Australian Government

Australian Transport Safety Bureau

ATSB TRANSPORT SAFETY INVESTIGATION REPORT

Aviation Occurrence Report – 200504018

Final

Operational and flight safety implications of the installation of hardened cockpit security doors in passenger aircraft having a seating capacity of 30 seats or more

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Operational and flight safety implications of the installation of hardened cockpit security doors in passenger aircraft having a seating capacity of 30 seats or more

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Abstract

On 14 April 2005 a crew member of a SAAB Aircraft AB SF-340B suffered a minor injury as a result of coming into contact with the sharp edges of the aircraft's hardened cockpit security door. A similar injury was reported to have occurred previously in like circumstances. More significantly, reports were received from a number of aircraft operators regarding flight safety and operational hazards associated with the installation of hardened cockpit security doors in four different aircraft types.

The investigation determined that, to enhance security, regulation 4.68 of the *Transport Security Regulations 2005* was drafted to combine a unique hardened cockpit security door requirement in aircraft having a passenger seating capacity of 30 to 59 seats, with the hardened cockpit door security requirements of Section 13.2.2 of Annex 6 to the Chicago Convention for application in aircraft with a seating capacity of 60 or more seats.

However, the development of regulation 4.68 did not take full account of the operational and flight safety requirements of the US Federal Aviation Regulations, or of other available international policy guidance. The result was a number of unintentional operational and flight safety hazards in affected aircraft, as evidenced by this investigation report.

The apparent scope of the potential hazards associated with the installation of hardened cockpit security doors, and their potential effect, formed the basis for the conduct of this investigation, which was formally commenced on 29 July 2005.

Post publication safety action update

As a result of this investigation, the Office of Transport Security (OTS) indicated that it would explore the establishment of a formal consultation mechanism with the Civil Aviation Safety Authority (CASA), and consult with CASA on relevant aviation security measures that had the potential to impact on aviation safety. The OTS also advised that it would, over time, consider the amendment of the *Aviation Transport Security Regulations 2005*, including in response to the potential safety concerns of the flight deck door requirements.

CASA indicated that it would seek a Memorandum of Understanding with the OTS to ensure the consideration of any potential operational and flight safety hazards that might result from the development of national aviation security requirements. Subsequently, in November 2009, CASA advised that it had established quarterly meetings with the Department of Infrastructure, Transport, Regional Development and Local Government to discuss the interaction of security and aviation safety regulatory requirements. On that basis, both organisations agreed that a formal Memorandum of Understanding was not required.

THE AUSTRALIAN TRANSPORT SAFETY BUREAU

The Australian Transport Safety Bureau (ATSB) is an operationally independent multi-modal Bureau within the Australian Government Department of Transport and Regional Services. ATSB investigations are independent of regulatory, operator or other external bodies.

The ATSB is responsible for investigating accidents and other transport safety matters involving civil aviation, marine and rail operations in Australia that fall within Commonwealth jurisdiction, as well as participating in overseas investigations involving Australian registered aircraft and ships. A primary concern is the safety of commercial transport, with particular regard to fare-paying passenger operations. Accordingly, the ATSB also conducts investigations and studies of the transport system to identify underlying factors and trends that have the potential to adversely affect safety.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and, where applicable, relevant international agreements. The object of a safety investigation is to determine the circumstances in order to prevent other similar events. The results of these determinations form the basis for safety action, including recommendations where necessary. As with equivalent overseas organisations, the ATSB has no power to implement its recommendations.

It is not the object of an investigation to determine blame or liability. However, it should be recognised that an investigation report must include factual material of sufficient weight to support the analysis and findings. That material will at times contain information reflecting on the performance of individuals and organisations, and how their actions may have contributed to the outcomes of the matter under investigation. At all times the ATSB endeavours to balance the use of material that could imply adverse comment with the need to properly explain what happened, and why, in a fair and unbiased manner.

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. While the Bureau issues recommendations to regulatory authorities, industry, or other agencies in order to address safety issues, its preference is for organisations to make safety enhancements during the course of an investigation. The Bureau prefers to report positive safety action in its final reports rather than making formal recommendations. Recommendations may be issued in conjunction with ATSB reports or independently. A safety issue may lead to a number of similar recommendations, each issued to a different agency.

The ATSB does not have the resources to carry out a full cost-benefit analysis of each safety recommendation. The cost of a recommendation must be balanced against its benefits to safety, and transport safety involves the whole community. Such analysis is a matter for the body to which the recommendation is addressed (for example, the relevant regulatory authority in aviation, marine or rail in consultation with the industry).

INTRODUCTION

Following the terrorist acts in the United States (US) on 11 September 2001, the aviation industry has been under significant pressure to contribute to the reduction of the risk of the repetition of such attacks. Globally, large cooperative investments have been made by governments and the aviation industry in an effort to enhance the security measures affecting air travel. Much of this activity has been undertaken under serious time pressures.

As a result of those collaborative efforts, new security requirements have been developed and introduced, such as those requiring the installation of hardened cockpit security doors[1] by international airlines. The aim of the installation of the hardened cockpit security doors was to inhibit forced entry into the flight deck and to protect flight crews against small arms fire and small cabin explosions.

The Bali bombings of October 2002 reinforced that the risk of terrorist acts in Australia, and to Australian interests could not be discounted. Aside from the terrorist threat, the requirement to minimise the risk of unlawful interference was also significant for Australian aviation security authorities. In that context, and in an effort to reduce the risk to Australian airlines and air travellers, the Australian Government extended the requirement for the installation of hardened cockpit security doors to include airline aircraft being flown on domestic operations. That included to aircraft having a seating capacity of 30 seats or more.

The *Transport Safety Investigation Act 2003* authorises the investigation of any transport safety matter. A transport safety matter can include ‘something that occurred that affected, is affecting, or might affect, transport safety.’

Although the initiating incident for this investigation was relatively minor in nature, the accompanying incident report highlighted a number of safety concerns on the part of the reporting airline. Those concerns were related to the installation of the hardened cockpit security doors and, together with other aircraft operator reports on the issue, caused the Australian Transport Safety Bureau (ATSB) to consider the potential effect of those installations on transport safety.

An initial examination by ATSB investigators of the requirement for, and installation of hardened cockpit security doors in Australian-registered aircraft determined that there were effectively two levels of requirements affecting the installation of hardened cockpit security doors. That hierarchy of requirements was, in the main, based on the seating capacity of the aircraft as follows:

- **Aircraft with a seating capacity of 30 to 59 seats.** This installation was capability-based, and included no operational or flight safety requirements.
- **Aircraft with a seating capacity of 60 seats or more.** This installation included the operational/flight safety requirement that the flight compartment door shall be capable of being locked and unlocked from either pilot’s station.

The nature of the incident in this case, and the reports from a number of aircraft operators of safety and operational hazards as a result of the installation of hardened

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1 Can be used interchangeably with the term ‘hardened flight compartment security door’, ‘strengthened flight deck door’, pilot compartment security door, and ‘enhanced Flight Compartment Access Door’ depending on the jurisdiction.

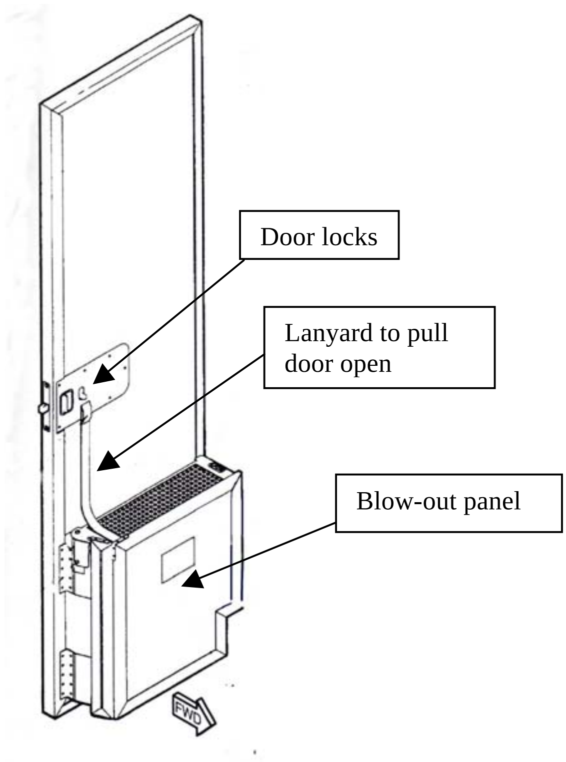
cockpit security doors indicated the potential for those installations to have adversely affected transport safety in at least five different aircraft types. The apparent scope of the potential hazards associated with the installation of hardened cockpit security doors, and their potential effect, formed the basis for the conduct of this investigation, which was formally commenced on 29 July 2005.

FACTUAL INFORMATION

History of the flight

On 14 April 2005 a crew member of a SAAB Aircraft AB SF-340B (SAAB 340B) suffered a minor injury as a result of coming into contact with the sharp edges of the recently installed hardened cockpit security door (figure 1). The security door incorporated a cover over the pressurisation blow-out panel[2] that restricted the available standing room for visitors to the flight deck. A similar injury was reported to have occurred previously in like circumstances.

Figure 1: Hardened cockpit security door



More significantly, additional concerns regarding the hardened cockpit security doors were reported amongst the operator's crews, including that:

- the doors were difficult to reach from the flight crew's positions
- the doors could only be unlocked by a crew member after leaving their respective control station
- there was no facility for emergency cabin crew access to the flight deck in the event of the flight crew becoming incapacitated.

Those concerns were supported by reports from two additional regional airlines, and by the results of an internal investigation that was carried out by a large regional airline operator into a pressurisation failure in one of its aircraft. That

2 Decompression venting panel.

investigation concluded that a pressurisation failure in an aircraft that included the installation of a hardened cockpit security door could, if the flight crew became incapacitated, result in a flight deck 'lockdown'[3]. The large regional airline considered that, in that case, it would be virtually impossible for anyone to access the flight deck in order to treat the flight crew, or to potentially recover the aircraft.

Aviation security regulation

The Convention on International Civil Aviation (also known as the Chicago Convention) defined the purpose of the International Civil Aviation Organization (ICAO), including the agreement that signatories to the convention:

> …agreed on certain principles and arrangements in order that international civil aviation may be developed in a safe and orderly manner and that international air transport services may be established on the basis of equality of opportunity and operated soundly and economically;

As a signatory to the Chicago Convention, Australia agreed to a number of International Standards and Recommended Practices (SARPS) that were listed in the Annexes to the Chicago Convention, and administered by ICAO. In that regard, Annex 17 established the SARPS affecting the standardisation of security measures applicable to the world's international airlines. In addition, the aim of Annex 6 of the Chicago Convention was to provide standardised criteria for safe aircraft operating practices. That included practices in response to aviation security imperatives.

In response to the increased risk to aviation security following the terrorist incidents in the US on 11 September 2001, ICAO amended Annex 17 to include additional areas of security concern, to clarify aviation security objectives in the changed security environment, and to recommend a number of administrative and cooperative arrangements. Together with the other signatories to Annex 17 of the Convention, Australia was required to reconsider the security of its international passenger aircraft, and the applicability of the content of Annex 17.

The following discussion examines the international and Australian responses to the amendments to Annex 17 as they affect the installation of hardened cockpit security doors in passenger aircraft. The operational and safety implications of those installations on the content of Annex 6 are also examined.

The international context

In the US, the events of September 11, 2001 resulted in prompt action by the US Government to require the installation of strengthened flight deck doors in aircraft flying into and within US airspace. The intent of the requirement for the installation of the strengthened doors was 'to prevent, or at least delay, entry of unauthorized persons into the flightdeck.'

US Federal Aviation Administration (FAA) Federal Aviation Regulation (FAR) Part 25 includes the airworthiness standards applicable to US transport category

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3 A flight deck 'lockdown' renders the flight deck impregnable, or nearly so.

aircraft. Within that Part, FAR 25.772, Subpart D – Design and Construction [4] outlined the safety implications of the requirement for strengthened flight deck doors in transport category aircraft. That regulation affected aircraft with more than 20 seats and included that:

> For an airplane that has a lockable door installed between the pilot compartment and the passenger compartment:
>
> (b) Means must be provided to enable flight crewmembers to directly enter the passenger compartment from the pilot compartment if the door becomes jammed.
>
> (c) There must be an emergency means to enable a flight attendant to enter the pilot compartment in the event that [all of] the flightcrew becomes incapacitated.

In that regard, FAA memorandum 01-115-11 of 3 December 2002 provided guidance for the development of systems that satisfied the requirements of FAR 25.772(c). Included was the potential use of an emergency unlock feature that incorporated an appropriate time delay.

FAR 121 mandates the FAA Part 121 operating requirements affecting US domestic, flag and supplemental operations. Amendment 121-288 to FAR 121.313(j)(2) required operators to establish a means for flight attendant access to the flight deck if one of the members of the flight crew became incapacitated. The regulation included the following acceptable approaches to satisfying that requirement:

- the inclusion in the aircraft flight manual of the requirement for another crew member to be present in the flight deck when one of the flight crew leaves that area
- the provision of a method to allow the strengthened flight deck door to be opened from each pilot's seat
- alternative methods, dependent on approval via the FAA issue paper process.

In November 2001, the European Joint Aviation Authorities (JAA) released a policy paper to member States' National Airworthiness Authorities (NAAs) that provided guidance on the design and installation of enhanced Flight Compartment Access Doors[5]. The objective of that paper was to provide for a more secure barrier between an aircraft's cabin and flight deck, with the aim of deterring terrorist activity and delaying or denying unauthorised access to the flight deck.

In its policy paper, the JAA noted a number of operational considerations associated with the installation of an enhanced flight compartment access door that should be addressed by an aircraft operator before releasing an aircraft for a revenue flight. Those considerations included the:

- development of supporting operational procedures

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4 U.S. Code of Federal Regulations, Federal Aviation Administration, Title 14 - Aeronautics and Space, Chapter 1, Part 25 Airworthiness and Standards, Subpart D, Design and Construction, Sec 25.772 Pilot Compartment Doors.

5 Each NAA retained the prerogative of following/not following the Policy Paper. Each of the member States' NAAs retained their national legal responsibilities.

- provision of relevant crew training in the use of the doors and application of the associated operational procedures
- requirement for communication between the flight and cabin crew in normal, abnormal and emergency situations (including intrusion to the flight deck and pilot incapacitation)
- need for procedures for application when one flight crew member leaves the flight deck (including for reasons of health, safety, security or crew rest).

In February 2002, the FAA gave a presentation to the ICAO Ministerial Conference on Aviation Security[6] in response to Agenda Item 2: ICAO Plan of Action for Strengthening Aviation Security. In its presentation, the FAA sought to encourage other contracting States to upgrade the aviation security precautions affecting those States' aviation industries. The FAA recommended that contracting States should establish a means to enable a member of the cabin crew to enter the flight compartment in the event of the incapacitation of a member of an aircraft's flight crew. That recommendation reflected the content of Amendment 121-288 to FAR 121.313(j)(2) (see previous discussion at page 3).

It was reported that Office of Transport Security (OTS) officers were unaware of the content or outcomes of the February 2002 ICAO Ministerial Conference on Aviation Security, or of the FAA presentation at that conference during the implementation of the Government's flight deck door decisions.

The Australian context

The OTS is a business division within the Australian Government Department of Transport and Regional Services (DOTARS). OTS provides policy advice to the Australian Government on transport security matters, including with respect to aviation security regulation, programs and services. The OTS also regulates the protective security provided by the Australian aviation industry against the threat of terrorism and unlawful acts. Policies, plans and regulations are developed by OTS in consultation with its key customers in order to improve Australia's security arrangements.

The Civil Aviation Safety Authority (CASA) was established on 6 July 1995 as an independent statutory authority. Under Section 8 of the *Civil Aviation Act 1988,* CASA became a body corporate, separate from the Commonwealth. Its primary function was to conduct the safety regulation of civil air operations in Australia, and of Australian-registered aircraft being operated overseas.

In November 2003, the then Minister for Transport and Regional Services presented CASA with a Charter Letter that set out CASA's strategic direction. The Letter noted that, although aviation security matters were excluded from CASA's legislation, a cooperative working relationship with DOTARS (ie the OTS) on matters of aviation security was essential.

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6 ICAO Ministerial Conference on Aviation Security, 19-20 February 2002, Montreal, Canada. Presentation by the U.S. FAA. Agenda item 2: ICAO Plan of Action for Strengthening Aviation Security.

In that context, the development of the regulatory requirements affecting the installation of hardened cockpit security doors in Australian aircraft was the responsibility of the OTS, with relevant input from CASA.

Australian regulatory requirements

On 9 July 2003, the Australian Government mandated the ICAO requirement for the installation of hardened cockpit security doors in aircraft having 60 or more seats, or weighing 45,500 kg or more for installation in similar capacity Australian aircraft. The DOTARS stipulated deadline for compliance was 1 November 2003 – the date of completion required by ICAO.

On 4 December 2003, the then Minister for Transport and Regional Services announced the Government’s Enhanced Aviation Security Package, which extended the ICAO security measure to aircraft having a seating capacity of 30 or more seats. The extension of the Government’s initial requirements to aircraft having 30 or more seats was to align Australia’s cockpit security requirements with those in the US and Canada. There was no evidence in the documentation provided to the investigation by the OTS or CASA of an operational and flight safety risk assessment having been carried out in association with that decision.

In January 2005, the OTS issued an *Aviation Risk Context Statement* in order to ‘provide the aviation industry with information on the aviation strategic risk context and the current security environment in Australia’. In addition, the statement acted as an information source to assist organisations and agencies that had an airside[7] interface to complete the transport security requirements of the *Aviation Transport Security Act 2004* and its associated regulations. The statement included the conclusion that the ‘threat of a terrorist attack on regional airlines in Australia is low’.

The *Aviation Transport Security Act 2004* and its associated regulations created an aviation security regulatory framework for application in the Australian aviation industry that was thought to align with the revised ICAO standards. That included Section 62(1)(a) of the *Aviation Transport Security Act 2004*, which provided for the development of regulations that would safeguard against unlawful interference relating to ‘the management and control of passengers (including persons in custody) on board an aircraft’.

Regulation 4.68 of the *Transport Security Regulations 2005* affected all Australian domestic and international aircraft with a seating capacity of 30 or more that were conducting regular public transport or open charter operations. Included in the additional security requirements for cockpits in those aircraft were:

> (2) The operator of an aircraft that has a certified maximum passenger seating capacity of 30 to 59 must not operate the aircraft unless the aircraft is equipped with a cockpit door that is:
>
> (a) designed to resist forcible intrusion by unauthorised persons; and
>
> (b) capable of withstanding impacts of at least 300 joules at critical locations; and

7 All parts of an airport containing aircraft. For passengers, beyond departure customs/immigration, prior to arrival customs/immigration.

(c) capable of withstanding at least 1113 newtons constant tensile load on the knob or handle; and

(d) designed to resist penetration by small arms fire and fragmentation devices to a level equivalent to level IIIa of the United States National Institute of Justice Standard (NIJ) 0101.04 Revision A, as in force on 15 January 2002.

Penalty: 50 penalty points.

(3) The operator of an aircraft that has a certificated maximum passenger seating capacity of 60 or more must not operate the aircraft unless the aircraft is equipped with a cockpit door that complies with section 13.2.2 of Annex 6, *Operation of Aircraft*, to the Chicago Convention, as in force on 28 November 2002.

Penalty: 50 penalty points.

Note The section [Section 13.2.2 of Annex 6] is as follows:

'13.2.2 From 1 November 2003, all passenger-carrying aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater that 60 shall be equipped with an approved flight crew compartment door that is designed to resist penetration by small-arms fire and grenade shrapnel, and to resist forcible intrusions by unauthorised persons. This door shall be capable of being locked and unlocked from either pilot's station.'

The Australian Government provided $3.2 million to regional airline operators to facilitate the purchase and installation of hardened cockpit security doors in all eligible aircraft affected by regulation 4.68 of the *Transport Security Regulations 2005*. The airlines paid all associated costs related to the installation of hardened cockpit security doors in aircraft with a seating capacity of 60 or more seats.

The requirements of regulation 4.68(3) reflected the ICAO Annex 6 standard for operations involving passenger-carrying aeroplanes of a maximum certificated take-off mass in excess of 45,500 kg, or with a passenger seating capacity of greater than 60. Although, regulation 4.68(2) was a stand-alone, Australian requirement, it paraphrased the security considerations and design requirements of FAR 25.795. That FAR did not include the ICAO Annex 6 section 13.2.2 requirement that the cockpit door should be capable of being locked and unlocked from either pilot's station. The Australian regulations did not include consideration of the content of FAR 25.772 relating to the potential for in-flight jamming of the hardened flight compartment door, or of flight crew incapacitation requiring flight attendant access from the aircraft's cabin.

OTS development of the Australian regulatory requirements

From 28 November 2003, the OTS had identified the need for CASA assistance in the preparation of an OTS briefing that was to be presented at a forthcoming aviation security meeting. The topic of that briefing was 'Approve reinforced cockpit doors from a safety perspective', and OTS requested CASA's input by the close of business on 9 December 2003. While CASA had indicated that it would ensure a response was provided to the OTS by 9 December, the investigation was unable to confirm that any response was provided.

Subsequently, during the lead-up to the Australian Government National Security Committee's 1 July 2004 deadline for the installation of hardened cockpit security doors in all regular public transport and charter aircraft of 30 seats or more capacity, the OTS advised operators:

- of the new security measures
- that the doors would have to meet the requirements of FAR 25.795
- of the proposed financial arrangements for the installation of the doors
- of certain OTS information requirements relating to operators' aircraft.

In response, a number of operators related their concern regarding the flight safety implications of the installation of the hardened cockpit security doors. Those concerns included that:

- in some aircraft, neither flight crew member would be able to unlock the door and open it from their pilot's control station
- if a flight attendant was required to be in the flight compartment whenever a pilot needed to leave his seat, the cabin would be left unattended for that period
- there was the risk that flight crew might experience difficulty during an emergency egress from the flight compartment
- the rescue of flight crew in an emergency could be impeded by the presence of the security door.

The OTS attempted to act on the safety and operational concerns that had been highlighted by some operators. That included the OTS on 6 May 2004 seeking a meeting with CASA officers in order to discuss a number of safety concerns that it understood were held by CASA. Subsequently, in June 2004 the OTS requested advice from CASA on whether CASA had considered the issue of emergency egress from the flight compartment of certain hardened door-installed aircraft. The OTS also sought CASA advice on how the OTS might resolve the issue of emergency access to the flight compartment. There was no evidence that CASA had responded to any of the OTS requests for support.

On 4 January 2005, the OTS circulated the draft Aviation Security Regulations to CASA and a number of other Government Agencies and industry participants, inviting comment on their content. That included the content of draft regulation 4.64[8] 'Additional requirements for security of flight crew compartment – aircraft with seating capacity 30 or more'. The relevant content of that draft regulation included:

> (1) This regulation applies in relation to an aircraft that has a certified maximum passenger seating capacity of 30 or more.
>
> (3) The aircraft's cockpit door must comply with section 13.2.2 of Annex 6, *Operation of Aircraft,* to the Chicago Convention, as in effect on 28 November 2002.
>
> *Note* The section is as follows:

8 Draft regulation 4.64, together with amendments, was ultimately promulgated as regulation 4.68 to the *Transport Security Regulations 2005*.

> '13.2.2 From 1 November 2003, all passenger-carrying aeroplanes of a maximum certificated take-off mass in excess of 45 500 kg or with a passenger seating capacity greater that 60 shall be equipped with an approved flight crew compartment door that is designed to resist penetration by small-arms fire and grenade shrapnel, and to resist forcible intrusions by unauthorised persons. This door shall be capable of being locked and unlocked from either pilot's station.'

Despite initial indications by the OTS in May 2004 that it proposed advising 'operators [of aircraft having a seating capacity of 30 or more] that they should install [hardened cockpit] doors that would meet standards established in part 25 section 25.795 of United States Federal Aviation Regulations', there was no reference in the draft regulations to the requirements of FAR 25.795. From the information provided to the investigation, the justification for, and history of the inclusion, of the additional and apparently paraphrased requirements of FAR 25.795 in the finalised regulation 4.68(2) of the *Transport Security Regulations 2005* was unable to be determined.

In recognition of the tight timeline for finalising any drafting comments, the OTS requested recipients' comments on the content of the draft regulations by 14 January 2005. The various responses were consolidated and considered over the period 17 to 19 January, before the OTS finalised the draft regulations during the period 20 to 24 January 2005. The finalised regulations were planned to be presented to the Governor General (Executive Council) by 16 February 2005 and tabled in Parliament before 9 March 2005.

CASA's comments on the content of the draft regulations were received by the OTS on 25 January 2005. CASA indicated that the delay was as a result of the magnitude of the review of the 230-page draft regulations, of the compressed timeframe for the provision of the CASA response to OTS, and of the difficulties associated with the time of year in which the review was undertaken. CASA's comments relating to draft regulation 4.64(3) included:

- A query of the intended meaning of the term 'approved' flight compartment door'. CASA cited that its approval function was limited to the certification issues affecting the fitment of the door. CASA indicated the understanding that the only hardened cockpit security door standard that had been approved was that contained in FAR 25.
- The observation that there was the potential for differing interpretation of the draft regulations, and whether they were relevant to all aircraft with a seating capacity of 30 or more, or only to those aircraft having a maximum certificated take-off mass in excess of 45,500 kg or with a passenger seating capacity greater than 60.
- A suggested simplified text for adoption as regulation 4.64(3). That simplified text retained the ICAO Annex 6 section 13.2.2 (and the ultimate *Transport Security Regulations 2005*) requirement that the hardened cockpit security door must be capable of being locked and unlocked from either pilot's station.

There was no specific concern indicated by CASA regarding the potential for any operational or flight safety issues as a result of the requirement to install hardened cockpit security doors in affected Australian aircraft.

There was also no evidence that any other operational or safety advice had been provided to the OTS during the development of the Australian legislation and associated regulations. Similarly, there was no evidence that OTS retrospectively considered the CASA input after having finalised the draft regulations. That may have been particularly relevant, given CASA's query of whether the requirements of draft regulation 4.64(3) were relevant to all aircraft with a seating capacity of 30 or more, or only those having a maximum certificated take-off mass in excess of 45,500 kg or with a passenger seating capacity of greater than 60.

The OTS recognised that the regulations might cause legitimate concerns for industry participants, and offered that there was scope for their amendment over time. The OTS aim was that the regulatory requirements affecting security in the Australian aviation industry ought to be able to be progressively improved as a result of its ongoing consultation program. The *Transport Security Regulations 2005* took effect from 31 July 2005.

After the regulations came into effect, the OTS became aware of the requirements of the FARs that addressed the safety and operational implications of the installation of hardened cockpit security doors in US transport category aircraft. During discussions with the investigation team, OTS officers indicated that the lack of safety advice that was received through the draft regulations comment period may have resulted in safety issues not being fully addressed. In addition, the OTS officers indicated that the safety and operational requirements of FAR Part 25, if included in the *Transport Security Regulations 2005*, would have had minimal impact on the security requirements of those regulations.

Civil Aviation Safety Authority input to the development of the Australian regulatory requirements

In accordance with Section 9 of the *Civil Aviation Act 1988*, CASA is not specifically responsible for aviation security. However, in accordance with that Act, CASA was required to 'regard the safety of air navigation as the most important consideration' when carrying out its function. CASA's safety-related functions as they might have related to the development of the *Transport Security Regulations 2005* included:

- the safety regulation of civil air operations in Australian territory and of Australian aircraft being operated outside Australian territory, by means including 'developing and promulgating appropriate, clear and concise aviation safety standards'
- the promotion of 'full and effective consultation and communication with all interested parties on aviation safety issues'
- any incidental functions to those safety-related functions outlined in Section 9(3) of the *Civil Aviation Act 1988*.

CASA provided some input to DOTARS (the OTS) during the development of the hardened cockpit security doors legislation and associated regulations. In addition, CASA indicated to the OTS its willingness to respond to operators' queries regarding the amendment of their Airline Security Programs, if those queries more correctly fell within the safety purview of CASA. However, CASA's primary focus remained that affected aircraft certification standards were maintained subsequent to the installation of hardened cockpit security doors. Other than the comments on the content of the draft security regulations that were provided to OTS on 25 January 2005, there was no documentary evidence confirming any input from CASA during the development of the hardened cockpit security doors legislation and associated regulations relating to potential operational and/or safety issues associated with that legislation.

In November 2001 CASA sought independent legal advice on whether the same flexibility was available to CASA in the application of its Australian legislation, as was being applied by the FAA in allowing US operators to modify or replace cockpit doors without the normal airworthiness approvals. Prior to seeking that advice, CASA officers expressed the opinion that the Civil Aviation Regulation 42ZS provision for exemptions against maintenance and airworthiness requirements was ‘not available in this circumstance as the exemption is likely to adversely affect the safety of air navigation’. The legal advice subsequently received by CASA included that:

> On any view it seems sensible that CASA take a ‘net safety benefit’ approach to its assessment of the safety impact of the proposed doors. CASA can therefore assess the potential safety detriment (for example if both pilots became simultaneously incapacitated in the locked cockpit) in the light of the safety benefit of preventing the entrance of unauthorised persons into the cockpit. This safety benefit can be assessed by CASA even though it appears to arise from an aviation security issue.

On 17 and 18 September 2003, CASA’s then Acting Executive Manager for Corporate Affairs gave a presentation to an aviation industry consultative meeting. That presentation included advice of CASA’s administrative approach to the security requirements being prepared for implementation by the OTS. CASA’s role was presented as one that ensured that aircraft modifications did not adversely affect the structural integrity of the modified aircraft, or in any way lead to a deterioration of the safety environment. Referring to the new hardened cockpit security doors, the Acting Executive Manager advised the meeting that, in most instances, particularly if a standard modification kit was purchased by an operator, CASA’s approval of the modification could be expected as a matter of course.

During the intervening period until the promulgation of the *Aviation Transport Security Act 2004* and its associated regulations, CASA remained appraised of the evolving international requirements affecting the installation of hardened cockpit security doors. CASA’s desire was to avoid as much as possible the development of uniquely Australian standards for application in Australian-registered, foreign-manufactured aircraft. However, CASA was required to ensure that, after the installation of a hardened cockpit security door, the modified aircraft still satisfied the certification standards for that aircraft. That included:

> …a range of issues relating to safety of the aircraft, including exit from the cockpit under unusual circumstances, and that cabin crew can access the flight crew if the flight crew are incapacitated after an emergency.

That was reflected during CASA’s consideration of the hardened cockpit security door being developed for installation in a Dutch-manufactured aircraft. In that case, the Type Certificate Data Sheet[9] required that the cockpit door must be able to be opened by rescuers in the event of an accident. That was as a result of the escape hatches not being able to be opened from outside the aircraft, and reflected an FAA memorandum that itself supplemented FAA Advisory Circulars.

9 Official specifications to which each unit (aircraft, engine, propeller, etc) that is commercially offered for sale must conform.

Tests and research

Hazards associated with the hardened cockpit security door installation in 30 to 59 seat capacity aircraft

Initially, the investigation examined the reports from two regional airline operators that flight crew in certain of the operators' 30 to 59 passenger seat capacity aircraft had reported difficulty operating the hardened cockpit security door from their normal pilot's control station. It was reported that that had, in some instances, required flight crew to vacate their control stations in order to unlock the door.

The investigation confirmed that, in some Australian-registered 30 to 59 seating capacity aircraft types, pilots were unable to lock or unlock the flight compartment door from either control station, representing a hazard to safety. The nature of that hazard included:

- **In the SAAB 340B.** In this aircraft type, the hardened cockpit security door was cumbersome for one pilot to operate, with the result that both pilots were often involved in opening it. In that case, there was the potential that there would be periods during which a pilot was not at the aircraft's controls as follows:
  - in attempting to reach the door latch, one or both pilots were required to move their seats back beyond the reach of the aircraft's flight controls
  - similarly, if one of the pilots left the flight compartment, when the remaining pilot was required to open the door to allow for the re-entry of the returning pilot, the pilot flying's seat often had to be moved back beyond the reach of the flying controls.

  The result in either case was that it could not be assured that a pilot would be able to remain continuously at the controls of the aircraft.
- **In the Embraer Brasilia EMB-120 (Brasilia).** In this aircraft type, whenever a pilot had to leave the flight compartment for any reason, the remaining pilot was unable to open the hardened cockpit security door without leaving the aircraft's controls unattended. In that circumstance, the operator required that, whenever one of the pilots was absent from the flight compartment, the sole cabin crew member on board the aircraft was to remain locked within the flight compartment. That was in order to open the door for the returning pilot. The result was that there could be no supervision of the aircraft's cabin and passengers for the period that the cabin crew member was restricted to being in the flight compartment.

In both aircraft types, it was identified that, if one of the pilots became incapacitated, the remaining pilot may be unable to open the flight compartment door in order for the cabin crew to render assistance. That would also be the case if both pilots were incapacitated. When this hazard was identified by one operator, a 'work-around' was developed that overcame the lack of emergency access to the flight compartment, but did not entirely comply with the security requirements of the *Aviation Transport Security Act 2004*.

In addition to the problem of pilot reach from the pilot's control station in SAAB 340B and Brasilia aircraft, operators of the Bombardier De Havilland DHC-8 (Dash 8), Fokker F100 and British Aerospace BAE 146 identified that, should the flight crew become incapacitated, the flight deck of those aircraft types was virtually inaccessible to aircraft cabin crews. The impact on the continued safe operation of an aircraft in that case would be the same as described above in either of the SAAB 340B or Brasilia.

Reported incidents of in-flight pilot incapacitation

The investigation attempted to gain an appreciation of the potential magnitude of the hazard identified in the case of pilot incapacitation in 30 to 59 seat aircraft that included a problematic installation of a hardened cockpit security door. That took the form of the retrieval and examination of the reported incidents of pilot incapacitation that were recorded in the ATSB's accident and incident database over the period January 2000 to July 2005.

The results of that examination included that there had been 43 reports of flight crew incapacitation during the period studied, or an average of about 8 incidents per year. The causes of the pilots' incapacitation varied, but included: the temporary loss of vision as a result of a lightning strike; physical illness, including stomach cramps and nausea; the lodgement of a foreign object in a pilot's eye; and incapacitation as a result of the contamination of the flight compartment. In one instance, both pilots became incapacitated.

In many of the reported incidents, a cabin crew member was required to enter the flight compartment to render assistance while the remaining pilot ensured the continued safe conduct of the flight.

ANALYSIS

Although intended to reflect US and Canadian requirements, the Australian decision to apply differing hardened cockpit security doors capability and other requirements depending on whether an aircraft had a seating capacity of 30 to 59, or 60 or more seats was unique. The Office of Transport Security (OTS) was subsequently under increased pressure to determine the relevant performance capabilities, and operational and flight safety requirements of a number of international cockpit security regulatory regimes, and their potential relevance to the Australian context. In turn, the involvement of the Civil Aviation Safety Authority (CASA) was important in that determination, and subsequent inclusion of the relevant capabilities and requirements in the *Transport Security Regulations 2005*.

The effective inclusion in regulation 4.68(2) of the *Transport Security Regulations 2005* of the hardened cockpit security door physical and capability specifications from US Federal Aviation Regulation (FAR) 25.795 was consistent with earlier advice provided to operators by the OTS. However, FAR 25.795 did not include any of the complementary US operational or safety requirements of FAR 25.772 Subpart D, or of amendment 121-288 to FAR 121.313(j)(2).

Further, while the requirements of regulation 4.68(3) reflected the requirements of Annex 6 of the Chicago Convention, they did not satisfy the operational and safety requirements of FAR 25.772 Subpart D. The result was that the Australian regulations did not:

- in the case of an aircraft with a seating capacity of 30 or more, include the requirement for a means to allow flight crew to enter the passenger cabin should a hardened cockpit security door jam, or for flight attendant access to the flight compartment in the event the incapacitation of the flight crew
- after the January 2005 amendment to the draft regulations, include the requirement for flight crew to be able to open the hardened cockpit security door from each pilot’s seat in aircraft having a seating capacity of between 30 and 59.

In that context, the importance of a risk assessment of the potential hazards associated with a unique Australian requirement should not be underestimated. In regard to the operational and flight safety considerations of that decision, the need for a collaborative, enduring relationship between officers of the OTS and CASA was highlighted. That requirement was anticipated by the then Minister for Transport and Regional Services in the Charter Letter that was presented to CASA in November 2003.

The lack of a response to the OTS request for CASA input to a December 2003 briefing, and to the June 2004 OTS request for input regarding emergency egress from certain hardened cockpit security door-installed aircraft increased the importance, for the OTS, of the review by CASA in January 2005 of the draft security regulations. The scope and compressed timeframe for that review, and the time of year in which the review was carried out, adversely impacted on the scope and timeliness of the CASA response. The result was that the OTS could not assure itself that the risks associated with the proposed security regulations had been able to be fully considered in the time available.

The investigation could not quantify the extent to which any risk assessment, if carried out, might have identified options for the OTS to have enhanced the regulations in order to treat the operational and flight safety hazards that were inherent in the *Transport Security Regulations 2005*. The apparent lack of a risk analysis, including with advice and input from CASA, in support of the development of the unique hardened cockpit security door regulations limited the opportunity for OTS to prevent hazards such as those reported by the SAAB 340B and other regional aircraft operators in this investigation.

Throughout the development of the *Transport Security Regulations 2005*, the OTS approached CASA on a number of occasions seeking CASA advice and involvement in the consideration of the potential flight safety implications of the requirement for the installation of hardened cockpit security doors in Australian aircraft.

In that regard, it appeared that there may have been two interpretations by CASA of its involvement in the flight safety deliberations highlighted by the OTS:

- The theme in a significant amount of the CASA correspondence appeared to be that CASA's responsibility was limited to the safety implications of a hardened cockpit security door installation in terms of its compliance with relevant airworthiness requirements. That included that CASA ought to be able to act in reliance of the certification and airworthiness standards of overseas regulatory agencies as they affected the installation of hardened cockpit security door modifications in relevant Australian aircraft.
- An alternate theme in some CASA correspondence was that a broader range of safety issues required examination when considering the installation of a hardened cockpit security door in an Australian-registered aircraft.

CASA would have retained an ongoing awareness of the evolving hardened flight deck security door requirements of FARs 25.795 and 25.772 Subpart D, of amendment 121-288 to FAR 121.313(j)(2), and of the requirements of the relevant Annexes of the Chicago Convention. That awareness appeared to have been confirmed by the emergency access requirements of the Type Certificate Data Sheet (TCDS) for the hardened cockpit security door installation in the Dutch-manufactured aircraft. In that case, the OTS ought to have been able to have expected that the operational and flight safety implications of the draft regulations might have been more comprehensively conveyed to OTS during the development and review of the draft security regulations. The apparent disparity in CASA's interpretation of its operational and flight safety role in regard to the development of the *Transport Security Regulations 2005* and the timing pressures may have explained why that had not been the case.

In any case, the OTS was aware of operators' flight safety concerns regarding the installation of hardened cockpit security doors. That awareness was confirmed by the repeated attempts by the OTS to obtain CASA's input regarding the potential hazards to flight safety that might have resulted from that developing security requirement. Given the initial concern that was displayed by the OTS in that regard, the investigation could not reconcile why, in isolation of any input from CASA during the development and review of the draft regulations, the *Transport Security Regulations 2005* did not more fully reflect the operational and flight safety requirements of FAR 25, or of other appropriate, international regulatory regimes.

The apparent time imperative affecting the finalisation and promulgation of the *Transport Security Regulations 2005*, and the nature of the CASA response to the draft regulations, appeared to have had an adverse impact on the full consideration by the OTS of the operational and flight safety implications resulting from the installation of hardened cockpit security doors in Australian aircraft. In that case, it is perhaps understandable that the Australian requirements did not include the relevant operational and flight safety considerations that were included in the FARs, and discussed in the European Joint Aviation Authorities (JAA) policy paper of November 2001. The lack of those or similar operational and flight safety considerations related directly to elements of the SAAB 340B operator’s incident report, and to the concerns of three other regional airlines.

FINDINGS

Contributing safety factor

- With respect to aircraft having a seating capacity of 30 to 59 seats, regulation 4.68(2) of the *Transport Security Regulations 2005* developed by the Office of Transport Security (OTS) did not include the complementary US operational and safety requirements of US Federal Aviation Regulation (FAR) 25.772 Subpart D, or of amendment 121-288 to FAR 121.313(j)(2).

Other safety factors

- During the development of the *Transport Security Regulations 2005*, the OTS was unaware of the content and outcomes of the International Civil Aviation Organization (ICAO) Ministerial Conference on Aviation Security that was held in February 2002.
- With respect to aircraft having a seating capacity of 60 seats or more, regulation 4.68(3) of the *Transport Security Regulations 2005* did not include the operational and safety requirements of FAR 25.772 Subpart D.
- The lack of a risk analysis, including with advice and input from the Civil Aviation Safety Authority (CASA), in support of the unique Australian hardened cockpit security doors regulations limited the opportunity for the OTS to identify and treat any potential operational and flight safety hazards associated with those regulations.
- The 25 January 2005 input by CASA to the review of the draft transport security regulations did not comprehensively address the potential operational and flight safety implications of those regulations and was not considered by the OTS.

Other key findings

- There was no evidence that an operational and flight safety risk assessment had been carried out in association with the decision to extend the initial hardened cockpit security door requirement that affected aircraft having 60 or more seats, or weighing 45,500 kg or more, to aircraft having 30 to 59 seats.
- The apparent time imperative affecting the finalisation and promulgation of the *Transport Security Regulations 2005*, and the nature of the 25 January 2005 CASA response to the draft regulations, appeared to have had an adverse impact on the consideration by the OTS of the full operational and flight safety implications resulting from the installation of hardened cockpit security doors in Australian aircraft.
- The nature of the OTS/CASA interaction during the development of the *Transport Security Regulations 2005* may have adversely affected the full consideration of the operational and flight safety hazards associated with the requirements of those regulations.

SAFETY ACTION

The Office of Transport Security

The Office of Transport Security (OTS) has indicated that it will:

- Explore options for the establishment of a formal consultation mechanism with the Civil Aviation Safety Authority (CASA). Once established, that mechanism will ensure the consideration of the potential operational and flight safety hazards that might result from the development of national security requirements for application in the Australian aviation industry.
- Consult CASA on relevant aviation security measures that have the potential to impact on aviation safety. Should CASA advise during such consultation that a proposed security measure may adversely impact aviation safety, OTS will, where appropriate, assist CASA in the conduct of a safety risk analysis.

The OTS also advised the ATSB that:

> Amendments to the Aviation Transport Security Regulations 2005 on a range of matters, including potential safety concerns with regard to flight deck door requirements, has been identified by the OTS as an important priority and will be addressed over time. The US FAA safety regulations will be considered in drafting amended regulations.

Civil Aviation Safety Authority

CASA has indicated that it will seek to develop a Memorandum of Understanding with the OTS in order to ensure the consideration of potential operational and flight safety hazards that might result from the development of national security requirements for application in the Australian aviation industry.

Post publication safety action update

In November 2009, CASA advised that:

> ...Executives from CASA and the Department of Infrastructure [Transport, Regional Development and Local Government] have met on a regular basis (through scheduled quarterly meetings) to discuss the interaction of security and safety regulatory requirements. These meetings are minuted with action items. The Executive of both organisations agree that in light of these meetings, a formal Memorandum of Understanding is not required.