FLIGHT SAFETY FOUNDATION
Airport Operations
Vol. 27 No. 4 *For Everyone Concerned With the Safety of Flight* July–August 2001

Traffic Conflict Near Australian Airport Prompts Call for Airborne Collision Avoidance Systems

The investigation revealed problems with situational awareness and self-separation techniques under instrument flight rules. The Australian Transport Safety Bureau recommended mandatory use of airborne collision avoidance systems by aircraft with 10 seats to 30 seats in regular public transport operations.

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FSF Editorial Staff

Based on its investigation of a traffic conflict during night operations by four aircraft along the same air route, the Australian Transport Safety Bureau (ATSB) in April 2001 identified safety deficiencies involving timely aircraft conflict-alerting procedures and aircraft self-separation procedures. Among ATSB's recommendations to the Civil Aviation Safety Authority of Australia (CASA) was mandatory airborne collision avoidance systems (ACAS) on aircraft with 10 seats to 30 seats engaged in regular public transport operations.[1]

ATSB's final report said that the traffic conflict occurred in Class G airspace[2] near Port Macquarie, New South Wales, on April 28, 1999. In this airspace, a flight service officer provides a directed traffic information service (radar traffic advisories) to pilots operating under instrument flight rules (IFR) but does not provide separation service. All four aircraft were operating under IFR, were being monitored on radar by air traffic control (ATC) personnel and were operating their transponders on the appropriate codes, the report said. Minor navigational deviations by pilots had caused all four aircraft to be operating to the west of the nominal course between Taree and Port Macquarie, said the report.

"Despite the provision of an adequate directed traffic information service, two regular public transport aircraft came within 1,000 meters [0.5 nautical mile] laterally and 200 feet [61 meters] vertically while in cloud," said the report. "Had the aircraft been equipped with an ACAS, there would have been a distinct probability that the situational awareness of the crews would have been significantly improved."

None of the aircraft in the investigation was equipped with ACAS, and there was no regulatory requirement for any of them to have ACAS, the report said.

The Australian *Aeronautical Information Publication* (*AIP*) requires pilots operating aircraft under IFR to perform the following tasks, said the report:

- "Maintain a listening watch on the flight service frequency;

- "Respond to any other aircraft that may be considered in potential conflict; and,

- "Report any change of level on the appropriate flight service frequency."

The report said that a large number of radio transmissions on two frequencies preceded the traffic conflict, but radio congestion was not a factor in the minute before the traffic conflict.

"The airspace complexity in the vicinity of Port Macquarie did not make it easy for crews to perform their radio broadcast requirements," said the report. "The crews of [the two regular public transport aircraft involved in the traffic conflict] needed to manage three frequencies (in addition to company requirements) in a short period while descending/climbing at comparatively high speeds. … The lack of adequate situational awareness of the crews … resulted in two regular public transport aircraft coming into relatively close proximity without either crew carrying out a positive separation plan."

The following aircraft were included in the investigation (the operators were not identified in the report):

- A Beech 1900, VH-IMA (IMA), was en route to Port Macquarie from Sydney and scheduled to be over Taree at 2002 (local time). Taree is 33 nautical miles [61.1 kilometers] south of Port Macquarie;

- A Beech 1900, VH-IMH (IMH), which had departed from Port Macquarie at 2002 and was en route to Williamtown on a route over Taree;

- A Piper PA-31 Chieftain, VH-SVV (SVV), which had departed from Port Macquarie at 1959 and was en route to Sydney on a route over Taree; and,

- A de Havilland Dash 8, VH-TQO (TQO), had departed from Taree at 1957 and was en route to Port Macquarie.

Except for a thin cloud layer extending upward from approximately 7,000 feet, weather conditions at the time of the traffic conflict were generally clear, the report said.

"The effect of this cloud band was such that visibility within the layer was restricted, but the pilot of SVV reported that he could see the lights of aircraft flying within the cloud," said the report.

The traffic conflict involved the two Beech 1900s at 2005:30, while they were being operated in instrument meteorological conditions. Figure 1 (page 3) shows the positions of the four aircraft at this time. The crew of IMA was maintaining 8,000 feet, and the crew of IMH was leaving 8,200 feet in a climb, which they had initiated from 8,000 feet about five seconds earlier, after the ATC sector controller — responsible for aircraft separation in the overlying Class E airspace — provided a traffic alert.

"Vertical separation was established between TQO and all aircraft, and between SVV and IMA," said the report. Nevertheless, a second potential traffic conflict — as IMH was overtaking SVV in a climb with two nautical miles [3,704 meters] horizontal separation and 800 feet [244 meters] vertical separation — was averted by chance, the report said.

The report said that the flight service officer and a flight service supervisor were providing traffic information service and monitoring for traffic conflicts, respectively, but the supervisor did not have access to all radar data.

"The flight service officer was very busy with numerous IFR aircraft requiring an information service," said the report. "The supervisor did not have access to all the [radar] console facilities but performed some coordination tasks. With this limited capacity, he did not have a full appreciation of the traffic picture and, therefore, these tasks were necessarily restricted.

"Although the flight service officer attempted to pass the taxiing information on IMH to the [ATC] sector controller in a timely manner, he was unable to give his undivided attention to this task. He had assessed that the directed traffic information service should have precedence and, as he was busy with that air/ground radio function, he was unable to allocate sufficient time to allow the sector controller time to answer the intercom line. Consequently, there was no taxiing advice to the sector controller on either SVV or IMH until after they had departed."

Despite Delay in Identification, Controller Provided Traffic Alert

Heavy ATC workload caused a delay in the coordination of information about aircraft and in the assignment of a transponder code to the crew of IMH, the report said.

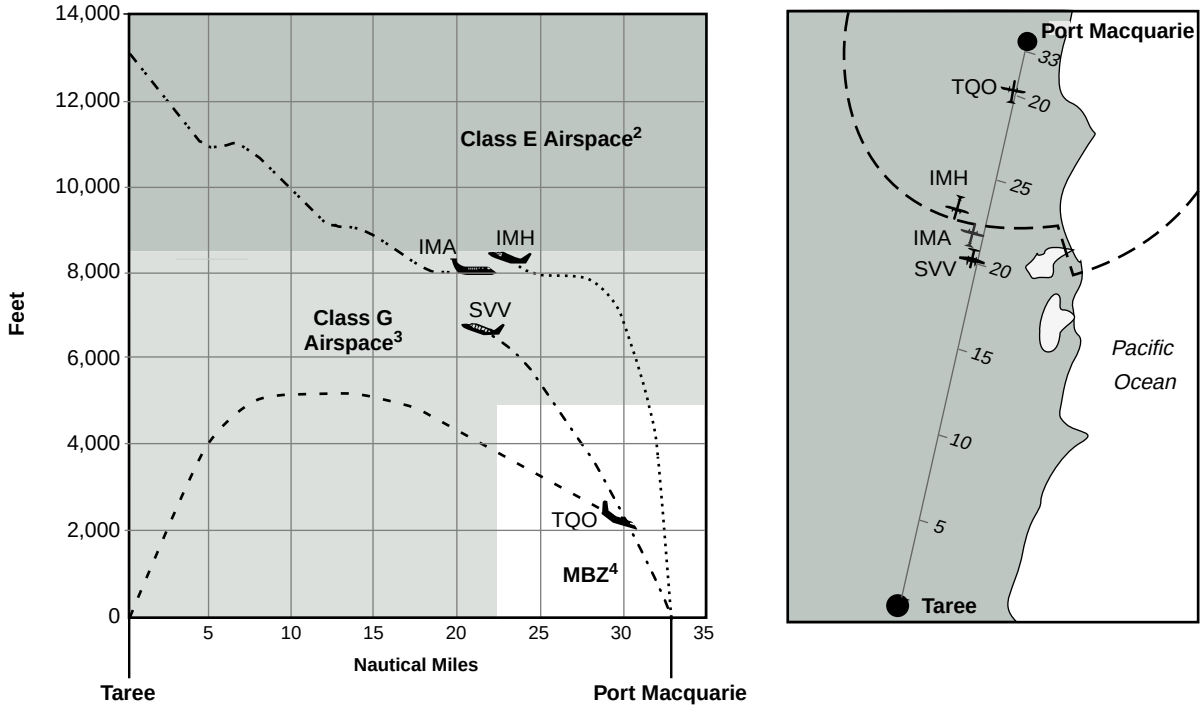
"Had this code been issued earlier, it would have enabled the sector controller to radar-identify IMH earlier, so that when the crew [of IMH] contacted the [sector] controller (at 2003:34), [the sector controller] may have been able to pass traffic information shortly after," said the report. "Instead, the identification was not made for another minute, and an aircraft conflict alert was not issued until 2004:57."

The report said that other tasks delayed the sector controller's identification of IMH.

"The sector controller was unaware of the departure of IMH until the crew contacted him requesting an airways clearance," said the report. "He was busy with other work-related tasks and had not been able to immediately answer the intercom line on those occasions when the flight service officer had

Traffic Conflict Near Port Macquarie, New South Wales, Australia
April 28, 1999

Situation at 2005:30 EST[1]



[1] Diagrams and aircraft are not to scale; the nose of each aircraft represents its position.

[2] Air traffic control (a sector controller) provided separation between aircraft being operated under instrument flight rules (IFR) in Class E airspace, which was from 8,500 feet to Flight Level 125 (12,500 feet); pilots of IFR flights entering this airspace were required to obtain an airways clearance.

[3] Flight service (a flight service officer) provided directed traffic information service (radar traffic advisories) to pilots of all aircraft being operated from ground level to 8,500 feet (Class G airspace), except within the Port Macquarie mandatory broadcast zone (MBZ).

[4] Pilots operating within the MBZ — from ground level to 5,000 feet within a 10-nautical-mile (18.5-kilometer) radius to the west and a 12-nautical-mile (22.2-kilometer) radius to the east — were required to broadcast their position and intentions, and to respond to other pilots to prevent traffic conflicts.

IMA = Beech 1900 VH-IMA IMH = Beech 1900 VH-IMH SVV = Piper PA-31 Chieftain VH-SVV TQO = de Havilland Dash 8 VH-TQO
EST = Eastern standard time, Australia MBZ = Mandatory broadcast zone

Source: Australian Transport Safety Bureau

Figure 1

initiated intercom coordination. Because [the sector controller] had no prior knowledge of [IMH], it took almost a minute and a half for him to establish the flight details, assign a transponder code and identify the aircraft. As soon as the controller observed the position and altitude of IMH, he provided the crew with a traffic alert on IMA."

During part of the time before the traffic conflict occurred, aircraft-specific transponder codes had not been assigned by ATC.

"Prior to the crew [of IMA] activating the assigned identification code, the controller had no specific radar information on any aircraft in that vicinity," said the report. "There were other radar returns showing the general transponder codes of 1200 (VFR [visual flight rules]) and 2000 (IFR) and indicating [aircraft at] lower levels that were not in immediate conflict with IMA. One such return was emanating from IMH and one from SVV before the crews had been issued specific codes."

The report said that the sector controller and the flight service officer "provided traffic information in an appropriate and timely manner" and that their services were sufficient for the crew of IMH and the crew of IMA to take action to ensure separation of their aircraft.

Sequence of Events Shows Inadequate Situational Awareness

The report provided the following sequence of events, beginning with the IMA crew's change of their flight-planned route because of a navigation equipment malfunction.

"The [IMA] crew had been cleared to track from a position northeast of Sydney direct to Port Macquarie; a track that would pass east of Williamtown and Taree," said the report. "As the aircraft was passing abeam Williamtown, its global positioning system [receiver] failed, and the crew elected to track via Taree to Port Macquarie with reference to the nondirectional beacons at each [airport]. They commenced descent [from controlled airspace at Flight Level [FL] 210 (21,000 feet)] at 1954 and transferred to the flight service frequency (121.6 MHz [megahertz]) at 1956 with an 'all stations' broadcast, which included details of their arrival track and estimated time of arrival."

The TQO crew was climbing to a cruise altitude of 5,000 feet and had broadcast their departure details on the flight service frequency. The SVV crew broadcast that they initially were climbing to 10,000 feet. The IMH crew broadcast on the flight service frequency that they would climb to FL 140, said the report.

The sector controller at 1956 cleared the crew of IMA to leave controlled airspace on descent and told the crew that flight service had traffic information, said the report.

"Between 1956 and 2002, the flight service officer provided all crews with up-to-date traffic information on the other three aircraft," said the report. "At 2002, the crew of IMA broadcast on the Port Macquarie mandatory broadcast zone (MBZ) frequency (118.1 MHz) that they were descending to FL 110. The crew of TQO responded to that call and then asked the crew of IMH if they were airborne. The reply (at approximately 2002:20) was affirmative, and [the IMH crew said] that they were climbing through 4,600 feet."

"At 2003, the crew of IMA broadcast on the MBZ frequency that they were 23 nautical miles [42.6 kilometers] south of Port Macquarie and descending to 9,000 feet. They then asked the pilot of SVV for his position, which he reported as eight nautical miles [14.8 kilometers] south and climbing through 4,800 feet. The crew of IMH reported that they heard this exchange but did not acknowledge the broadcast. However, they did elect to maintain 8,000 feet.

"Also at 2003, the crews of IMH and SVV were instructed by the flight service officer to contact [ATC] approaching 8,500 feet, the base of controlled airspace in that area. At about the same time, the crew of TQO reported on the flight service frequency that they were transferring to the Port Macquarie MBZ frequency.

"At 2003:34, the crew of IMH contacted the sector controller and requested an airways clearance. [The crew] reported that the aircraft was five nautical miles [9.3 kilometers] south of Port Macquarie and passing 7,500 feet. The controller had not received any coordination on the aircraft from flight service and there was an exchange of information with the crew, which included the [issuance] of a secondary surveillance radar transponder code, that lasted until 2005:05. At that time, the controller identified IMH on radar and issued … traffic conflict advice to the crew, which gave the radar-observed position of IMA as three nautical miles [5.6 kilometers] at 12 o'clock and indicating an altitude of 8,000 feet on descent.

"At 2003:57, the crew of IMH questioned the flight service officer regarding the nonavailability of a transponder code from [ATC]. The code had not yet been issued to the flight service officer by the sector controller because the flight service officer had been unable to perform the coordination with the sector controller.

"At 2004:05, the crew of IMH unsuccessfully attempted to contact the pilot of SVV on the flight service frequency to arrange mutual separation. Shortly after, on the MBZ frequency, the crew of IMA requested that the pilot of SVV maintain 7,000 feet to assist their arrival. [The pilot of SVV] agreed.

"At 2005:08, the crew of IMA broadcast on the flight service frequency an acknowledgment not related to any information being broadcast on that frequency, but which was in response to a transmission made on the MBZ frequency by the crew of TQO regarding turbulence in the MBZ. This transmission was also acknowledged by the crew of IMA on the MBZ frequency. There were no additional transmissions from either crew on the flight service frequency until after their aircraft had passed.

"At 2005:10, the flight service officer contacted the sector controller and coordinated the departure of IMH. At about the same time, the crew of IMA broadcast on the MBZ frequency that they were 14 nautical miles [25.9 kilometers] south and maintaining 8,000 feet.

"At 2005:19, the crew of IMH again requested an airways clearance from the sector controller. The clearance was issued at 2005:24 and included the [instruction] 'confirm you have IMA in sight.' The reply, at 2005:34, was, 'Negative, we're in cloud.'"

The IMH copilot was conducting standard frequency changes and communication with ATC to enter the controlled airspace when he received the ATC traffic alert.

"This gave the crew approximately 25 seconds warning of the point of nearest conflict and was the first time they were aware that the 1,000-foot separation they thought they had, did not exist," said the report. "Even then, there was a 20-second delay before they commenced climb."

The traffic conflict occurred when IMA and IMH passed at 2005:30, the report said, and 18 seconds later, the first radio communication occurred between the two crews.

"At 2005:48 … they established that IMH had left 9,300 feet on climb and [that] IMA had left 8,000 feet on descent," said the report. "At 2005:54, the sector controller informed the crew of IMH that radar indicated that they had passed IMA. Between 2005:15 and 2006, on the MBZ frequency, the pilot of SVV reported to the crew of IMA that he had visually [confirmed that SUV had] passed their aircraft."

Radar Analysis Reveals Recording Anomalies

The crew of IMH believed that they had activated IFR transponder code 2000 on departure from Port Macquarie, but investigators could not identify IMH for a 70-second period of flight using the transponder returns on radar recordings, said the report.

"Recorded radar data displayed seven returns between 7,000 feet and 7,300 feet, but [radar] did not detect any further returns on that code which were consistent with the track and altitude of IMH," said the report. "The investigation was unable to determine why the code 2000 transponder returns from IMH were not recorded between 2003:30 and 2004:40."

The report said that the radar recording revealed that:

- "TQO was at least 500 feet below SVV approximately five nautical miles prior to their passing and below IMH approximately two minutes prior to passing;
- "SVV had maintained flight below 7,000 feet until passing IMA at 2005:18. The horizontal distance at that time was approximately 1,200 meters [0.6 nautical miles] with IMA maintaining 8,000 feet;
- "The first radar return from IMH on its specific assigned code was at 2004:40, when it was maintaining 8,200 feet (8,000 feet after allowance was made for atmospheric pressure differences). At that time, SVV was passing 5,100 feet on climb;
- "At the time IMH had left 8,000 feet on climb (approximately 2005:25), SVV was two nautical miles ahead and passing 7,200 feet on climb;
- "IMA had descended initially to FL 110 and then to 9,000 feet. There was a short delay at 9,000 feet before descending to 8,000 feet. The aircraft maintained 8,000 feet until 2006:10, when unrestricted descent was commenced; [and,]
- "The climb of IMH from 8,000 feet had commenced approximately five seconds before passing IMA."

Communication Influenced Altitude Decisions of Flight Crews

During the period in which the traffic conflict occurred, the crew of TQO communicated with pilots of the three other aircraft on the flight service frequency or the MBZ frequency, and the crew of TQO was operating at altitudes below those of the three other aircraft by 2003:30, the report said. The pilot of SVV also was in communication with the other pilots and coordinated altitudes with the IMA crew.

Prior to leaving Class E airspace, the crew of IMA made a general broadcast on the flight service frequency and received from the flight service officer traffic information about the other three airplanes.

"[The crew of IMA] decided to initially maintain FL 110 while assessing the relative positions of the other traffic," said the report. "Shortly after, they elected to descend to 9,000 feet and broadcast that intention on the MBZ frequency. They then contacted the pilot of SVV. … They then descended to 8,000 feet and, although the crew stated that they made a descent broadcast, no such transmission was recorded on either the MBZ [frequency] or flight service frequency.

"At about 2005, the crew [of IMA] broadcast on the MBZ frequency that they were maintaining 8,000 feet. Although they had received taxiing information [about] IMH and had been listening on the [flight service] frequency when several transmissions between the crew of [IMH] and the flight service officer were made regarding their departure, the crew of IMA did not make radio contact with the other crew until after the aircraft had passed. The crew of IMA stated that they did not hear any of the broadcast from IMH during that period."

The report said that while taxiing at Port Macquarie, the crew of IMH had received traffic information about the other three aircraft and had heard the broadcast from the crew of IMA indicating descent to 9,000 feet.

"[The crew of IMH] elected to maintain 8,000 feet as a result but did not broadcast that intention," said the report. "When the aircraft departed, the crew made their departure broadcast on the flight service frequency and reported a departure track of 201 degrees and initial climb to 8,000 feet. The flight service officer immediately questioned the altitude and a correction was made by the crew [saying] that they were climbing to FL 140." Nevertheless, the report said that the crew of IMH subsequently maintained 8,000 feet.

The report said that communication between the crew of IMH and the pilot of SVV initially ensured vertical separation while IMH was overtaking SVV; nevertheless, communication was not continued to ensure awareness of current altitudes.

The crew of IMH heard radio transmissions by the crew of IMA prior to the traffic conflict, said the report.

"The crew [of IMH] was very busy and it took a few seconds for the copilot to inform the pilot-in-command [PIC] of the traffic [alert] on IMA that had been passed by the sector controller," said the report. "The [PIC's] reaction was to initiate

a climb to avoid that aircraft. At approximately the same time, the sector controller issued an airways clearance and the climb was continued into [the Class E] controlled airspace."

Level-off During Descent Raises Reporting Question

ATSB's investigation of this traffic conflict generated questions about some pilots' understanding of whether the *AIP* requirement to report altitude changes includes reporting on the flight service frequency any level-off during a descent, or any continuation of an announced descent when operating under IFR.

"Although the *AIP* required pilots to report a change of level on the flight service frequency, the question of what is a change of level appeared to be in doubt among some pilots," said the report. "If a crew reported leaving a flight level on unrestricted descent and then maintained a level (or altitude) without reporting that fact, did they have to report maintaining the level as a change of level or could they re-commence descent, some time later, as part of the original descent advice? The same argument could be applied to a crew maintaining a level while on climb to some higher level. However, if a level was reported as being maintained, advice of a change to that level was required."

ATSB's investigation found that the crew of IMA and the crew of IMH had maintained intermediate levels to establish vertical separation — and the IMA crew had broadcast on the MBZ frequency that they were maintaining 8,000 feet — but neither crew had broadcast on the flight service frequency that they were maintaining 8,000 feet, said the report.

The report said, "As the onus for separation was on mutual cooperation between pilots, adequate transmission of information was essential for flight safety."

The report said that the intentions of the IMA crew — in descending to 8,000 feet and in leveling off during descent — were not communicated adequately to the other aircraft crews.

"In their initial broadcast on the flight service frequency, the crew had included (by implication) an intention to conduct an unrestricted descent," said the report. "That intention was never updated, despite a level-off at both 9,000 feet and 8,000 feet. … Consequently, the other crews were not able to assess the change in circumstance of IMA in their traffic-avoidance considerations."

The report said that the IMA crew's coordination of altitudes with the pilot of SVV enabled them to descend to 8,000 feet with separation from SVV but did not ensure their separation from IMH.

"As the crew of IMA had information on the impending departure of IMH, they had sufficient knowledge to initiate mutual separation procedures. Also, during the period from 1958 to 2005, the crew of IMH made several broadcasts on the flight service frequency indicating climb to both 8,000 feet and FL 140. The crew of IMA had been listening on the flight service frequency since 1956:23 but were not cognizant of these transmissions. They had received an update on the position of IMH from the flight service officer at 1958:28 and, therefore, should have initiated radio contact with the crew of IMH to establish an adequate form of separation assurance in a similar manner to that achieved with the pilot of SVV."

The report said that because of their inadequate monitoring of radio transmissions and their focus on only one of the two aircraft that could conflict with their aircraft, the IMA crew remained unaware of their opposite-direction closure with IMH.

"Because the [IMA] crew had decided that SVV was their prime conflict, they elected to concentrate on performing self-separation procedures with that aircraft until the departure of IMH," said the report. "Unfortunately, while performing this task, both pilots turned down the volume of the [flight service] frequency and missed the departure broadcast that they were waiting for."

Because of the intentions broadcast by the IMA crew, the IMH crew believed that by maintaining 8,000 feet, a 1,000-foot vertical separation would be assured without communication, the report said.

Maintaining Altitude for Separation Caused Closure With Second Aircraft

The decisions and actions taken by the IMH crew to prevent a traffic conflict had an additional unintended consequence that compromised safety, said the report.

"The [IMH] crew had established their aircraft above SVV and, due to their superior climb performance, expected to increase that separation," said the report. "However, when they then elected to maintain 8,000 feet in relation to [IMA], they enabled SVV to reduce the vertical separation to 800 feet. At that point, IMH was two nautical miles behind SVV and closing. That distance would have become closer had the crew of IMH not commenced climb when they did. The climb was 'by chance' in relation to this conflict.

"At the time, the crew of IMH had information that the pilot of SVV was climbing to 10,000 feet; they had not heard the conversation between the crew of IMA and the pilot of SVV. … The pilot of SVV had last heard the crew of IMH report (on the flight service frequency) that they were above his aircraft and on climb to FL 140. The lack of a broadcast announcing their intention to maintain 8,000 feet removed a safety net by not giving the other crews up-to-date information on which to base their separation decisions."

The report said that before the traffic conflict, the crews of IMA and IMH had listened to the flight service frequency for eight minutes without announcing their intentions.

"A radio broadcast to the crews of those aircraft would have clarified the situation and would have been the basis for establishing a positive separation plan. … Separation between IMH and SVV and between IMH and IMA was not guaranteed after initial intentions were amended without adequate, informative radio broadcasts."

The report said that following factors were involved in the traffic conflict near Port Macquarie:

- "The volume of radio transmissions on both the MBZ and [flight service] frequencies made adequate radio management difficult;
- "The crew of IMA did not make any level-change broadcasts on the flight service frequency;
- "The crew of IMH did not make any level-change broadcasts on the flight service frequency;
- "The crews of IMA and IMH did not [communicate with] each other until after the time of passing;
- "There was no [ACAS] fitted to any aircraft; [and,]
- The crews of IMA and IMH did not apply appropriate separation-assurance techniques."

Aircraft Proximity Occurrences Raise Issue of ACAS Requirements

The report said that proposals to mandate ACAS have been discussed by ATSB and CASA since 1995, and that ATSB has considered ACAS capabilities while analyzing reports of aircraft proximity occurrences since 1995.

"Between January 1995 and November 2000, [ATSB] has received 1,188 notifications of events where aircraft proximity was considered to be a hazard and has investigated over 350 occurrences where an ACAS did, or would have, significantly improved the situational awareness of flight crews," said the report. "Between 1 May 1999 and 30 November 2000, [ATSB] has investigated (at the category 4 level) 41 occurrences involving aircraft operating in controlled airspace where an ACAS provided one or more crews with improved situational awareness during an infringement of separation standards. Additionally, 23 occurrences were investigated involving aircraft operating outside controlled airspace, where the proximity of aircraft was considered to be potentially prejudicial to safety. In each of those 64 occurrences, one or more aircraft was conducting a fare-paying passenger operation." In category 4 occurrences, an investigation is required to substantiate facts, but the facts do not indicate a serious safety deficiency, said the report.

The report said that a significant advantage of ACAS — compared to directed traffic information service alone — is accurate real-time information for flight crews about potential traffic conflicts.

ATSB recommended that CASA:

- "Mandate the [installation] and use of [ACAS] in all aircraft with a passenger-seating capacity of [10 seats to 30 seats] engaged in regular public transport operations and set a timetable for the introduction of such equipment [Recommendation R20000181];
- "Consider the requirement for the [installation] and use of a suitable [ACAS] in aircraft engaged in the carriage of 10 or more passengers for hire or reward in other than regular public transport operations [Recommendation R20000182];
- "Expand the requirements for the carriage and activation of transponders with the object of maximizing the effectiveness of ACAS [Recommendation R20000183];
- "Expand the current level of education among all levels of the industry to maximize transponder activation in all airspace [Recommendation R20000184];
- "Ensure that any company authorized for fare-paying passenger operations has standard operating procedures that are adequate for self-separation assurance [Recommendation R20000198];
- "Review [CASA's] educational program for all levels of pilot licenses to improve pilot understanding of separation-assurance techniques [Recommendation R20000199]; [and,]
- "In conjunction with Airservices Australia, review the existing airspace model with a view to enhancing conflict recognition and resolution for fare-paying passenger operations to and from non-controlled [airports] [Recommendation R20000300]."

The recommendations did not address specifically how to improve pilot understanding of what constitutes a change of level under AIP reporting requirements.

Following the investigation of this air traffic conflict, the operator of IMA and IMH refined its frequency-management plan and reminded crews of their obligations in broadcasting information to other flight crews and the operator of TQO completed installation of ACAS in its fleet of Dash 8 airplanes, ATSB said.♦

[FSF editorial note: This article is based on Australian Transport Safety Bureau Investigation Report no. 199901959 "Traffic Confliction Near Port Macquarie: Beech 1900 VH-IMA, Beech 1900 VH-IMH, Chieftain VH-SVV, Dash 8 VH-TQO, 28 April 1999," published in April 2001. The 24-page report contains seven diagrams and one table.]

Notes and References

1. The Australian Transport Safety Bureau defined *airborne collision avoidance system* as "an aircraft system based on secondary surveillance radar (SSR) transponder signals, which operates independently of ground-based equipment to provide advice to the pilot on potential conflicting aircraft that are equipped with SSR transponders."

2. The report contained the following information about Australian airspace: "Air traffic control [provides] a separation service between [instrument flight rules (IFR)] aircraft in Class E airspace from 8,500 feet to Flight Level 125 [12,500 feet] (and above in Class C airspace). IFR flights entering this airspace [require] an airways clearance. … Flight service [provides] a directed traffic information service to all IFR aircraft from ground level to 8,500 feet (Class G airspace), except within the confines of the [mandatory broadcast zone (MBZ)]. In addition, where possible, IFR flights were provided with radar-based traffic information on potentially conflicting traffic operating in Class G airspace prior to being released to the flight service frequency. This service would have included information on any observed [visual flight rules (VFR)] aircraft. … The [Port Macquarie] MBZ existed from ground level to 5,000 feet within a 10-nautical-mile radius to the west and [a] 12-nautical-mile radius to the east. Within the Port Macquarie MBZ, all crews were required to broadcast their position and intentions and to respond to other crews if they considered that a conflict may occur. … Pilots of IFR aircraft were required to activate transponder code 2000 while outside controlled airspace unless a specific code had been issued by air traffic control."

Airport Operations

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