must be bought, and there is strong anecdotal evidence that some private pilots do not purchase them. The BASI Investigation Report *Violations of Controlled Airspace* identified the same problem.

³ R Smith, *An Open Letter to Pilots Who Want to Keep Flying*, 1992.

4.4.1.4 OTHER

From the interviews and discussions, it was learned that RPT pilots sometimes encounter pilots with no intention of complying with the requirements. They stated that these pilots do not appreciate the risks they create, have a "healthy disrespect" for regulations and authority, and feel no obligation to conduct their operations in a professional or conscientious manner. It was considered that these pilots are a small minority and a greater surveillance and enforcement presence from the CAA would improve the situation.

4.4.2 TRAFFIC ASSESSMENT

The principle of self-separation by pilots in MTAF areas depends on a pilot hearing broadcasts and responding if necessary. The judgement of whether a response is necessary lies entirely with the pilot receiving the broadcast.

4.4.2.1 RESPONSE

Some of the interviewed crews spoke of pilots in MTAF areas who appeared unable to determine in which compass quadrant they were flying. They consequently failed to respond to the broadcasts of other aircraft, believing no conflict existed. The CAA's *Aviation Bulletin* Number 4 of May/June 1993 encourages pilots: "If in doubt, broadcast a response". This advice may partially alleviate such situations.

This *Aviation Bulletin*, an advisory publication without the force of law, stated that following the implementation of the airspace changes which were scheduled for 11 November 1993, "All aircraft in the MTAF must respond to another aircraft's call if in the same compass quadrant, or will be in the circuit area at or about the same time". The MTAF ARP (refer section 1.1.3) proposes to mandate a response to "conflicting aircraft". Present requirements laid down in the AIP do not specify any mandatory response at all.

Some RPT pilots suggested that a solution to this problem might be a mandated response to all calls. This would make the crews of all aircraft aware of each other, offering greater opportunity to assess the traffic situation. An obvious difficulty associated with mandated responses is the congestion of radio frequencies that would probably result. Section 4.4.3 addresses frequency congestion. The occurrences involving procedural non-compliance by pilots suggest that surveillance would be necessary to maintain compliance with any mandatory response requirements.

4.4.2.2 TRAINING

In forming a mental picture of the relative positions of aircraft, one difficulty which was highlighted is the high closing speeds that can be involved. Some pilots may lack an appreciation of the different aircraft speeds involved, and that an RPT turboprop or jet aeroplane may rapidly approach their position or overtake them.

Some RPT pilots suggested that since even a solo student pilot may share MTAF airspace with an RPT flight, some rudimentary classroom training or briefing in traffic assessment at an early stage in a pilot's education might be of value.

Investigators noted repeatedly that there appears to be a reluctance among some private pilots to make themselves heard on the radio. Elementary training in traffic assessment may give infrequent pilots the confidence to contribute to another crew's information. Additional education of pilots about the function and regulations of MTAFs would also assist in this regard.

4.4.3 FREQUENCY CONGESTION

During the period from 12 December 1991 to 30 June 1993 there were 19 occurrences in MTAF areas in which frequency congestion was considered to have been a factor. Eleven of these occurrences involved RPT aircraft. However, a total of 31 MTAF occurrence reports mentioned frequency congestion during this period.

Frequency congestion may be alleviated by the promulgation of a larger number of area frequencies, each to be used over a smaller area. This is a consideration in the CAA's allocation of frequencies for use outside controlled airspace after the proposed implementation of the airspace changes. CAA AIP Supplement H31/93 (now cancelled) set out CTAF and MTAF details for this proposed new airspace structure. This AIC Supplement showed one national common frequency ("the Australian CTAF") for inter-pilot traffic broadcasts. However, fourteen regions in which frequency congestion is anticipated were allocated discrete CTAFs.

Another difficulty at present is that when changing from the surrounding area frequency to the MTAF, broadcasts can be missed. Even with two radios, broadcasts can be overtransmitted or multiple transmissions confused. This particular problem would be largely solved with the implementation of the proposed new airspace in which, with four exceptions, the MTAF would be the same as the surrounding area frequency or CTAF. The four exceptions are Bamylili, NT; Dubbo and Port Macquarie, NSW; and Southport, Qld.

4.4.4 CERTAINTY OF INFORMATION

In the former system of AFIZs, pilots directed their initial broadcasts to a FSU, and the FSU responded. Pilots thus knew that their transmissions had been heard. The mandatory MTAF call is in the form of an "all stations" broadcast and a response cannot necessarily be expected. Interviewed crews pointed out that there is thus no means by which a faulty transmitter, incorrect frequency selection, or overtransmission may be detected.

If a pilot makes a broadcast on the MTAF and no response is received, it may be assumed that there is no pertinent traffic. Two possible remedies for this situation are the reintroduction of FSUs on these frequencies, and the use of a local radio operator or Unicom service at aerodromes. (This system is in operation overseas.) However, there are obvious economic considerations for these proposals.

In the proposed airspace, the upward extension of MTAF areas to the base of Class E airspace would assist information flow between pilots by having RPT flights pass directly from Class E to MTAF airspace. However other traffic, including IFR traffic, entering the MTAF area from G airspace would not be monitored.

5. CONCLUSIONS

The study established that in the majority of RPT flights within the MTAF system, traffic information is obtained, and pilots successfully arrange separation. However, the study period revealed continuing occurrences in MTAF airspace involving RPT flights. The majority of the other aircraft involved in these occurrences were privately operated VFR aircraft. Diligent lookout and relatively light traffic levels averted possible accidents.

Each of occurrences investigated during the six week study period, and a large percentage of all RPT occurrences in MTAF areas, involved a failure to obtain correct traffic information. There was no correlation between occurrences and specific MTAF areas or RPT operators.

The MTAF airspace system relies more heavily than the previous AFIZ system on the judgement and procedural compliance of pilots. It was found that some pilots do not comply with procedures for a variety of reasons including lack of traffic assessment ability, avoidance of landing fees, and a reluctance to broadcast.

Additional regulatory surveillance may increase pilot compliance with airways procedures. Compliance also requires operational information, and the cost of flight documents appears to be a deterrent to some pilots. This need for appropriate documents was addressed by recommendation (2) of the *Violations of Controlled Airspace* study (RP/92/10).

The safety of the MTAF system can be further enhanced by additional pilot training in traffic assessment and reemphasis of the importance of MTAF procedural requirements.

With the exception of four locations which are proposed to have MTAFs different from the surrounding CTAF, the possibility of selecting an incorrect frequency, or of missing broadcasts during frequency changes, would be reduced by the introduction of the proposed ICAO airspace model.

The level of occurrence reporting during the study period was higher than the average over the 18 month period since the inception of MTAFs. This may reflect BASI's endeavours to encourage RPT pilots to report and may indicate some degree of under-reporting under normal circumstances.

6. RECOMMENDATIONS

The Bureau of Air Safety Investigation recommends that the Civil Aviation Authority:

1. Commit greater resources to surveillance and enforcement of procedural compliance by pilots.
2. Incorporate training in procedural compliance and traffic conflict recognition into the private pilot and student pilot (with passenger carrying privileges) licence syllabi.
3. Examine ways to ensure that all pilots have the operational documents necessary for the proposed flight. (This recommendation was previously made in the *Violations of Controlled Airspace* study, BASI RP/92/10)
4. Mandate pilot responses to traffic broadcasts by aircraft in the same compass quadrant of MTAF areas.

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APPENDIX 1: EXAMPLES OF OCCURRENCES

Example A

"While tracking to intercept the outbound radial from the aerodrome, an unidentified light aircraft was seen tracking from right to left. The aircraft was about 500 metres in front and 100 feet below the departing [RPT] aircraft which was passing 4,000 feet in the climb. The light aircraft pilot did not respond to radio calls on the MTAF."

Example B

"The RPT aircraft was approaching the circuit at 1,000 feet and was about to join downwind for runway 24. Suddenly a Cessna type aircraft was seen ahead at the same altitude. The RPT crew took evasive action and passed the other aircraft, which was on a converging track, with a horizontal separation of about 300 metres."

Example C

"On approach for landing the RPT crew made [radio] contact with a light aircraft on the MTAF who advised that he had commenced a takeoff from runway 35. The RPT crew commenced an approach for runway 35 and was advised by the light aircraft that he had them in sight. The RPT crew then sighted the light aircraft on an opposing heading departing from runway 17 [the reciprocal runway]."

APPENDIX 2: LIST OF MTAF AREAS

Western Australia	ABA	Albany
	BR	Broome
	CR	Carnarvon
	XM	Christmas Island
	CC	Cocos Island
	DBY	Derby-Curtin
	ESP	Esperance
	GN	Geraldton
	KG	Kalgoorlie/Boulder
	KU	Kununurra
	LM	Learmonth
	MR	Meekatharra
	NW	Newman
	PB	Paraburdoo
TEF	Telfer	
South Australia	MTG	Mount Gambier
	PLC	Port Lincoln
	WHA	Whyalla
	WR	Woomera
Northern Territory	AYE	Ayers Rock
	BMY	Bamyili
	GV	Gove
	GE	Groote Eylandt
Queensland	BUD	Bundaberg
	GLA	Gladstone
	MA	Mount Isa
	PN	Proserpine/Whitsunday
	SPT	Southport
	WP	Weipa
New South Wales	BNA-CAS-LIS	Ballina-Casino-Lismore
	BHI	Broken Hill
	COM	Cooma
	DU	Dubbo
	NF	Norfolk Island
	PMQ	Port Macquarie
Victoria	MIA	Mildura
Tasmania	DEV-WYY	Devonport-Wynyard
	KII	King Island

(Control zones also become MTAF areas outside their hours of operation.)

**APPENDIX 3: PARTICIPATING RPT COMPANIES
OPERATING INTO MTAf AREAS**

Aeropelican Air Services, Belmont	Flight West Airlines, Brisbane
Air North, NT	Hazelton Air Services, Cudal
Airlines of Tasmania, Launceston	Kendell Airlines, Adelaide
Ansett Airlines, Brisbane	Kendell Airlines, Melbourne
Ansett Airlines, Melbourne	Lincoln Airways, Port Lincoln
Ansett Airlines, Perth	Oxley Airlines, Port Macquarie
Arnhem Air Charter, NT	Skyport Air Charter, Alice Springs
Augusta Airways, Port Augusta	Skywest Airlines, Perth
Australian Airlines, Melbourne	Southern Aust'n Airlines, Mildura
Eastern Australian Airlines, Sydney	Sunstate Airlines, Brisbane
Eastwest Airlines, Sydney	Whyalla Airlines, Whyalla
Emu Airways, Adelaide	Yanda Airlines, Singleton
Executive Air Charter, Adelaide	