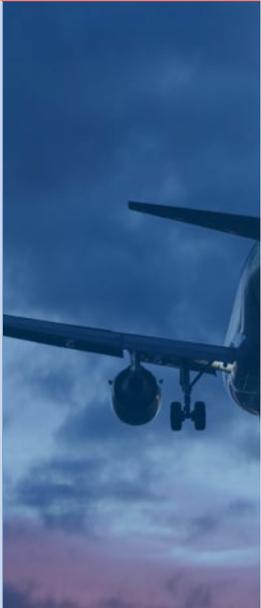




**Australian Government**

**Australian Transport Safety Bureau**



**ATSB TRANSPORT SAFETY REPORT**  
Cross-modal Research and Analysis Report  
XR-2011-001  
Final

**Safety issues and safety actions identified  
through ATSB transport safety investigations:  
2010-2011 financial year**





**Australian Government**  

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### Abstract

In the 2010–2011 financial year, the Australian Transport Safety Bureau (ATSB) completed 51 aviation, 11 marine, and 8 rail investigations where safety factors (events or conditions affecting safety risk) were identified using the ATSB analysis framework. From these investigations, 121 safety issues (factors that have a potential to adversely affect the safety of future operations) were identified and 137 safety actions were undertaken by various parties to address these safety issues. This report documents and analyses these safety issues and safety actions and explores the risk levels (critical, significant or minor) assigned to them to provide an understanding of where the greatest risks to each transport mode appear to lie. The results will be useful for government decision makers, regulators and the aviation, rail and marine industries to understand if and where attention to risk needs to be applied.

Inadequate procedures were a common safety issue found by ATSB investigations for all transport modes. Specifically for rail, the design and operation of procedures were common issues. Risk controls to manage technical failures were also common in aviation. Marine investigations found that equipment problems and safety management systems were also of significant concern.

Once safety issues are identified in an investigation, they need to be addressed. Across the three transport modes, 71 per cent of safety issues of significant risk were addressed (that is, had their risk reduced to an acceptable level), while 15 per cent were only partially addressed. Only one safety issue (from marine) continues to be not addressed without any expected future safety action.

Proactive industry safety action during an investigation was the most common way that safety issues were addressed across the aviation and marine modes, while for rail the most common method of addressing safety issues was for the ATSB to issue formal Safety Advisory Notices. Only one safety issue, in aviation, was assessed to pose a critical risk to safety and was addressed by technical inspections, repairs or modifications and changes to mandatory requirements.

The most common avenue to address safety issues that posed a significant risk to aviation safety was to communicate with and/or educate those involved. For marine, changing or reviewing policy or conducting organisational surveillance were the most common ways to address significant safety issues. In rail, the most common ways to address significant safety issues involved technical actions and policy changes.

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# THE AUSTRALIAN TRANSPORT SAFETY BUREAU

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The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The Bureau is governed by a Commission and is entirely separate from transport regulators, policy makers and service providers. The ATSB's function is to improve safety and public confidence in the aviation, marine and rail modes of transport through excellence in: independent investigation of transport accidents and other safety occurrences; safety data recording, analysis and research; fostering safety awareness, knowledge and action.

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.

The ATSB performs its functions in accordance with the provisions of the *Transport Safety Investigation Act 2003* and Regulations and, where applicable, relevant international agreements.

## **Purpose of safety investigations**

The object of a safety investigation is to identify and reduce safety-related risk. ATSB investigations determine and communicate the safety factors related to the transport safety matter being investigated. The terms the ATSB uses to refer to key safety and risk concepts are set out in the next section: Terminology Used in this Report.

It is not a function of the ATSB to apportion blame or determine liability. At the same time, an investigation report must include factual material of sufficient weight to support the analysis and findings. 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.

## **Developing safety action**

Central to the ATSB's investigation of transport safety matters is the early identification of safety issues in the transport environment. The ATSB prefers to encourage the relevant organisation(s) to initiate proactive safety action that addresses safety issues. Nevertheless, the ATSB may use its power to make a formal safety recommendation either during or at the end of an investigation, depending on the level of risk associated with a safety issue and the extent of corrective action undertaken by the relevant organisation.

When safety recommendations are issued, they focus on clearly describing the safety issue of concern, rather than providing instructions or opinions on a preferred method of corrective action. As with equivalent overseas organisations, the ATSB has no power to enforce the implementation of its recommendations. It is a matter for the body to which an ATSB recommendation is directed to assess the costs and benefits of any particular means of addressing a safety issue.

When the ATSB issues a safety recommendation to a person, organisation or agency, they must provide a written response within 90 days. That response must indicate whether they accept the recommendation, any reasons for not accepting part or all of the recommendation, and details of any proposed safety action to give effect to the recommendation.

The ATSB can also issue safety advisory notices suggesting that an organisation or an industry sector consider a safety issue and take action where it believes appropriate, or to raise general awareness of important safety information in the industry. There is no requirement for a formal response to an advisory notice, although the ATSB will publish any response it receives.

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# TERMINOLOGY USED IN THIS REPORT

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## Occurrence

An *occurrence* is an accident, serious incident, or incident.

Specifically, it includes all transport safety matters as defined by Section 23 of the *Transport Safety Investigation Act 2003*. In general, this includes something that occurred that affected, is affecting, or might affect, transport safety.

## Safety factor

A *safety factor* is an event or condition that increases safety risk.

In other words, it is something that, if it occurred in the future, would increase the likelihood of an occurrence, and/or the severity of the adverse consequences associated with an occurrence.

Safety factors are identified through the course of ATSB investigations. They include individual actions (e.g. errors and violations), local conditions, current risk controls and organisational influences. Table 1 provides an outline of these five types of safety factors.

**Table 1: Safety factors in the ATSB investigation analysis model**

Term	Description
Individual actions	Individual actions are observable behaviours performed by operational personnel. The term 'operational personnel' refers to any person that can have a relatively direct impact on the safety of a transport activity; for example, flight crew, locomotive drivers, ships' masters, cabin crew, controllers, dispatch and loading personnel, and maintenance personnel.
Technical failure mechanism	The mechanisms behind technical events.
Local conditions	Local conditions are those conditions which exist in the immediate context or environment in which individual actions or technical events occur, and which can have an influence on the individual actions or technical events. Local conditions include characteristics of the individuals and the physical environment.
Risk controls	Risk controls are the measures put in place by an organisation to facilitate and assure safe performance of the operational components of the system (that is, operational personnel and equipment). They can be viewed as the outputs of the organisation's safety management system. Risk controls are sometimes termed 'defences', 'safeguards' or 'barriers', although some definitions of these terms can vary in scope.
Organisational influences	Organisational influences are those conditions that establish, maintain or otherwise influence the effectiveness of an organisation's risk controls. There are two main types of organisational influences: organisational conditions and external influences.

The ATSB investigation analysis model is based on the widely used ‘chain-of-events’ theory of accident causation made popular by James Reason’s model of organisational accidents<sup>1</sup>. For more information, see the ATSB publication *Analysis, Causality and Proof in Safety Investigations*<sup>2</sup>.

A safety factor can be either a **contributing safety factor** or **other safety factor**:

- A **contributing safety factor** is a safety factor that, had it not occurred or existed at the time of an occurrence, then either:
  - (a) the occurrence would probably<sup>3</sup> not have occurred; or
  - (b) the adverse consequences associated with the occurrence would probably not have occurred or have been as serious; or
  - (c) another contributing safety factor would probably not have occurred or existed.
- **Other safety factor**, which is a safety factor identified during an occurrence investigation that did not meet the definition of contributing safety factor, but was still considered to be important to communicate in an investigation report in the interests of improved transport safety.

## Safety issue

A *safety issue* is a safety factor that can:

- reasonably be regarded as having the potential to adversely affect the safety of future operations, and;
- is a characteristic of an organisation or a system, rather than a characteristic of a specific individual, or characteristic of an operational environment at a specific point in time.

The primary way for ATSB investigations to improve future transport safety is through the identification and mitigation of safety issues. This report will focus on safety issues and safety actions resulting from ATSB investigations, as well as documenting all safety factors identified through investigations.

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<sup>1</sup> Reason, J. (1990). *Human error*. Cambridge, Cambs, United Kingdom: Cambridge University Press.

Reason, J. (1999). *Managing the risks of organizational accidents*. Aldershot, Hants, United Kingdom: Ashgate Publishing.

<sup>2</sup> Walker, M. B. & Bills, K.M. (2008). *Analysis, Causality and Proof in Safety Investigations*. (Aviation Research and Analysis Report AR-2007-053). Canberra: ATSB.

<sup>3</sup> ‘Probably’ is defined as being equivalent to ‘likely’, and meaning that there was more than a two in three chance that the occurrence would not have happened.



Derailment of freight train 4DA2 near Cadney Park, South Australia (RO-2010-012)

## Risk level

Each time it identifies a safety issue, the ATSB assesses the level of risk associated with that issue. That assessment reflects the risk level as it existed at the time of the occurrence.

It is widely recognised that all modes of transport will always operate with some level of risk, but that this risk should be as low as reasonably practicable. On that basis, the ATSB broadly classifies safety issues in terms of their level of risk as follows:

- **Critical** safety issue: associated with an intolerable level of risk and generally leading to the immediate issue of a recommendation for safety action unless corrective safety action has already been taken.
- **Significant** safety issue: associated with a risk level regarded as unacceptable, unless the risk has been assessed to be as low as reasonably practicable, or action is taken to reduce it to a level as low as reasonably practicable. The ATSB may issue a safety recommendation or a safety advisory notice if it assesses that further safety action may be practicable.
- **Minor** safety issue: associated with a broadly acceptable level of risk. The ATSB still encourages the relevant organisation(s) to take safety action, but it does not issue a formal recommendations. However, when safety action has been taken, it is published in the final report.

## Safety action

*Safety actions* are the steps taken or proposed to be taken by a person, organisation or agency in response to a safety issue. They can be classified into the following types:

- **Proactive industry safety action** refers to local or systemic action taken by an organisation or individual in response to safety issues identified in an ATSB safety investigation, which is taken prior to the release of any ATSB safety action.
- **ATSB safety action** refers to formal activities conducted by the ATSB to initiate additional safety action by relevant organisations. Safety action by the ATSB, such as issuing safety recommendations and SANs, is normally done as a last resort and is generally taken when other attempts to facilitate sufficient safety action with an organisation or individual have not been successful, and the risk level is still assessed as either critical or significant (and not as low as reasonably practicable).

There are two types of ATSB safety action:

- **Safety recommendations** are a formal recommendation to an organisation for it to address a specific safety issue. The ATSB cannot compel an organisation to take action, but the recommendation and any response will be publicly released. The relevant party is required by law to respond to any such recommendation within 90 days of release. Safety recommendations focus on stating the problem (a description of the safety issue). They do not identify specific solutions for reducing risk.
- **Safety Advisory Notice (SAN)** is a formal advisory to an organisation, or more broadly to transport industry participants, that they should consider a safety issue and take action when appropriate. A SAN is released for less significant safety issues when the available evidence is too limited for a safety recommendation to be issued, or where the safety issue might be applicable to many organisations or individuals. Safety Advisory Notices do not require a formal response, however, the ATSB will publish the notice and any responses received.

## Safety action outcomes

When safety action is taken by an organisation in response to a safety issue, it can be in many different forms. These include changes to procedures, policies, and documentation, the implementation of new training, or the redesign of components.

In all cases, the action (or actions) taken must be appropriate to reduce the risk that the safety issue poses to safe transport operations to as low as reasonably practicable. For example, a regulator can issue a new regulation (one safety action), and then initiate an education campaign to make industry participants aware of the changes (another safety action). Both of these safety actions combined may adequately address the safety issue.

In 2011, the ATSB introduced a new way of categorising safety action outcomes for both ATSB safety actions and proactive industry safety actions. They can be divided into a few broad categories:

- **Technical action** in which parts or systems are inspected, redesigned, modified or replaced to address a safety issue.

- **Policy action** in which an organisation changes a policy or an aspect of their safety management system (SMS) to address a safety issue.
- **Procedural action** where an organisation reviews, amends, or creates new procedures to address a safety issue.
- **Training action** where an organisation provides further training to its personnel, reviews the effectiveness of existing training, or re-trains some personnel to address a safety issue.
- **Communication/education action** in which an organisation provides information to its personnel or other organisations to make them aware of a safety issue and how to reduce the risk it poses.
- **Mandatory requirements action** in which a regulator provides directives to organisations to address a safety issue, or reviews the efficacy of legislation or requirements.
- **Organisational surveillance action** in which an organisation conducts an internal quality assessment, audit, or risk assessment of its operations/policies/procedures/equipment to address a safety issue.
- **External surveillance action** in which external parties, such as regulators or government agencies, monitor or audit an organisation or industry to address a safety issue.

More detailed information on how safety action categories are assigned is presented in Appendix A.

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## ABBREVIATIONS

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<b>AC</b>	Alternating current
<b>AIC</b>	Accident Investigation Committee of Papua New Guinea
<b>AMSA</b>	Australian Maritime Safety Authority
<b>ANRF</b>	ARTC Network Form
<b>ANSG</b>	ARTC Network Rules – Signals and Signs
<b>ANTR</b>	ARTC Network Rules
<b>ANWT</b>	ARTC Network Rules – Work on Track
<b>ARTC</b>	Australian Rail Track Corporation
<b>ATS</b>	Air traffic service
<b>ATSB</b>	Australian Transport Safety Bureau
<b>BEA</b>	Bureau d’Enquêtes et d’Analyses pour la sécurité de l’aviation civile (France)
<b>CAAP</b>	Civil Aviation Advisory Publication (CASA)
<b>CALM</b>	Catenary anchor leg mooring
<b>CASA</b>	Civil Aviation Safety Authority
<b>EASA</b>	European Aviation Safety Authority
<b>FAA</b>	Federal Aviation Administration (United States of America)
<b>GA</b>	General aviation
<b>GPS</b>	Global positioning system
<b>IMC</b>	Instrument meteorological conditions
<b>IMDG</b>	International Maritime Dangerous Goods Code
<b>ISO</b>	International Standards Organization
<b>MEC</b>	Main equipment centre
<b>NOPSA</b>	National Offshore Petroleum Safety Authority
<b>OPGGSA</b>	<i>Offshore Petroleum and Greenhouse Gas Storage Act 2006 (Cth)</i>
<b>QRH</b>	Quick reference handbook
<b>REEFVTS</b>	Great Barrier Reef and Torres Strait Vessel Traffic Service
<b>RET</b>	Department of Resources, Energy and Tourism (Cth)
<b>RPT</b>	Regular public transport
<b>SAN</b>	Safety Advisory Notice
<b>SB</b>	Service bulletin

<b>SMS</b>	Safety management system
<b>SOLAS</b>	Safety of life at sea
<b>SPAD</b>	Signal passed at danger
<b>TOA</b>	Track occupancy authority
<b>TWA</b>	Track work authority
<b>VMC</b>	Visual meteorological conditions



Visual flight into instrument meteorological conditions, Dorrigo, New South Wales (AO-2009-077)

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## BACKGROUND

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The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory Agency that, in the 2010-2011 financial year, was responsible for conducting independent investigation of:

- aviation accidents and serious incidents involving Australian civilian-registered aircraft anywhere in the world and foreign aircraft in Australia;
- marine accidents and serious incidents involving Australian registered ships<sup>4</sup> anywhere in the world, foreign flag ships within Australian waters, or where evidence relating to an accident involving ships is found in Australia; and
- rail accidents and serious incidents that occur on the Defined Interstate Rail Network (DIRN).

The ATSB has developed a comprehensive investigation analysis framework<sup>5</sup>, which is designed to help identify safety factors which may indicate safety issues and lead to resultant safety actions. In most investigations, the investigation report documents one or more safety issues identified during the investigation. They also identify the risk level associated with each safety issue.

For each safety issue, the ATSB also individually documents safety actions completed by industry and regulators when it is taken. When no or inadequate safety action occurs, the ATSB may issue a safety recommendation, which is required to be responded to within 90 days of release.

This report documents the safety factors, safety issues and related safety actions identified by ATSB investigations during the 2010-2011 financial year in all three transport modes (aviation, marine and rail). It will explore the risk levels assigned to each safety issue, and provide an understanding of where the greatest safety risks appear to lie in each mode of transport. The results will be useful for government decision makers, regulators, and the aviation, rail and marine industries to understand if and where greater attention needs to be applied to risk.

### Investigation priorities

The ATSB's primary investigation focus is on enhancing safety for fare paying passengers, and in particular, investigating those transport safety matters that may present a significant threat to public safety. The ATSB directs significant attention to identifying systemic failures in aviation, marine and rail mass public transport systems that have the potential to result in catastrophic accidents, and which have a potential to result in fatalities and serious injuries.

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<sup>4</sup> In the 2010-2011 financial year, the ATSB did not investigate accidents and incidents involving: trading ships on intrastate voyages; Australian fishing vessels on domestic voyages; fishing fleet support vessels on domestic voyages; inland waterways vessels; pleasure craft; off-shore industry mobile units that are fixed to the seabed; Australian defence ships; or exempt foreign ships.

<sup>5</sup> For more information on the ATSB investigation analysis framework model, see: Walker, M. B. & Bills, K.M. (2008). *Analysis, Causality and Proof in Safety Investigations*. (Aviation Research and Analysis Report AR-2007-053). Canberra: ATSB.

In each transport mode, investigations are broadly prioritised based on this investigation focus – both in terms of deciding whether or not to investigate, and in determining the level of investigation response.

## **Aviation**

Aviation investigations are generally prioritised in the following order:

1. Passenger transport – large aircraft engaged in regular public transport (RPT) operations.
2. Passenger transport – small aircraft engaged in:
  - a. RPT and charter operations
  - b. Humanitarian operations or aerial work (e.g. emergency medical service, search and rescue).
3. Commercial/fare paying recreational operations (e.g. joy flights).
4. Aerial work flights with participating passengers (e.g. news reporters, geological surveyors).
5. Flying training operations.
6. Other aerial work:
  - a. Non-passenger carrying aerial work (e.g. agricultural spraying/survey, freight operations)
  - b. Private or personal business transport.
7. Non-fare paying recreational operations:
  - a. High-risk personal recreation
  - b. Sports aviation
  - c. Experimental aircraft operations.

## **Marine**

Marine investigations are generally prioritised in the following order:

1. Passenger-carrying operations.
2. Freight and other commercial operations.
3. Non-commercial operations.

## **Rail**

Rail investigations are generally prioritised in the following order:

1. Mainline operations that impact on passenger services.
2. Freight and other commercial operations.
3. Non-commercial operations.



Fatality on board *Karratha Spirit*, off Dampier, Western Australia (MO-2008-013)

## Classifying investigations

The ATSB internally classifies investigations by their complexity, and/or by the level of resources required to complete the investigation. Classification of investigations also takes into account the anticipated safety value of an investigation, including the likelihood of furthering the understanding of the scope of any safety system failures; the likelihood of safety action arising from the investigation, particularly of national or global significance; and the existence and extent of fatalities and serious injuries and/or structural damage to transport vehicles and other infrastructure.

- **Complex investigations** generally involve in-the-field activity, are likely to involve significant ATSB resources, and possibly external resources. Complex investigations use the ATSB investigation analysis model to identify safety factors (which form the findings of the investigation). These safety factors may include safety issues which may in turn result in safety actions to address those safety issues. While dependent on the scale and complexity of the investigation, the ATSB aims to complete 35 complex investigations each year, each within 12 months.
- **Less complex investigations** may or may not involve in-the-field investigation, depending on their complexity. The ATSB aims to complete 90 less complex investigations in the 2011-2012 financial year, each within 9 months.

Less complex investigations include:

- **occurrence investigations** which involve the identification of safety factors using the ATSB investigation analysis model (as per Complex investigations, but less comprehensively); and
- **factual-only investigations** which involve the compilation of the information the ATSB has gathered, sourced from individuals or organisations involved in the occurrences, on the circumstances surrounding the occurrence and what safety action may have been taken or identified as a result of the occurrence. These investigations do identify safety factors based on the facts

gathered, but this process does not involve analysis using the ATSB investigation analysis model. Safety issues are therefore not identified.



Boeing 747 tail damage following a ground strike, Sydney Airport, New South Wales (AO-2010-029)

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## OVERVIEW – ALL MODES

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### **Investigations**

During the 2010-2011 financial year (1 July 2010 to 30 June 2011), the ATSB completed 133 investigations across the aviation, marine, and rail modes.

#### ***Occurrence investigations***

The ATSB completed 122 investigations across the aviation, marine, and rail modes into occurrences in Australia or involving Australian transport vehicles.

Of these, there were 69 complex and less-complex ATSB occurrence investigations which involved the identification of safety factors using the ATSB investigation analysis model. The remaining 53 investigations were factual-only investigations.

#### ***Safety issue investigations***

There were no safety issue investigations completed in 2010-2011.

#### ***External investigations***

There were 11 external investigations conducted by the ATSB in the 2010-2011 financial year. These external investigations were undertaken at the request of another organisation. Of these 11 external investigations in the 2010-2011 financial year:

- The ATSB participated in one aviation investigation which identified safety factors (under the direction of the Accident Investigation Commission (AIC) of Papua New Guinea). These safety factors are documented in this report.
- For the remaining 10 external aviation investigations, the ATSB's was not involved in the analysis of safety factors. The ATSB's role in these investigations was generally confined to technical assistance tasks, such as the download of on-board recorder information. Details about these external investigations can be found in the *ATSB Annual Report 2010-2011* available in October 2011.



Investigation update into the collision with terrain—near Kokoda, Papua New Guinea (AE-2009-050)

***Investigations analysed in this report***

This report involves the analysis from the 123 investigations completed that involved the identification of safety factors. That is, 69 ATSB complex and less complex occurrence investigations involving investigation analysis, 53 factual-only investigations, and one external investigation involving investigation analysis.

A break-down of these investigation levels by transport mode can be seen in Table 2. There were 103 aviation investigations in total (about half of which were factual-only), 11 marine investigations (all complex), and nine rail investigations (including one factual-only). Details of these investigations are provided in Appendix B.

**Table 2: Breakdown of investigations completed by investigation level in the 2010-2011 financial year**

Transport mode	Complex	Less complex (analysis)	Less complex (factual-only)	All investigations
Aviation	21	30	52	103
Marine	11	-	-	11
Rail	4	4	1	9
<b>Total</b>	<b>36</b>	<b>34</b>	<b>53</b>	<b>123</b>

Two of the complex investigations were conducted at a higher level than the other complex investigations. These were:

- the depressurisation of a Boeing 747-400 aircraft 475 km northwest of Manila, Philippines on 25 July 2008<sup>6</sup>
- the controlled flight into terrain of a Papuan New Guinean-registered de Havilland Canada DHC-6 Twin Otter aircraft 11 km southeast of Kokoda Airstrip, Oro Province, Papua New Guinea on 11 August 2009 (external investigation)<sup>7</sup>.

#### Safety factor analyses

The analyses of safety factors for each mode included those safety factors identified in all 123 investigations described above. This includes the 52 factual-only investigations that were completed for aviation, and the single factual-only investigation completed for rail. Although these investigations did not involve the ATSB investigative analysis framework to identify safety factors, safety factors were assigned based on the facts gathered.

#### Safety issue and safety action analyses

As the factual-only investigations do not identify safety issues, they are not included in the analyses of safety issues or safety actions in this report. These analyses are therefore restricted to the 70 investigations involving the identification of safety factors through the ATSB analysis framework model (36 complex and 34 less complex (analysis) investigations).

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<sup>6</sup> Australian Transport Safety Bureau. (2010). *Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines, 25 July 2008, Boeing 747-438, VH-OJK* (Aviation Occurrence Investigation AO-2008-053). Canberra: ATSB.

<sup>7</sup> Accident Investigation Commission of Papua New Guinea. (2011). *Controlled flight into terrain - 11 km south-east of Kokoda Airstrip, Papua New Guinea, 11 August 2009, P2-MCB, De Havilland Canada DHC-6-300* (AIC File Reference AS 09 1005, ATSB File Reference AE-2009-050). Port Moresby: AIC.



Oxygen cylinder failure and depressurisation, 475 km north-west of Manila, Philippines (AO-2008-053)

## Safety issues identified

From the 70 investigations completed by the ATSB in the 2010-2011 financial year with safety factors identified through the ATSB analysis framework, there were 120 safety issues identified. These represented either minor or significant risk (see *Risk level* on page ix for more information on how safety issues are risk assessed). In addition, there was one critical safety issue identified from an incomplete aviation investigation (AO-2010-089). While the final report of this investigation has not been released at the time of writing, the safety issue was published, together with a recommendation for action, on 2 December 2010.

**Table 3: Breakdown of safety issues identified by risk level in the 2010-2011 financial year**

Transport mode	Minor risk	Significant risk	Critical risk	Total
Aviation <sup>8</sup>	60	14	1	75
Marine	11	16	-	27
Rail	15	4	-	19
<b>Total</b>	<b>86</b>	<b>34</b>	<b>1</b>	<b>121</b>

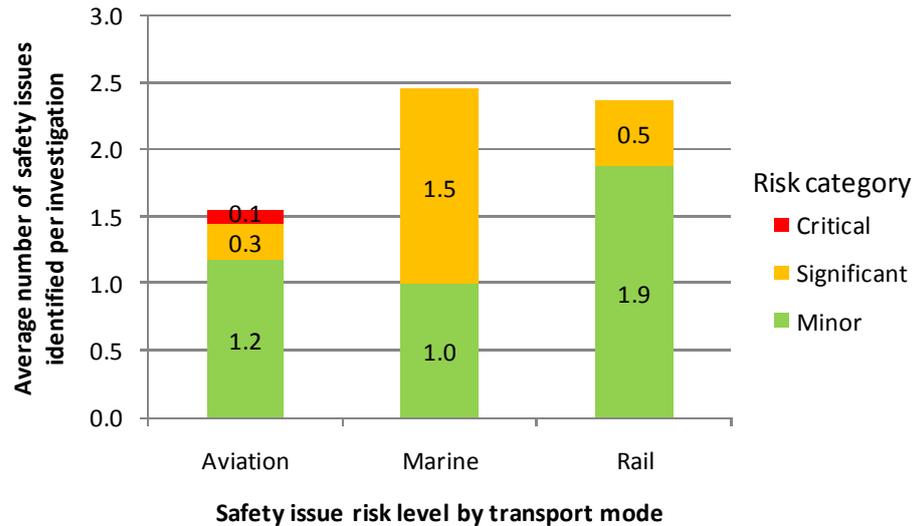
In aviation and rail investigations, most safety issues identified were rated as minor: that is, the ATSB assessed the risk those issues posed to transport safety as broadly

<sup>8</sup> Includes four minor safety issues identified by the ATSB in one external aviation investigation.

acceptable. In marine investigations, more safety issues were rated as a significant risk than of a minor risk.

The number of investigations completed for each transport mode is different so there are naturally more safety issues identified in some modes than in others. For the purposes of comparing across modes, Figure 1 shows the number of safety issues identified per investigation.

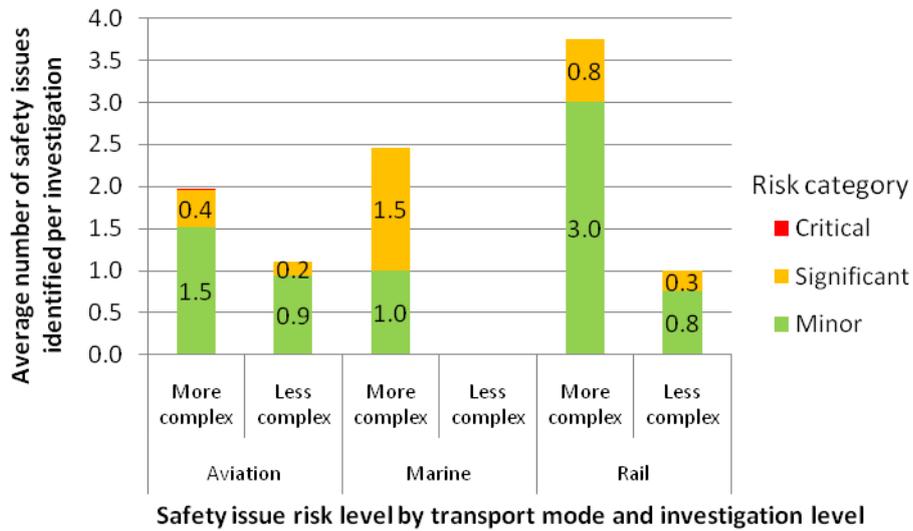
**Figure 1: Average number of safety issues identified per completed investigation, by transport mode (2010-2011 financial year)**



In all transport modes, more complex investigations had a higher total number of safety issues identified than less complex investigations. This is due to the nature of the accidents and incidents involved, as well as the increased scope of these investigations (Figure 2).

Figure 2 also shows that in aviation and rail investigations, most safety issues identified posed a minor risk to continued safe operations in both more complex and less complex investigations. In marine investigations, more significant safety issues were identified on average than minor safety issues. There were no less-complex marine investigations completed in the 2010-2011 financial year.

**Figure 2: Average number of safety issues identified per completed investigation, by investigation level (2010-2011 financial year)**



More detailed information on the safety issues specific to each transport mode are discussed later in this report.



Oxygen cylinder failure and depressurisation, 475 km north-west of Manila, Philippines (AO-2008-053)

## Safety actions

Table 4 presents the number of safety actions that have been undertaken to address safety issues identified by the ATSB through aviation, marine, and rail investigations completed in the 2010-2011 financial year. Note that there is often

more than one safety action taken to address a safety issue, so there are more safety actions than there are safety issues.

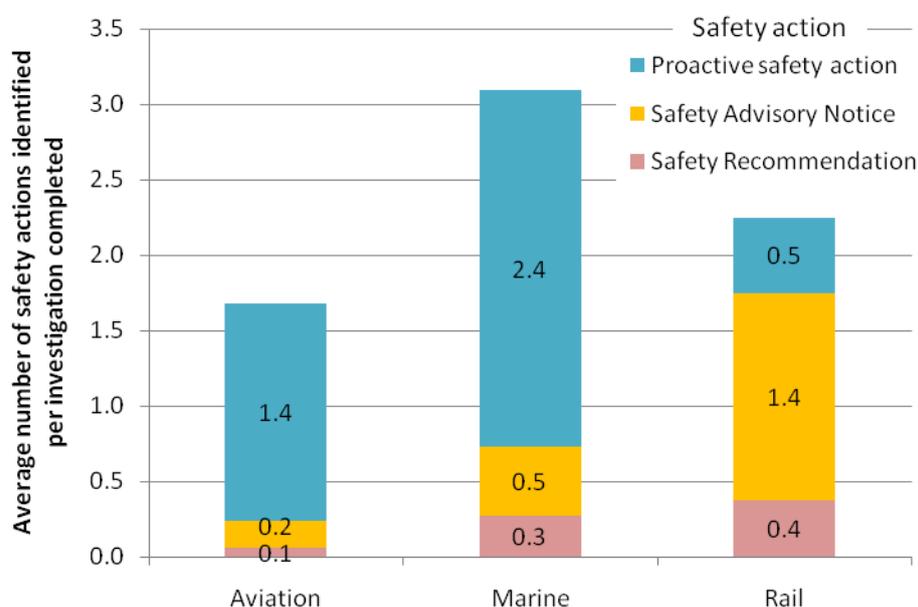
**Table 4: Safety actions identified in ATSB investigations (2010-2011 financial year)**

	Aviation	Marine	Rail	Total
Proactive industry safety action	73	26	4	<b>103</b>
ATSB Safety Recommendation	3	3	3	<b>9</b>
ATSB Safety Advisory Notice	9	5	11	<b>25</b>
<b>Total</b>	<b>84</b>	<b>34</b>	<b>18</b>	<b>137</b>

Aviation investigations recorded more safety actions than the other transport modes, due to the higher proportion of aviation investigations done by the ATSB.

Figure 3 shows the number of each different type of safety actions that were, on average, identified in each investigation in the 2010-2011 financial year, by transport mode. On the whole, marine investigations prompted the most safety actions per investigation, followed by rail investigations.

**Figure 3: Average number of safety actions per completed investigation in 2010-2011 financial year, by transport mode**



The ATSB encourages proactive industry safety actions before the release of any formal ATSB safety action and so the ATSB generally issues safety recommendations and safety advisory notices (SANs) as a last resort. This is reflected in aviation and marine where, on average, more proactive industry safety actions than formal ATSB safety actions per investigation. In rail investigations, however, there were more SANs compared with safety recommendations and proactive industry safety actions. Rail investigations produced more safety recommendations and SANs, both in total and per investigation, than aviation and marine investigations.

More details about safety actions in each of the transport modes are presented in the following chapters.



Derailment of freight train, Tottenham, Victoria (RO-2009-004)

## Safety issues addressed through safety action

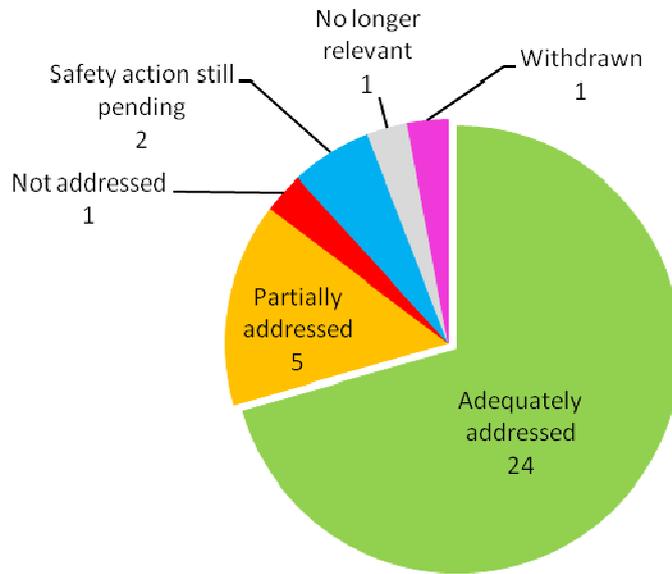
Safety issues identified in the course of investigations are specific to one or more action organisations. In most investigations, action organisations can be the transport vehicle operator, a regulator, equipment manufacturer, service providers, or whichever organisation is best placed to address the safety issue. The ATSB consults with action organisations as part of the investigation process to highlight how the safety issue increases the risk to continued safe transport operations.

The aim of this process is for the action organisation to identify and implement safety actions which will appropriately address any significant or critical safety issue. To accept that a safety issue is adequately addressed, the ATSB must be satisfied that the residual risk (risk after safety action was completed) is either minor or as low as reasonably practicable.

The single critical safety issue identified for the *active* aviation investigation AO-2010-089 (*In-flight uncontained engine failure - overhead Batam Island, Indonesia - 04 November 2010 - VH-OQA - Airbus A380-842*) was adequately addressed through safety action conducted by the engine manufacturer, airline and regulator (see the *Aviation* section on page 14 for further details).

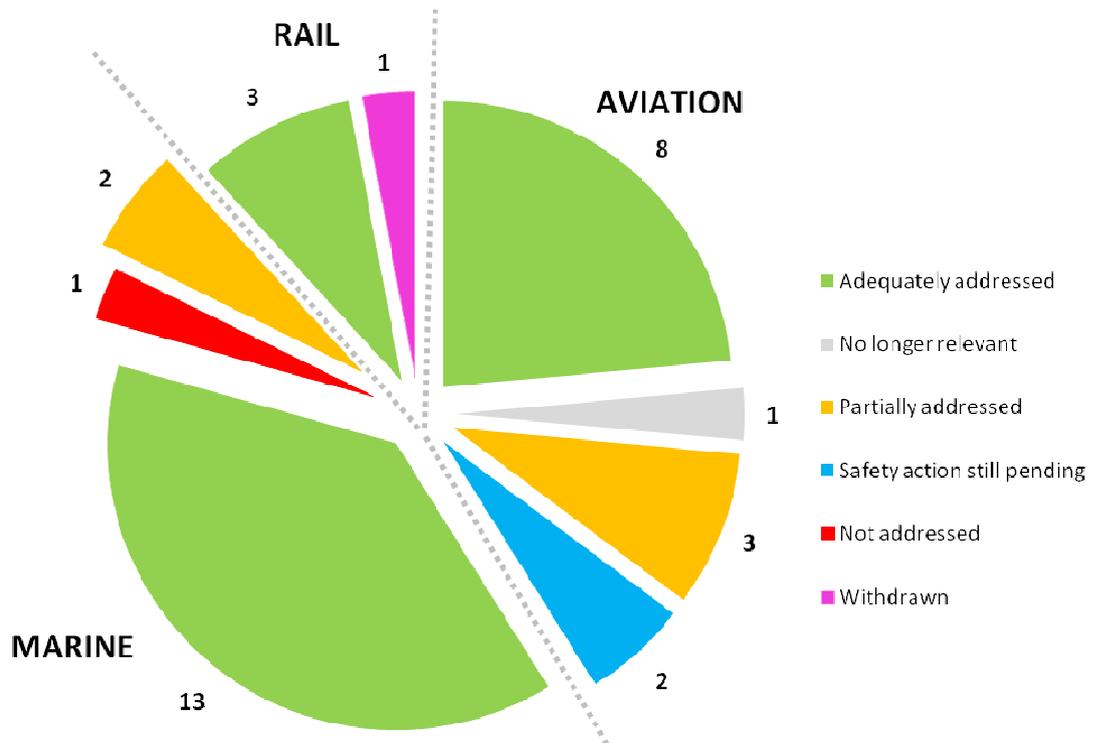
For the 34 significant safety issues identified through completed investigations in the 2010-2011 financial year, 71 per cent were adequately addressed by some safety action across all transport modes (Figure 4). A further five significant safety issues were partially addressed, while two others may be adequately addressed once safety action is completed.

**Figure 4: Proportion of safety issues that were addressed or not addressed from investigations completed in the 2010-2011 financial year**



A breakdown of significant safety issues addressed by transport mode can be seen in Figure 5. More details about significant safety issues that were not adequately addressed are presented for each of the transport modes in the following chapters.

**Figure 5: Significant safety issues addressed identified in investigations completed in the 2010-2011 financial year by transport mode**

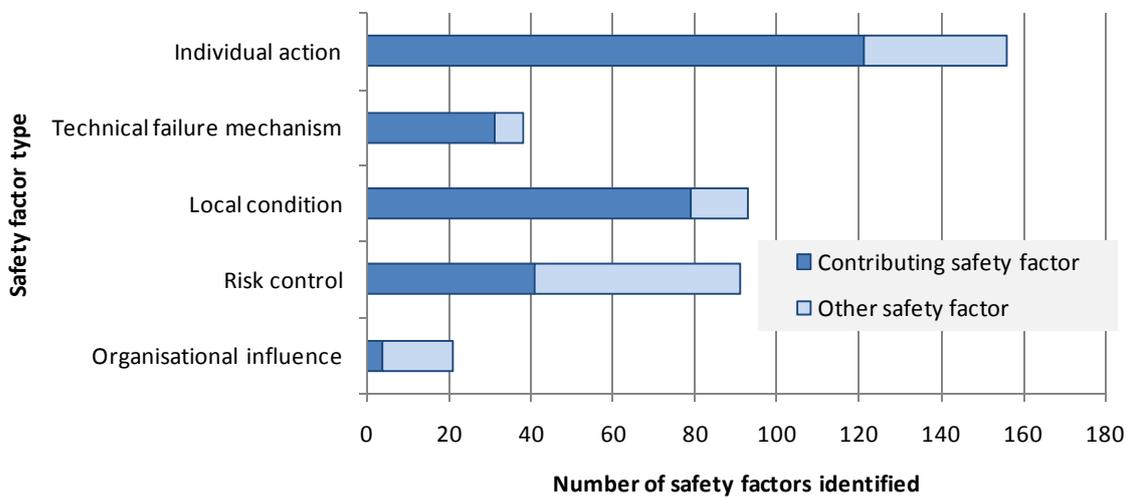


## Safety factors

Most of the safety factors identified in aviation investigations in the 2010-2011 financial year related to individual actions, risk controls, or local conditions (Figure 6). Most of these safety factors were found to have contributed to the occurrence (contributing safety factors) (Figure 6).

Of the safety factors that the ATSB could identify based on information available to investigations, individual actions made up 39 per cent of all contributing safety factors, followed by local conditions (23 per cent) and risk controls (23 per cent).

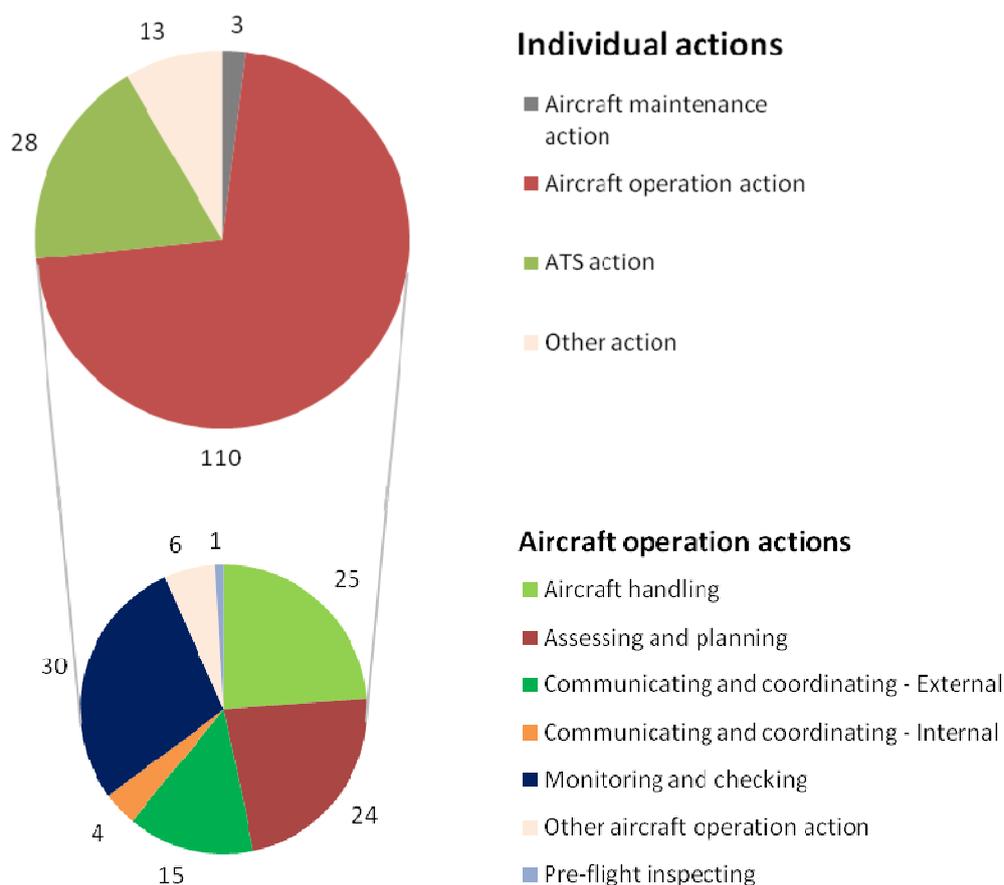
**Figure 6: Safety factors identified in aviation investigations completed in the 2010-2011 financial year**



## Individual actions

Figure 7 below provides a further breakdown of the types of individual actions identified in aviation occurrences (both contributing and non-contributing) that were investigated in the 2010-2011 financial year.

**Figure 7: Individual action safety factors identified in aviation investigations completed in the 2010-2011 financial year**



Of the 156 individual actions involved in investigated aviation occurrences, almost three-quarters were aircraft operation actions. Common operation-related actions identified in aviation investigations were:

- assessing and planning issues
- monitoring and checking issues
- inappropriate aircraft handling.

Typical examples of *assessing and planning* problems in the last financial year included flying in deteriorating weather conditions or not obtaining weather forecasts prior to flight, insufficient fuel planning, incorrectly loading the aircraft with respect to centre of gravity limits, and not conducting a go-around for an unstable approach (for high capacity air transport aircraft) – especially when entering instrument meteorological conditions on approach. A number of assessing and planning problems were related to pilots making decisions which further increased their workload, leading to slips and lapses. A large majority of these safety factors involved general aviation occurrences.

Problems with *monitoring and checking* of aircraft instruments, systems, flight path and flying conditions mostly involved passenger transport operations. One of the most common problems was less than adequate monitoring of meteorological conditions, as was continuous checking to establish whether the approach to land was stable.

*Aircraft handling* issues were typically related to inappropriate handling of the control column (too much pitch up), and not maintaining correct speed / thrust control relative to other aircraft in the circuit. Many aircraft handling issues occurred during the approach to land, or during landing.

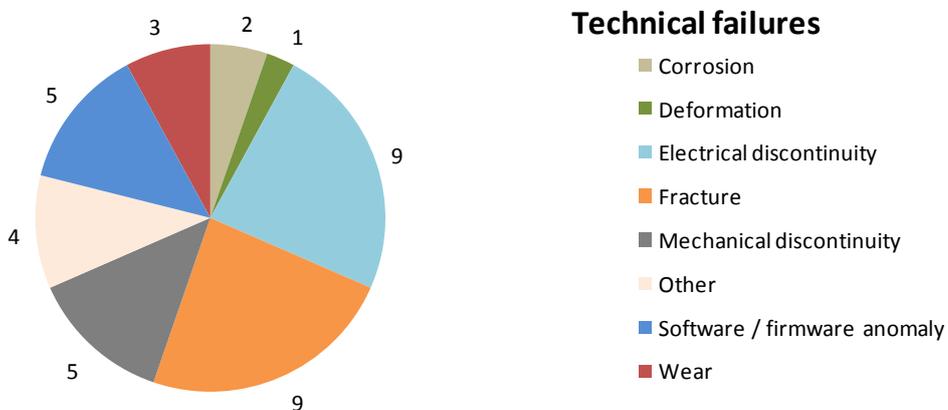


Robinson R44 helicopter wirestrike, Langkoop, Victoria (AO-2009-017)

### Technical failures

Figure 8 details the types of technical failures which were involved in investigated aviation occurrences.

**Figure 8: Technical failure mechanism safety factors identified in aviation investigations completed in the 2010-2011 financial year**



Fractures (which refer to the physical separation of parts or an aircraft component) and electrical problems were the major types of technical failures.

*Fractures* in investigations completed in the 2010-2011 financial year were often related to landing gear failures (wheel hub or axle fatigue cracking). There were also two fractures which led to aircraft depressurisations.

Most *electrical* issues in aviation investigations last financial year were associated with one occurrence where a Boeing 747 aircraft depressurised following an oxygen cylinder failure.<sup>9</sup>



Total power loss, Hobart, Tasmania (AO-2010-025)

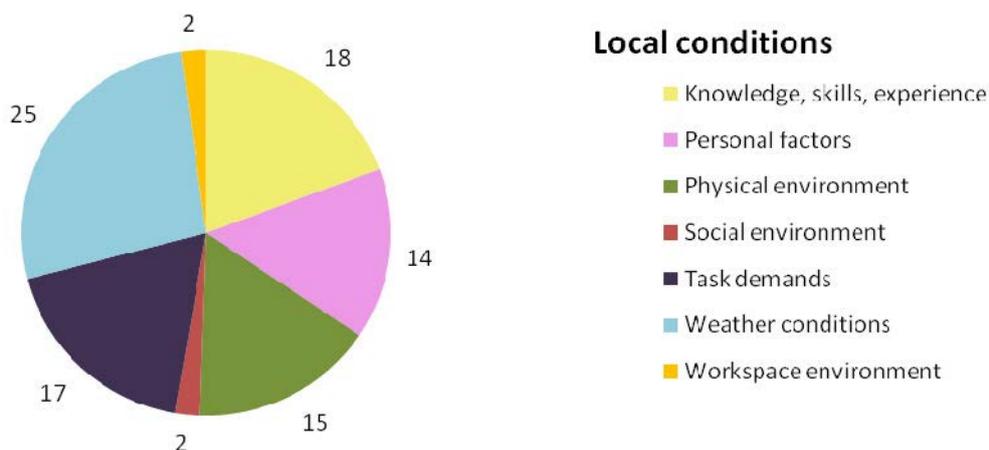
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<sup>9</sup> Australian Transport Safety Bureau. (2010). *Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines, 25 July 2008, Boeing 747-438, VH-OJK* (Aviation Occurrence Investigation AO-2008-053). Canberra: ATSB.

## Local conditions

Weather, knowledge/skills/experience, personal factors, physical environment, and task demands were all common local conditions involved in aviation investigations completed in the 2010-2011 financial year (Figure 9).

**Figure 9: Local condition safety factors identified in aviation investigations completed in the 2010-2011 financial year**



Restricted visibility (due to instrument meteorological conditions or sun glare) and turbulence issues were the most common *weather conditions* to be associated with aviation occurrences, particularly those involving general aviation (GA) aircraft.

Most safety factors related to *knowledge, skills and experience* in aviation investigations also involved GA aircraft. Most were related to inadequate task knowledge, and ranged from incorrect reading of the fuel dipstick due to design issues, to non-use of standard phraseology when communicating via radio. Low experience on type was a common theme in these occurrences.

While *personal factors* were of a wide variety of types, safety factors due to *task demands* were usually due to a high workload or distractions. About half of workload issues involved air traffic services (ATS) personnel, with the other half involving flight crews or individual pilots. *Physical environment* issues commonly were due to poor visual contrast on approach between the runway and taxiway, or between powerlines and the sky (or background terrain).

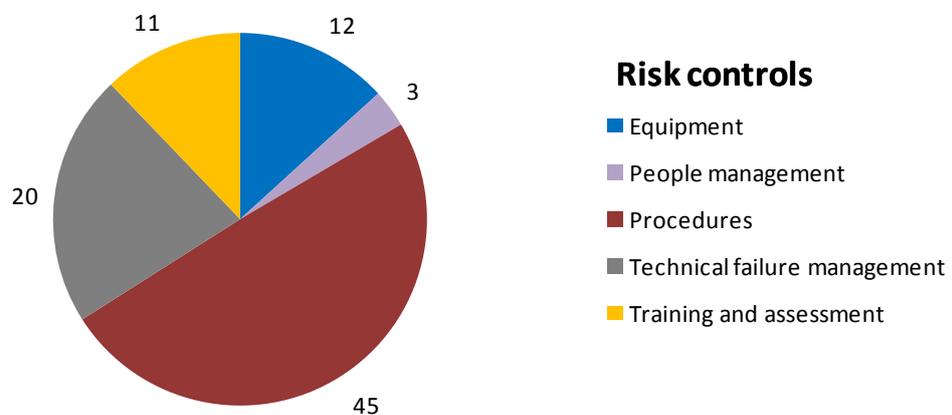


Collision with terrain, 120 km west of Paraburdoo, Western Australia (AO-2009-031)

## Risk controls

Risk control-related safety factors identified in aviation investigations were dominated by issues with procedures (Figure 10).

**Figure 10: Risk control safety factors identified in aviation investigations completed in the 2010-2011 financial year**



The majority of procedural problems were related to inadequate guidance provided by operators of high capacity and other passenger carrying operations to complete a task, and covered a wide range and variation of *procedures*. Several procedure-related safety factors concerned aircraft maintenance.

*Management of technical failures* was also a common risk control safety factor identified in aviation investigations. Design issues included modifications and repairs to the galley drainage system on a Boeing 747 aircraft, fatigue cracking susceptibility in the design of a Boeing 737 main wheel, and the positioning of a helicopter's air data system close to the external air vent allowing the ingress of

moisture into electrical components. Maintenance issues included a failure to identify crack propagation in a Fairchild Metro II cockpit side windscreen retainer hole prior to failure.



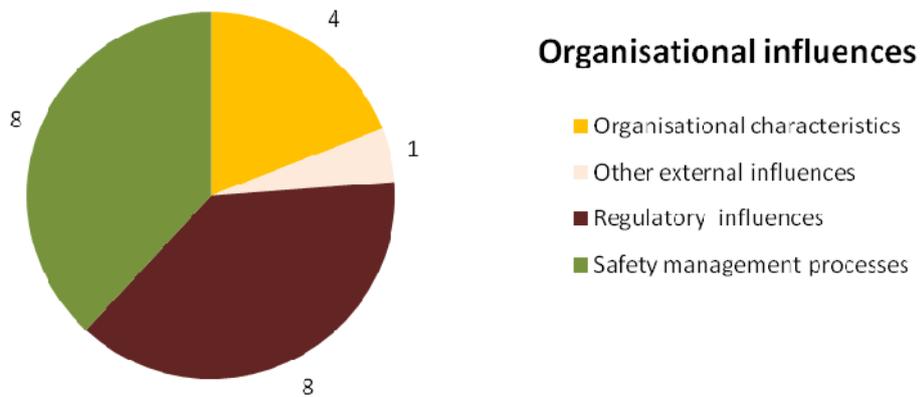
Main landing gear failure, Melbourne Aerodrome, Victoria (AO-2009-062)

## Organisational influences

Regulatory influences and safety management processes made up most of all the organisational factors identified in aviation investigations (Figure 11). The majority of these influences were the lack of guidance material, or a lack of specific training or endorsements for certain operations. For example, one investigation found there was industry confusion concerning the correct authorisation for persons to supervise pilots with a Grade 2 Agricultural Pilot (Aeroplane) Rating.

*Safety management processes* which investigations found could be improved included communication between helicopter owners, helicopter operators, and maintenance providers on the allocation of hazard identification and risk mitigation responsibilities.

**Figure 11: Organisational influence safety factors identified in aviation investigations completed in the 2010-2011 financial year**



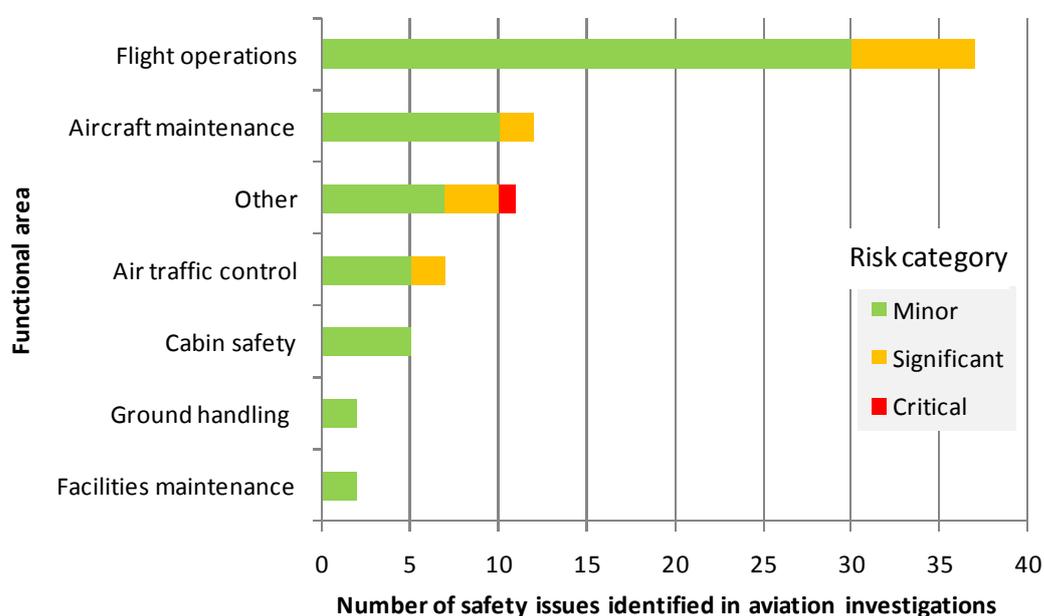
## Safety issues

Of the 74 safety issues identified in complex and less complex aviation investigations completed in the last financial year, most were of minor risk potential (60 safety issues), and 14 posed a significant risk to safe transport operations.

In addition, there was one critical safety issue identified for an *active* investigation (AO-2010-089). As this safety issue was released in the 2010-2011 financial year, it has been included in the following analysis of safety issues.

Most safety issues in aviation investigations were associated with flight operations (Figure 12). Significant safety issues occurred in flight operations, aircraft maintenance, and in air traffic control.

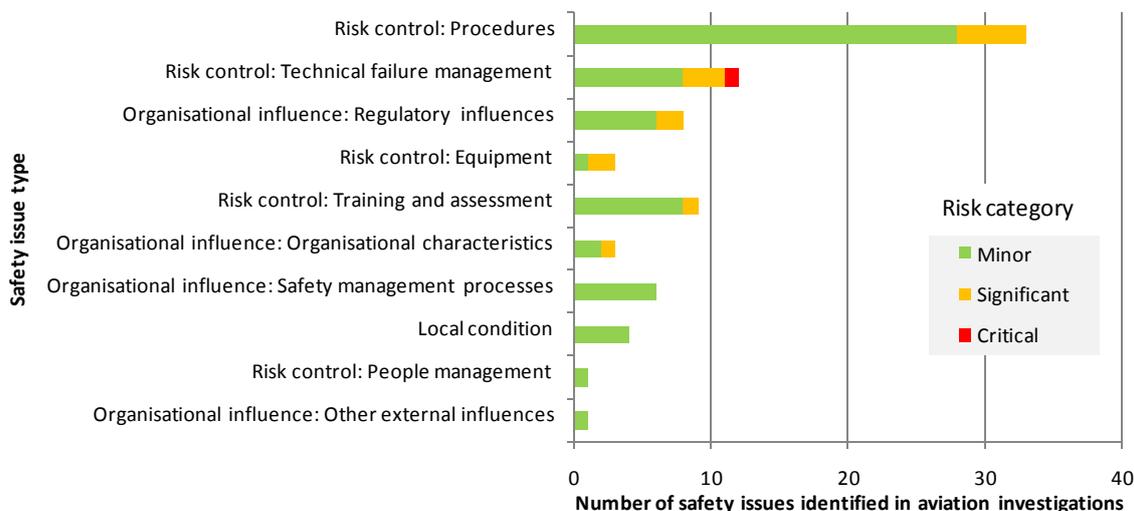
**Figure 12: Safety issues by functional area for aviation investigations completed in the 2010-2011 financial year**



The *Other* functional area was associated with seven minor, three significant and one critical safety issue. This category included aircraft and component manufacturers, regulators, and aerodrome operators. That critical safety issue related to the design and manufacturing standards for some components of the engine fitted to the Airbus A380 that experienced an in-flight engine failure, and was directed to the engine manufacturer. *Other* significant safety issues in the last financial year were of a wide variety: guidance not provided by regulators on the liquid protection requirements of electrical system units on passenger aircraft, issues with the design and lack of sealing above the underfloor main equipment centre (MEC) on Boeing 747 aircraft to prevent liquid ingress, and an absence of criteria for assessing the potential wind impact of aerodrome building developments on aircraft operations.

Figure 13 provides further detail of the types of safety issues that were identified in aviation investigations.

**Figure 13: Safety issues identified in aviation investigations completed in the 2010-2011 financial year**



Overall, without considering the risk categories, less than adequate procedures were by far the main source of safety concern identified in aviation investigations (42 per cent). Technical failure management (14 per cent), training and assessment (11 per cent), and regulatory influences (10 per cent) were the next most common types of safety issues.

The types of issues associated with procedures were varied, as were the range of regulatory issues. Most technical failure management issues were related to one investigation involving the ingress of liquid into the main electrical centre of a Boeing 747 aircraft and interfering with aircraft systems. Training issues included correct use of emergency oxygen systems by cabin crew personnel, and the quality of third-party endorsement training for flight crew on Airbus A320 aircraft.

### Safety issues of significant and critical risk in aviation

The safety issues that were considered to have posed a significant risk to continued safe operations in aviation were related to procedures that act as risk controls to mitigate human/operator risks (a third of all significant safety issues), and to the risk controls that were in place to manage technical failures (20 per cent of all significant safety issues) (Figure 13, above).

Closer examination of significant *procedural* safety issues showed a number of areas of concern.

- The non-inclusion of detailed emergency procedures in a high capacity regular public transport (RPT) operator's Quick Reference Handbook (QRH) for electrical system failures.<sup>10</sup>
- The maintenance processes of an operator that were unable to identify or correct a failure of the forward drain line heater in a Boeing 747 aircraft prior to the

<sup>10</sup> Australian Transport Safety Bureau. (2010). *Electrical system event - Boeing 747-438, VH-OJM, 25 km NNW of Bangkok International Airport, Thailand, 7 January 2008* (Aviation Occurrence Investigation AO-2008-003). Canberra: ATSB.

failure causing an ice blockage and overflow of the galley drain into an electrical bay.<sup>10</sup>

- A helicopter operator's winching procedures, which did not require the pilot to confirm an adequate hover reference prior to deploying personnel on the winch.<sup>11</sup>
- No standard criteria existing to assess the potential wind impact of building developments near runways and approach areas, which allowed two buildings to be constructed at a capital city airport that probably affected the prevailing wind characteristics of a runway under certain conditions.<sup>12</sup>



Turbulence event, Canberra Aerodrome, Australian Capital Territory (AO-2010-008)

Ineffective methods of *managing the impact of technical failures* on safe operations caused the single critical safety issue and three other significant safety issues.

The single critical safety issue was associated with a misaligned stub pipe counter-boring related to the manufacturing process of Trent 900 engines used on Airbus A380 aircraft. The ongoing investigation into the in-flight failure of a Trent 900 engine on a Qantas A380 aircraft over Indonesia in November 2010 determined that this manufacturing fault could lead to an elevated risk of fatigue crack initiation and growth, oil leakage and potential catastrophic engine failure from a resulting oil fire.<sup>13</sup>

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<sup>11</sup> Australian Transport Safety Bureau. (2011). *Operational event - 132 km west of Horn Island Aerodrome, Qld, 9 November 2009, VH EMZ, Bell Helicopter 412* (Aviation Occurrence Investigation AO-2009-068). Canberra: ATSB.

<sup>12</sup> Australian Transport Safety Bureau. (2011). *Turbulence event - Canberra Aerodrome ACT, 31 January 2010, VH-ERP, Grumman Traveller AA-5* (Aviation Occurrence Investigation AO-2010-008). Canberra: ATSB.

<sup>13</sup> Australian Transport Safety Bureau. (2011). *Inflight engine failure - Qantas, Airbus A380, VH-OQA, overhead Batam Island, Indonesia, 4 November 2010* (Preliminary Report, Aviation Occurrence Investigation AO-2010-089). Canberra: ATSB.

Where ineffective methods of *managing the impact of technical failures* on safe operations caused a significant safety issue, they were generally associated with procedural risk control problems. All three significant technical failure safety issues were related to the ingress of moisture into electrical components. Two were identified in the investigation above involving liquid ingress into the main equipment centre (MEC) of a Qantas Boeing 747-400 aircraft:<sup>10</sup>

- The design of the aircraft placed the drain relative to a decompression panel, and the placement of that panel above an electrical bay without any sealing to protect liquid dripping onto electrical components.
- A drip shield fitted in the MEC also showed signs of water damage, and the investigation found that normal maintenance processes were not able to identify or correct any deterioration of the drip shield.

The other significant technical failure safety issue was identified in an investigation where an Agusta Westland AW139 helicopter had an uncommanded autopilot disengagement during cruise, which went unnoticed by the flight crew for 6 minutes.<sup>14</sup> This investigation found that the design of the ram air cooling inlet for the helicopter's avionics units was not filtered, and allowed moisture to affect electrical components. In this occurrence, water ingress caused corrosion of printed circuit boards and led to the disengagement of the autopilot, as well as the failure of the flight data recorder and a number of spurious fire detection warnings.



Electrical system event, 25 km NNW of Bangkok International Airport, Thailand (AO-2008-003)

*Regulatory influences* were significant safety issues in two investigations. In the above Boeing 747 electrical systems event investigation,<sup>10</sup> the US Federal Aviation

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<sup>14</sup> Australian Transport Safety Bureau. (2010). *Operational event - 89 km south-east of Townsville Aerodrome, Qld, 2 February 2009, VH-ESH, Agusta Westland AW139* (Aviation Occurrence Investigation AO-2009-004). Canberra: ATSB.

Administration regulations and associated guidance material did not provide detailed liquid protection requirements or guidance for electrical system units in transport category aircraft, increasing the risk of inadequate protection of those units against water ingress. In another investigation involving an agricultural aircraft<sup>15</sup>, a lack of guidance material for the supervision of a pilot with an Agriculture Pilot (Aeroplane) Rating Grade 2 increased the risk of inadequate supervision of some pilots.

Two significant safety issues related to *equipment operation* were identified in aviation investigations completed in the 2010-2011 financial year:

- The first related to the design of pitot probes fitted to Airbus A330 and A340 aircraft, which while meeting relevant design specifications, did not have sufficient anti-ice protection in some types of environmental conditions. Icing of both the main and standby pitot probes led to an unreliable speed indication, which required the aircraft to divert.<sup>16</sup>
- The second safety issue was identified in the Boeing 747 electrical systems event investigation,<sup>10</sup> and was due to the liquid ingress causing a loss of power to three-quarters of the main alternating current (AC) power buses. When this occurred, many aircraft avionics were relying on backup battery power. This is only available for about 30 minutes on this aircraft type, but there was no automated way at the time of the occurrence to alert the crew to how long battery power had been used for. There were also no guidelines available to the flight crew on how to recharge the batteries in-flight. While battery charge was not a factor in the occurrence (the batteries had been providing power for 21 minutes when the aircraft landed), any delays to the landing would likely have caused a loss of radio communication and other essential electrical systems. This would have significantly increased pilot workload and increased the risk to safe flight.

Other safety issues of significant risk were related to training and assessment, equipment, regulatory influences, and organisational characteristics.

In one investigation, an air traffic controller had not received training to recover situations in which separation between two high capacity RPT aircraft had been compromised.<sup>17</sup> In this case, the lack of a separation plan, combined with the controller's response led to the flight crews identifying the conflict and initiating avoidance action to maintain separation.

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<sup>15</sup> Australian Transport Safety Bureau. (2010). *Collision with terrain - VH-ZRR, 21 km SE of Kojonup ALA WA, 17 November 2009* (Aviation Occurrence Investigation AO-2009-070). Canberra: ATSB.

<sup>16</sup> Australian Transport Safety Bureau. (2011). *Unreliable airspeed indication - 710 km south of Guam, 28 October 2009, VH-EBA, Airbus A330-202* (Aviation Occurrence Investigation AO-2009-065). Canberra: ATSB.

<sup>17</sup> Australian Transport Safety Bureau. (2011). *Loss of separation assurance - Airbus A330-300, B-HLV and Boeing B737-800, VH-VUJ, 222 km NW of Tennant Creek, NT, 22 December 2009* (Aviation Occurrence Investigation AO-2009-080). Canberra: ATSB.

*Organisational characteristics* were a significant safety issue in one investigation, in respect of the aircraft operator's training and checking of its pilots. In this accident,<sup>18</sup> the pilot's endorsement training on Metro III aircraft was not conducted in accordance with the operator's approved training and checking manual. The supervisory pilots who conducted the pilot's in command under supervision training were not approved training or supervisory pilots in accordance with the training and checking manual and at least one of those pilots did not meet the operator's minimum requirements as a training captain.



Collision with terrain, 5 km north-east of Wickepin, Western Australia (AO-2009-060)

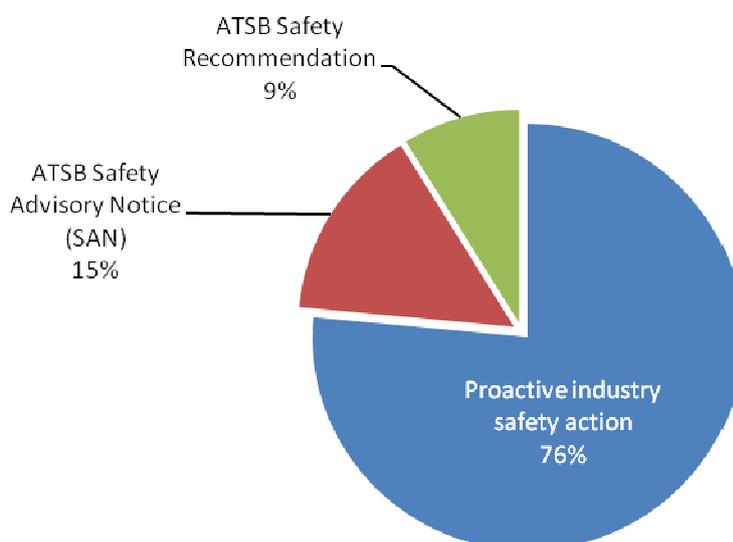
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<sup>18</sup> Australian Transport Safety Bureau. (2011). *Loss of control – Fairchild Metro III, VH-OZA, 19 km SE Sydney, NSW, 9 April 2008* (Aviation Occurrence Investigation AO-2008-026). Canberra: ATSB.

## Safety actions

The majority of safety actions from aviation investigations (86 per cent) were proactively carried out by industry (Figure 14). There were three recommendations made and nine safety advisory notices (SANs). Safety recommendations are issued to a specific party (such as an airline, an air traffic service provider, a regulator or an aircraft manufacturer). In contrast, SANs are issued when the ATSB needs to communicate a safety issue to a wide variety of stakeholders (such as all flying training providers), or to an entire industry (such as all agricultural pilots, or to all licensed aircraft engineers).

**Figure 14: Safety actions in response to aviation investigations completed in the 2010-2011 financial year**



### ATSB Safety Recommendations in aviation investigations

In total, the ATSB issued three safety recommendations in the 2010-2011 financial year.

One of these safety recommendations was related to the critical safety issue relating to an instance of misaligned stub pipe counter boring in a Rolls Royce Trent 900 engine on a Qantas Airbus A380, which suffered an uncontained in-flight failure in November 2010.<sup>13</sup> This safety recommendation was issued to Rolls-Royce as the engine manufacturer, as misaligned stub pipe counter-boring is understood to be related to the manufacturing process. The investigation to date has found that this condition could lead to an elevated risk of fatigue crack initiation and growth, oil leakage and potentially catastrophic engine failure from a resulting oil fire.

The recommendation was issued on 2 December 2010 during the early stages of the investigation as the safety issue was considered a critical risk that needed immediate rectification. On the same day, Rolls Royce issued revision 1 to service bulletin RB211-72-G595 incorporating assessment and engine rejection criteria for the measurement of potential counter-bore misalignment, and a tightening of the compliance time frame from 20 to 2 flight cycles.

The other two safety recommendation resulted from significant safety issues identified during the Boeing 747 electrical system event investigation.<sup>10</sup>

In response to the first recommendation (concerning the crew's QRH not including sufficient information for flight crew to manage the emergency), the aircraft manufacturer (Boeing) addressed the recommendation through an awareness campaign, and through changes to the QRH and operations manual to include guidance to flight crews on the effect and management of cases where multiple AC electrical buses are lost in flight. This included a note to flight crews on how long battery power would be available if an abnormal or unexpected battery discharge occurred.

The second recommendation was to the US Federal Aviation Administration (concerning regulations and associated guidance material not providing detailed liquid protection requirements or guidance for electrical system units in transport category aircraft). The Federal Aviation Administration has reported that they are investigating the issue, considering the scope of the recommendation and planning the best course of action, and anticipate submitting a follow-on response by 31 March 2012. The ATSB continues to monitor this recommendation.

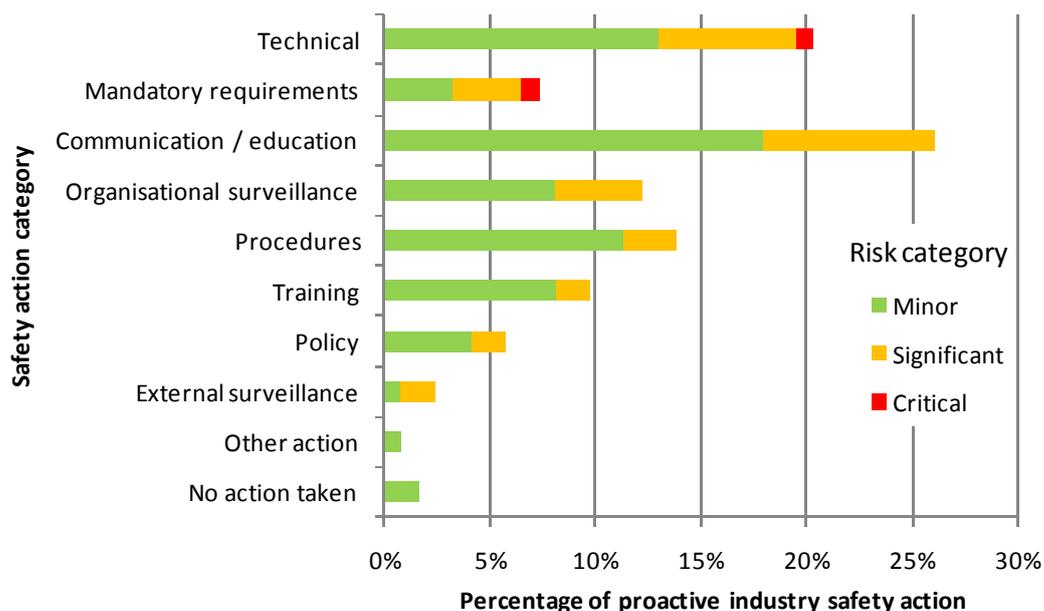


Operational event, 89 km south-east of Townsville Aerodrome, Queensland (AO-2009-004)

## Proactive industry safety action in aviation

Most safety actions that were proactively completed by the aviation industry in the 2010-2011 financial year were related to communication and awareness activities, and technical changes made to equipment and systems. There were several proactive actions to remedy significant safety issues in aviation that involved internal surveillance and risk assessments by organisations, and changes made by regulators to mandatory requirements (Figure 15).

**Figure 15: Proactive industry safety actions in aviation undertaken in the 2010-2011 financial year**



Two proactive safety actions were taken to address the critical safety issue identified in the Airbus A380 in-flight engine failure accident overhead Batam Island, Indonesia in November 2010.<sup>13</sup> These actions were taken by Qantas and CASA in relation to the borescope measurement inspection of the HP/IP turbine bearing support structure oil feed tube on Qantas' Airbus A380 RB211 Trent 900 series engines. The fact that this investigation has not yet been completed reflects the willingness of operators to take proactive measures to address identified transport safety issues of critical and significant risk.

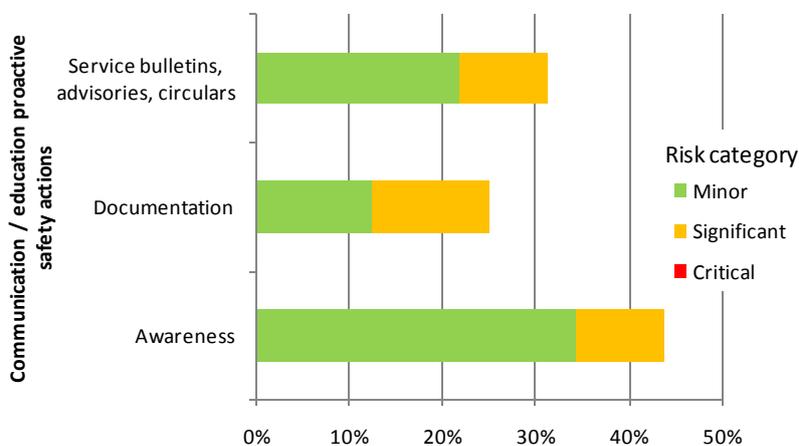


Collision with terrain, 257 km ENE of Derby, Western Australia (AO-2010-042)

In response to the 14 *significant* safety issues identified in the last financial year, 19 proactive actions were taken by aviation organisations.

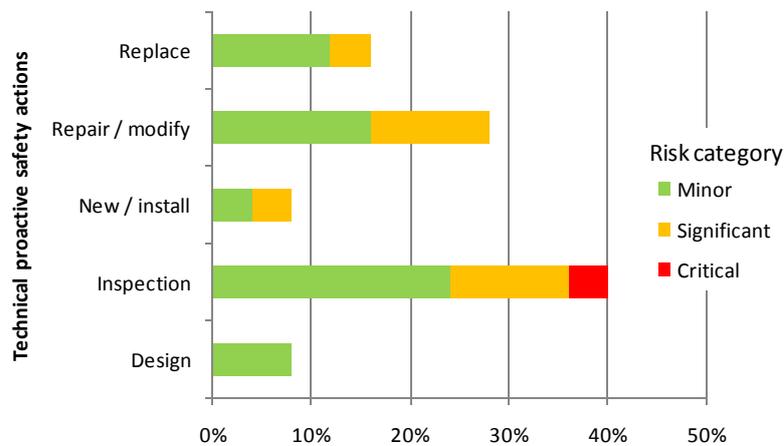
About half of all safety actions related to improving communication were in response to significant safety issues identified in the Boeing 747 electrical system investigation discussed earlier.<sup>10</sup> These involved Boeing advising operators to inspect decompression panels to ensure they did not provide a direct path for water to flow from the galley drain to the decompression plate above the MEC, initiating further research into new underfloor sealing methods, and evaluating guidance provided to flight crews to make them aware of the limitations of continued operations on standby power. Figure 16 shows that communication and education-related industry safety actions were generally awareness activities (14 safety actions), followed by service bulletins, advisories and circulars (10 safety actions).

**Figure 16: Proactive industry safety actions in aviation related to communication and education**



Technical-related responses to significant safety issues were mostly related to undertaking inspections of components for premature wear or corrosion, or repairing/modifying components to improve reliability (Figure 17). One example of such a safety action was following the electrical fault and autopilot occurrence involving an AW139 helicopter.<sup>14</sup> In that case, the operator developed a modification to protect the modular avionics system against contamination. This was then followed up by a service bulletin released by Agusta Westland to help operators identify if corrosion was present. Agusta Westland subsequently developed a series of modifications to improve the waterproofing of AW139 helicopters.

**Figure 17: Proactive industry safety actions in aviation related to technical actions**



Mandatory directives and organisational surveillance tasks as safety actions were usually supporting measures for technical actions by operators. An example was improving the design of drip shields in Boeing 747-400 aircraft – the US Federal Aviation Administration proposed an airworthiness directive for all Boeing 747 operators to add reinforcing brackets to the drip shield and gutters to prevent degradation due to moisture, and is considering recommending the installation of a new drain in the main equipment centre avionics bay as a further risk control.

## Significant and critical safety issues addressed

The single *critical* safety issue (related to the engine failure of the Rolls-Royce engine on a Qantas A380 aircraft on 4 November 2010) was adequately addressed through safety action from Rolls-Royce, CASA and Qantas.

Of the 14 *significant* aviation safety issues identified, eight were considered to be adequately addressed through safety action.

### Safety issues partially addressed

There were three significant safety issues identified that were only partially addressed by the action organisations involved. All were directed to Boeing and were related to the design of maintenance procedures involving Boeing 747-400 drip shields and floor sealing above the MEC,<sup>10</sup> and the redesign of some aircraft parts. In all three cases (Table 5), although actions were considered to only partially address the significant safety issue, the residual (post-safety action) risk was assessed as minor.

**Table 5: Partially addressed significant aviation safety issues**

<b>Investigation:</b>	<b>AO-2008-003</b> <i>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</i>
<b>Safety issue:</b>	Maintenance processes did not identify or correct the inoperability of the forward drain line heater.
<b>Action organisation 1:</b>	Boeing
<b>Pro-active safety action 1:</b>	AO-2008-003-NSA-032
<b>Safety action 1:</b>	The aircraft manufacturer: <ul style="list-style-type: none"> <li>initiated a review of continuing maintenance of 747-400 drain system and ribbon heaters.</li> </ul>
<b>Action organisation 2:</b>	Qantas Airlines
<b>Pro-active safety action 2:</b>	AO-2008-003-NSA-033
<b>Safety action 2:</b>	The aircraft operator: <ul style="list-style-type: none"> <li>Conducted a fleet inspection of 747-400 drain mast heaters, drain line heaters and drain mast hoses, and of 30 aircraft inspected, identified 11 failed drain ribbon heaters and four split drain hoses.</li> <li>Performed fleet-wide drain mast heater inspections on 747-300 aircraft, and identified one failed drain ribbon heater of 4 aircraft inspected.</li> <li>Introduced operational testing of the forward drain mast ribbon heater every A check (750 hours maximum). Results of the inspections will be analysed and an appropriate check interval will be established into the system of maintenance in accordance with the findings.</li> </ul>

<b>ATSB justification for this safety issue being only partially addressed:</b>	At the time of writing, the ATSB is uncertain if Boeing is actually going to make any changes to the design of the drain mast heater on the Boeing 747 aircraft.
<b>Safety issue:</b>	Maintenance processes did not identify or correct the deterioration of the drip shield.
<b>Action organisation 1:</b>	Boeing
<b>Pro-active safety action 1:</b>	AO-2008-003-NSA-026
<b>Safety action 1:</b>	On 11 January 2008, the aircraft manufacturer issued a Multi Operator Message to operators of 747-400 series aircraft that contained advice and instructions for the inspection and repair of main equipment centre drip shields. The manufacturer is preparing an inspection and repair alert service bulletin on the same subject that is scheduled for release by May 2008.
<b>Action organisation 2:</b>	Qantas Airways
<b>Pro-active safety action 2:</b>	AO-2008-003-NSA-027
<b>Safety action 2:</b>	<p>The aircraft manufacturer:</p> <ul style="list-style-type: none"> <li>• Issued a multi-operator message that contained advice and instructions for the inspection and interim repair of main equipment centre drip shields in 747-400 aircraft.</li> <li>• Is developing service bulletins, scheduled for release on 30 April 2009, advising that the following modifications be made to 747 400 drip shields: <ul style="list-style-type: none"> <li>- add raised flanges to cooling exhaust holes in plenum to prevent any water inside the plenum from spilling onto equipment (manufacturer proposed compliance time 24 months);</li> <li>- install additional drain lines to remove water from plenum (manufacturer proposed compliance time 24 months);</li> <li>- repair and reinforce the drip shield gutter (manufacturer proposed compliance time 24 months); and</li> <li>- seal and reinforce the plenum interfaces (manufacturer proposed compliance time 5-10 years ).</li> </ul> </li> <li>• Is developing a service bulletin advising application of a waterproof, fibreglass reinforced overcoat to 747-400 drip shields.</li> </ul>
<b>Action organisation 3:</b>	Federal Aviation Administration (United States)
<b>Pro-active safety action 3:</b>	AO-2008-003-NSA-115
<b>Safety action 3:</b>	<p>Subsequent to this occurrence, the United States (US) Federal Aviation Administration (FAA):</p> <ul style="list-style-type: none"> <li>• Adopted airworthiness directive AD 2009 22 14 (effective 8 December 2009), requiring the installation of larger dripshields and drain lines in the electrical/electronic equipment centres of aircraft manufacturer's 747-200C and 747-200F aircraft to prevent water contamination of essential electrical/electronic units. The aircraft manufacturer's procedure referenced by the</li> </ul>

	<p>airworthiness directive was first published on 15 February 2007 and revised on 9 October 2008.</p> <ul style="list-style-type: none"> <li>• Issued a notice of proposed rulemaking (NPRM) on 5 May 2010 stating: We propose to adopt a new airworthiness directive (AD) for certain Model 747-400 and 747-400D series airplanes. This proposed AD would require installing aluminium gutter reinforcing brackets to the forward and aft drip shield gutters of the main equipment center (MEC); and adding a reinforcing fibreglass overcoat to the top surface of the MEC drip shield, including an inspection for cracking and holes in the MEC drip shield, and corrective actions if necessary. This proposed AD also provides for an option to install an MEC drip shield drain system, which, if accomplished, would extend the compliance time for adding the reinforcing fibreglass overcoat to the top surface of the MEC drip shield. This proposed AD results from a report indicating that an operator experienced a multi-power system loss in-flight of 1, 2, and 3 alternating current (AC) electrical power systems located in the MEC. We are proposing this AD to prevent water penetration into the MEC, which could result in the loss of flight critical systems.</li> </ul> <p>Comment on the NPRM was required by 6 July 2010.</p>
<b>ATSB justification for this safety issue being only partially addressed:</b>	While the modifications will fix the problem for now, the ATSB is not convinced that the ongoing effectiveness of the drip shields is ensured.
<b>Safety issue:</b>	The location of the decompression panel and absence of cabin floor sealing above the main equipment centre increased the risk of liquid ingress into the aircraft's electrical systems.
<b>Action organisation 1:</b>	Qantas Airways
<b>Pro-active safety action 1:</b>	AO-2008-003-NSA-030
<b>Safety action 1:</b>	<p>The aircraft operator:</p> <ul style="list-style-type: none"> <li>• Issued instructions to install a water barrier gutter at the rear of the forward galley dry bulkhead on aircraft VH-OJD, VH-OJM and VH-OJO and is planning to carry out the same modification to the rest of the fleet.</li> <li>• Is planning to install an additional bead of sealant around the first class seat pods to protect the decompression vent on the rest of the fleet.</li> </ul>
<b>Action organisation 2:</b>	Boeing
<b>Pro-active safety action 2.1:</b>	AO-2008-003-NSA-029
<b>Safety action 2.1:</b>	<p>The aircraft manufacturer:</p> <ul style="list-style-type: none"> <li>• Issued a multi-operator message containing a recommendation that operators review decompression vents that have been relocated after delivery to verify that they do not become a direct water path to the MEC drip shield.</li> <li>• Is investigating methods to improve floor sealing in 747 400 aircraft.</li> </ul>

<b>Pro-active safety action 2.2:</b>	AO-2008-003-NSA-036
<b>Safety action 2.2:</b>	<p>The aircraft manufacturer:</p> <ul style="list-style-type: none"> <li>• Initiated a review of potential applicability of identified drip shield issues to its other aircraft types, expected to be completed within the first quarter of 2009.</li> <li>• Initiated a separate review for all of its aircraft types regarding the design approach for protecting electrical equipment from the effect of large water spills in excess of that considered as normal condensation and moisture from the passenger cabin environment. That review includes examination of: <ul style="list-style-type: none"> <li>- design requirements and objectives in relation to liquid management, expected to be completed in April 2009</li> <li>- effectiveness of the 'lesson learned' feedback process</li> </ul> </li> </ul> <p>The aircraft manufacturer reported that, at the time of publication, it had not identified any issues of concern in regard to those items.</p>
<b>ATSB justification for this safety issue being only partially addressed:</b>	The ATSB is uncertain if Boeing is actually going to make any changes to the design of the drip shield in the Boeing 747 aircraft.

### ***Safety issues awaiting action***

There were two safety issues that were still awaiting safety action at the time of writing. One involved an issue from the above investigation concerning regulations and associated guidance material, which did not provide detailed liquid protection requirements or guidance for electrical system units in transport category aircraft. The ATSB issued a safety recommendation to the US Federal Aviation Administration and is waiting for an updated response on action.

The other outstanding significant safety issue relates to the lack of guidance material for the supervision of a pilot with an Agriculture Pilot (Aeroplane) Rating Grade 2.<sup>19</sup> This issue will be adequately addressed when CASA publishes an advisory circular as proposed.

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<sup>19</sup> From the ATSB investigation: *Collision with terrain - VH-ZRR, 21 km SE of Kojonup, Western Australia - 17-November-2009* (AO-2009-070).

## Summary of aviation safety

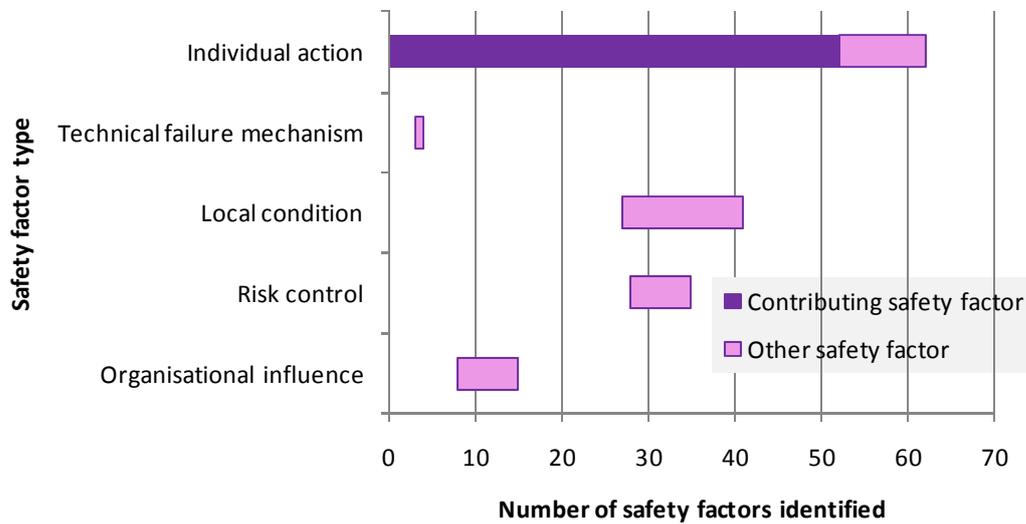
- Individual actions, local conditions and risk controls were commonly identified as safety factors in investigated aviation incidents and accidents. The majority of contributing safety factors were linked with individual actions and local conditions.
- Most individual actions were aircraft operation actions. Assessing and planning, aircraft handling, and monitoring and checking problems were very common.
- Less than adequate procedures were the most common safety issue identified. In most cases where procedures were a significant safety issue, they commonly involved procedures used in unusual or non-normal situations, and were compounded by a lack of documentation or adequate guidance on how to effectively respond to those situations.
- The vast majority of safety issues that posed a significant risk to public safety were associated with flight operations.
- Most of the safety actions taken in response to these significant safety issues were done proactively by the aviation industry, with only a very small percentage being in response to ATSB recommendations.
- Many of the proactive industry safety actions involved organisations communicating safety issues to their pilots, passengers, or operators of their equipment. Inspections or modifications to technical components, changes to mandatory requirements by regulators, and risk assessment or other internal quality reviews initiated by organisations were also common responses to safety issues.
- Most significant safety issues were addressed by industry. There were however three significant issues identified by the ATSB in aviation investigations in the last financial year that have only been partially addressed, although all three are now assessed as minor safety risks. Two significant safety issues are still waiting on action to be conducted to address the issue.

## Safety factors

Similar to aviation, most of the safety factors identified in marine investigations in the 2010-2011 financial year were individual actions, local conditions, and risk controls (Figure 18). Most of these safety factors were found to have contributed to the occurrence.

Individual actions made up 44 per cent of all contributing safety factors, followed by risk controls (24 per cent) and local conditions (23 per cent).

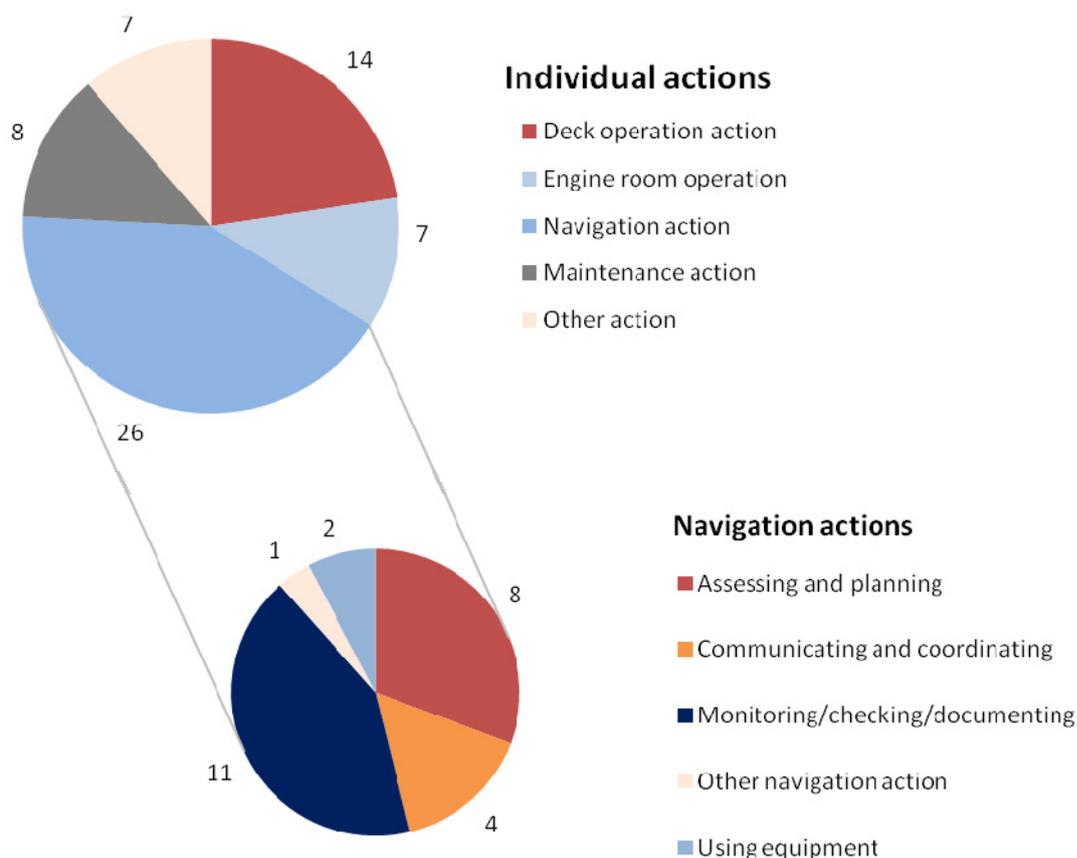
**Figure 18: Safety factors identified in marine investigations completed in the 2010-2011 financial year**



## Individual actions

Figure 19 provides a further breakdown of the types of individual actions identified in marine accidents and incidents (both contributing and non-contributing) that were investigated in the last financial year.

**Figure 19: Individual action safety factors identified in marine investigations completed in the 2010-2011 financial year**



Of the 62 individual actions involved in investigated marine occurrences, about a quarter occurred in deck operations – half of which were assessing and planning errors. Two particular investigations were involved in most of these errors<sup>20, 21</sup>, some of which related to the insufficient lashing of containers for sea conditions, the master’s actions to alleviate ship’s roll, and other members of the crew not challenging decisions of the master when disconnecting from a mooring buoy due to having less operational experience and the presence of a steep crew gradient.

<sup>20</sup> Australian Transport Safety Bureau. (2011). *Independent investigation into the loss of containers from Pacific Adventurer off Cape Moreton, Queensland, 11 March 2009* (Marine Occurrence Investigation 263-MO-2009-002). Canberra: ATSB.

<sup>21</sup> Australian Transport Safety Bureau. (2010). *Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker Karratha Spirit, off Dampier, Western Australia, 24 December 2008* (Marine Occurrence Investigation 261-MO-2008-013). Canberra: ATSB.

Two-fifths of individual action safety factors were due to navigation actions. The majority were related to monitoring, checking and documenting, or to assessing and planning.

Typical examples of navigation-related assessing and planning problems in marine accidents and incidents were either decision errors or action errors. Most were related to the grounding of the products tanker *Atlantic Blue* in the Torres Strait in February 2009<sup>22</sup>, or to the grounding of the bulk carrier *Shen Neng 1* on the Great Barrier Reef in April 2010<sup>23</sup>. In the latter accident, they included ineffective bridge resource management and poor communication between different crew on the bridge, particularly highlighted through inadequate development of a passage plan with defined off-track limits, poor decision making by an officer on watch due to the effects of fatigue, and a watch handover between the chief and second mates that was not conducted within ship's or industry best practices. The decisions made from these assessments and plans led the ship to alter course too late to avoid colliding with reefs.



Grounding of *Shen Neng 1*, Douglas Shoal, Queensland (MO-2010-003)

Most monitoring and checking errors in marine investigations in the last financial year also involved these grounding occurrences, particularly in relation to checking that the adjustments to course required to make a turn were of sufficient magnitude to remain on track, taking into consideration the prevailing wind when making heading adjustments, forgetting to plot position fixes on navigation charts, and not utilising electronic charting systems on the bridge as an additional defence against

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<sup>22</sup> Australian Transport Safety Bureau. (2010). *Independent investigation into the grounding of the Hong Kong registered products tanker Atlantic Blue at Kirkcaldie Reef in the Torres Strait on 7 February 2009* (Marine Occurrence Investigation 262-MO-2009-001). Canberra: ATSB.

<sup>23</sup> Australian Transport Safety Bureau. (2011). *Independent investigation into the grounding of the Chinese registered bulk carrier Shen Neng 1 at Douglas Shoal, Queensland on 3 April 2010* (Marine Occurrence Investigation 274-MO-2010-003). Canberra: ATSB.

straying off course. Other monitoring and checking errors were related to personnel decisions, such as a chief mate not accurately recording the hours he had worked on board, and a master leaving the bridge without checking that it was safe to do so by verifying the ship's position.

## Technical failures

There were very few technical failures identified in marine investigations completed in 2010-2011 that contributed to accidents or incidents.

In the engine room fire on board *River Embley*, the compressor did not automatically shut down when the temperature of the fluid reached the alarm point. As a result, the fluid continued to get hotter, eventually reaching its flashpoint.<sup>24</sup>

Another accident where a technical failure contributed involved the container ship *MSC Basel*, which grounded in Moreton Bay while departing the Port of Brisbane. A fault in the ship's steering control system resulted in the rudder moving to starboard without the application of any helm.<sup>25</sup>



Grounding of *MSC Basel* in Moreton Bay, Queensland (MO-2010-009)

## Local conditions

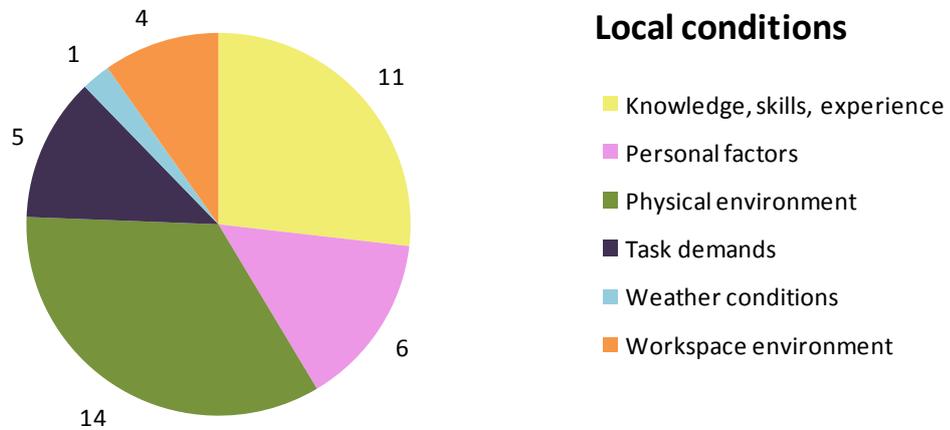
The physical environment (such as rags left in close proximity to a leaking oil pipe, improperly stowed hatch covers on containers, or hot components in close proximity to flammable materials) contributed to over a third of local condition safety factors in marine investigations (Figure 20). One example was a fire that occurred on board the bulk carrier *River Embley* when a compressor fluid cooling system thermostat failed to operate correctly. This caused the compressor fluid temperature to increase, and a fire started in the compressor separator when the fluid was ignited by a hot spot or spark generated within the compressor. The fire led to the pressure inside the compressor separator to increase until the safety valve lifted, which sprayed hot oil vapour into the engine room, which ignited. In this case, an effective and trained crew response prevented serious injury or major damage.<sup>24</sup>

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<sup>24</sup> Australian Transport Safety Bureau. (2011). *Independent investigation into the engine room fire on board the Australian registered bulk carrier River Embley off Gladstone, Queensland, on 16 February 2010* (Marine Occurrence Investigation 272-MO-2010-001). Canberra: ATSB.

<sup>25</sup> Australian Transport Safety Bureau. (2011). *Grounding of the container ship MSC Basel in Moreton Bay, Queensland 1 November 2010* (Marine Occurrence Investigation 280-MO-2010-009). Canberra: ATSB.

**Figure 20: Local condition safety factors identified in marine investigations completed in the 2010-2011 financial year**



Issues related to knowledge, skills, and experience of personnel also made up about a third of local conditions. Some examples included an oiler who was not aware of the danger of explosion associated with using an angle grinder to remove the top of an oil drum, and misunderstanding the capabilities of an automatic external defibrillator when attempting to use it to revive a crew member who had been critically injured and had entered cardiac arrest.

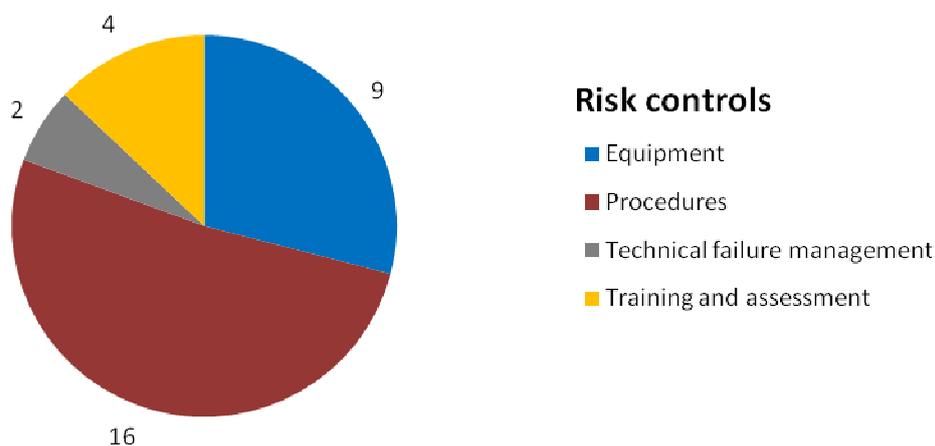


Engine room fire on board *River Embley* off Gladstone, Queensland (MO-2010-001)

## Risk controls

Like aviation, risk control-related safety factors identified in marine investigations in the 2010-2011 financial year were dominated by procedural problems (Figure 21).

**Figure 21: Risk control safety factors identified in marine investigations completed in the 2010-2011 financial year**



Pilotage and deck operation procedural issues were common weak points across many individual investigations. In the investigation into the fire on board the anchor handling tug supply vessel *Petra Frontier*, it was identified that while the ship's safety management system (SMS) contained fire and abandon ship drills that complied with safety of life at sea (SOLAS) requirements, a drill schedule was also provided that conflicted with the drill procedures.<sup>26</sup>

In an investigation into a fatality aboard the chemical tanker *Bow De Jin*, crew members entered confined spaces without appropriate safety requirements being met. Although the crew were filling out enclosed space entry checklists, they were not being used as a proactive means to ensure that safety requirements were being met before entering confined spaces. This led to the chief mate entering a cargo tank without breathing apparatus and sustaining fatal injuries.<sup>27</sup>

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<sup>26</sup> Australian Transport Safety Bureau. (2010). *Independent investigation into the steering gear compartment fire on board the Marshall Islands registered anchor handling tug Petra Frontier at sea off Darwin, NT on 28 September 2009* (Marine Occurrence Investigation 269-MO-2009-009). Canberra: ATSB.

<sup>27</sup> Australian Transport Safety Bureau. (2010). *Independent investigation into the fatality on board the Hong Kong registered chemical tanker Bow De Jin at sea on 24 November 2009* (Marine Occurrence Investigation 270-MO-2009-010). Canberra: ATSB.

Equipment failures made up about a third of risk control safety factors. In the loss of containers from *Pacific Adventurer* in 2009, the poor state of lashing equipment, and the packaging of ammonium nitrate prills<sup>28</sup> not in approved containers allowed them to move in such a way that may have contributed to 31 containers toppling overboard in rough seas, and damage to two oil bunker tanks. About 270 tonnes of fuel oil leaked into the sea, damaging 38 miles of Queensland's coastline.<sup>20</sup>



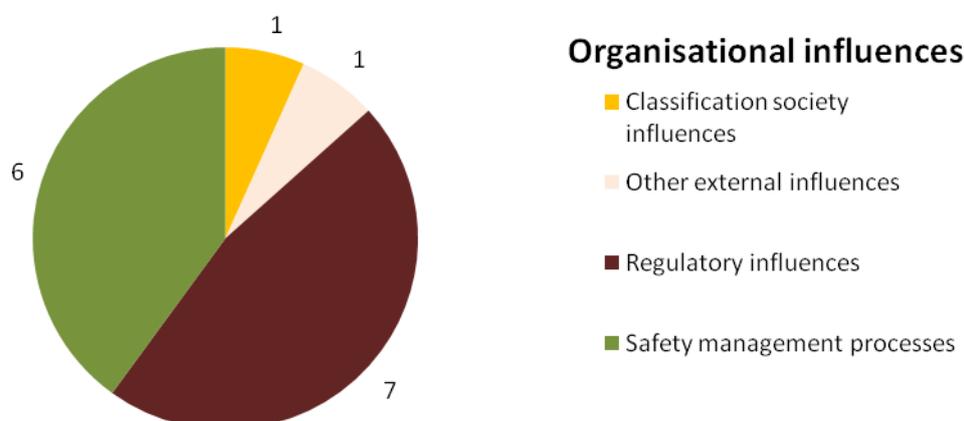
Steering gear compartment fire on board *Petra Frontier* at sea off Darwin, Northern Territory (MO-2009-009)

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<sup>28</sup> The process of 'prilling' is undertaken to make a solid into granules or pellets that flow freely and do not clump together.

## Organisational influences

Figure 22: Organisational influence safety factors identified in marine investigations completed in the 2010-2011 financial year



Regulatory influences and safety management processes made up almost all organisational factors identified in marine investigations (Figure 22). Regulatory oversight and compliance auditing of goods packaging was a safety factor in the investigation of the loss of containers from *Pacific Adventurer*<sup>20</sup>, as were checks of the serviceability of critical safety equipment during flag State inspections in the case of *Petra Frontier*, which suffered a steering gear compartment fire at sea. In that case, the ship's managers did not require the master to confirm that the ship was, in his opinion, seaworthy before it was allowed to depart. When the fire occurred, the crew could not effectively fight it because fire hydrants and breathing apparatus did not function correctly or were not compatible with fittings on the ship, and the emergency response was not well coordinated.<sup>26</sup>

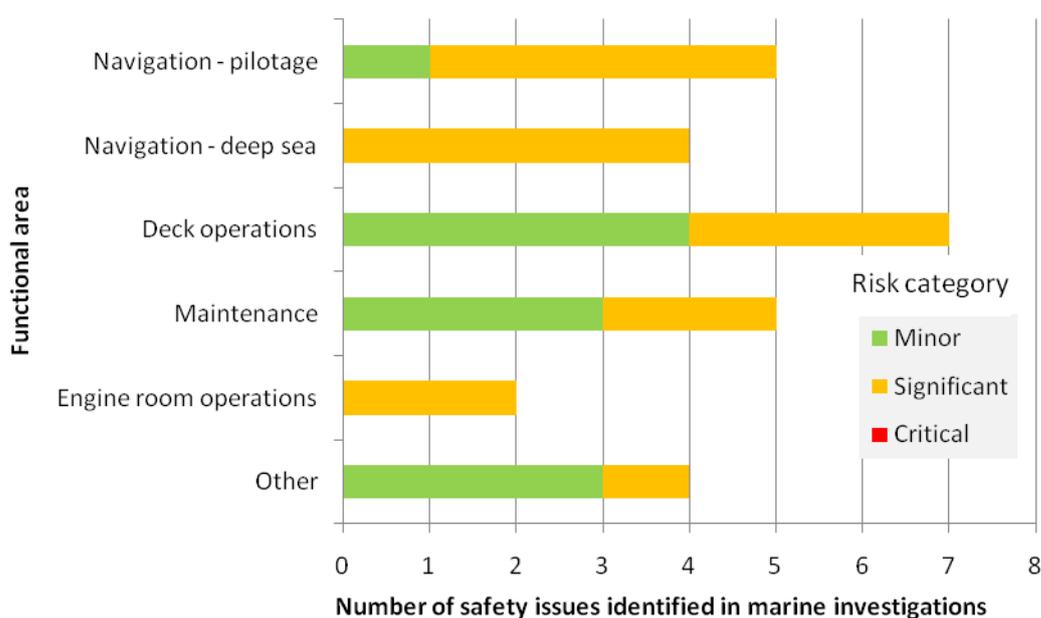
## Safety issues

Sixteen of the 27 safety issues identified in marine investigations completed in the last financial year posed a significant risk to safe transport operations.

There were no critical safety issues identified in marine investigations completed in the 2010-2011 financial year.

Most safety issues in marine investigations were associated with navigation and deck operations (Figure 23). *Significant* safety issues occurred in all functional areas, but were more prevalent in navigation under pilotage, deep sea navigation, and engine room operations.

**Figure 23: Safety issues by functional area for marine investigations completed in the 2010-2011 financial year**



The *Other* functional area was associated with three minor safety issues, and one safety issue of significant risk. These were packaging of cargo in containers not in accordance with the International Maritime Dangerous Goods (IMDG) Code, confusion over the jurisdiction of the Australian Maritime Safety Authority (AMSA) and the National Offshore Petroleum Safety Authority (NOPSA) to conduct maritime safety compliance audits resulting in some vessels not being correctly audited, and conflicting fire and abandon ship procedures in a ship's safety management system.

Figure 24 provides further detail of the types of safety issues that were identified in marine investigations.

**Figure 24: Safety issues identified in marine investigations completed in the 2010-2011 financial year**



As in aviation investigations, procedural problems were by far the main source of safety issues identified in marine investigations (30 per cent). Equipment problems, regulator influences, and inadequate safety management systems all made up more than 10 per cent of safety issues.

### **Safety issues of significant risk in marine**

Navigation procedures posed the most significant risk to safe marine operations in investigated occurrences (60 per cent of all safety issues that posed a significant safety risk). Equipment problems and safety management systems were also of significant concern.

Pilotage and deep sea navigation procedures equally contributed to heightened safety risk. The investigation into the grounding of *Atlantic Blue*<sup>22</sup> found that the 'shallow water alert' generated by the Great Barrier Reef and Torres Strait Vessel Traffic Service's (REEFVTS) monitoring system did not provide adequate warning that the ship was entering shallow water because the boundary of the defined shallow water alert area was too close to dangers off Kirkcaldie Reef. *Atlantic Blue*'s safety management system did not contain procedures or guidance on the proper use of Global Positioning System (GPS) route plans and their relationship to the ship's passage plans. Furthermore, there was no effective fatigue management system in place to ensure that the bridge watch keeper was fit to stand a navigational watch after the ship was loaded in Gladstone. All of these factors contributed to the grounding of the ship.



Fatality at sea on board *Cape Darnley* off Vavouto, New Caledonia (MO-2010-005)

Other significant safety issues were related to maintenance procedures (for example, *River Embley*'s planned maintenance system did not require routine testing of the compressor high temperature alarm/shutdown, which contributed to hot oil spraying at high pressure out of the compressor), and engine room operation (using an angle grinder to remove the top of an oil drum indicated that the oiler on *Cape Darnley*<sup>29</sup> was likely not aware of the ship's safety management system hot work permit requirements). Some significant issues also related to deck procedures, particularly relating to connecting and disconnecting the import hose on *Karratha Spirit*<sup>21</sup>, and disconnecting the ship from the catenary anchor leg mooring (CALM) buoy. These procedures were signed off as being satisfactory and reflecting shipboard practice, but they had not been effectively reviewed on board the ship to identify discrepancies between the procedures and the ship's practices.

Equipment issues, and the management of technical failures of that equipment, were identified as posing significant safety risk in several investigations. For example, in the grounding of *Atlantic Blue*<sup>22</sup>, the investigation found that the REEFVTS monitoring system did not provide an 'exiting corridor alarm' when the ship exited the two-way route that it was transiting, because the route had not been defined as a navigational corridor. In the investigation into the container loss incident on *Pacific Adventurer*<sup>20</sup>, it was found that there was no requirement for any third party to inspect or survey the fixed and loose lashing equipment on a ship at the time of the incident. Had this been done, the maintenance and replacement regime of equipment (such as container lashing) on board the ship might have been more effective.

Safety management systems and regulatory oversight were also sources of significant risk identified in some marine investigations. At the time when *Shen Neng I* grounded, the protections against collision afforded by the REEFVTS monitoring system employed in the northern sections of the Great Barrier Reef were not in place in the sea area off Gladstone. In the case of the grounding of *Atlantic Blue*, the pilot did not define off-track limits or make effective use of recognised bridge resource management tools in accordance with the Queensland Coastal Pilotage Safety Management Code, and regular assessments of his procedures and practices under the code's check pilot regime conducted over a number of years had not resolved these inconsistencies.

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<sup>29</sup> Australian Transport Safety Bureau. (2011). *Fatality at sea on board the Liberian registered multipurpose ship Cape Darnley on 8 July 2010* (Marine Occurrence Investigation 276-MO-2010-005). Canberra: ATSB.

Facilities/infrastructure issues of significant risk in the last financial year were related to the completeness of alerts provided by the REEFVTS monitoring system in the grounding of *Atlantic Blue*<sup>22</sup>, and to the grounding of *Shen Neng 1*. The latter investigation<sup>23</sup> found that in the 30 minutes leading up to the grounding, there were no visual cues to warn either the chief mate or the seaman on lookout duty to the underwater dangers directly ahead of the ship.

Some local conditions in maintenance and engine room tasks, combined with training in those tasks, were also associated with a significant level of risk. This included the existence of an explosive air environment in the oil drum on *Cape Darnley*, which led to a fatality when an angle grinder was used to remove the drum's lid. Another example was the assembly of a scaffolding tower on the bulk carrier *United Treasure*, which had been constructed to allow painting of empty cargo holds while the ship was at anchor off Port Kembla, NSW. The tower was not assembled as designed. The outriggers and intermediate planks, both key components, were missing and the work platform guard rails were not used. The manufacturer's instructions were also missing, but no attempt was made to obtain them, a parts list, or the missing parts. As the crew lifted equipment on to the scaffolding, *United Treasure* rolled and the tower swayed. This changed the tower's centre of gravity, causing the scaffolding to collapse, seriously injuring two crew members.<sup>30</sup>



Serious injury on board *United Treasure* off Port Kembla, New South Wales (MO-2009-005)

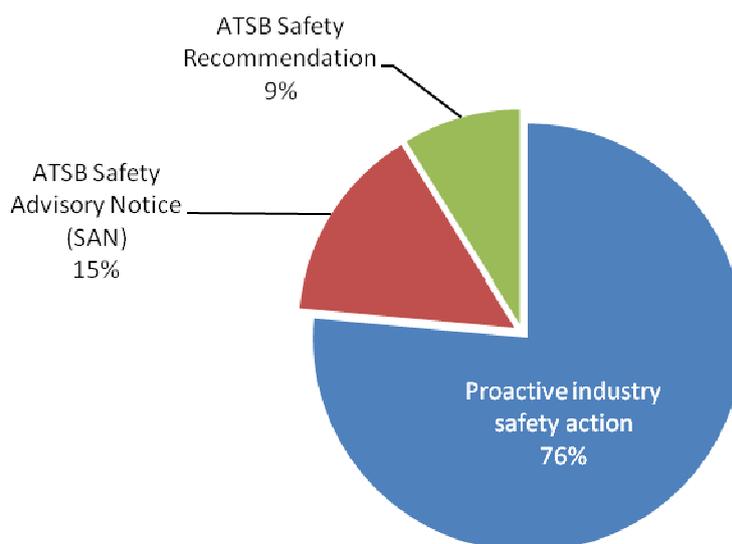
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<sup>30</sup> Australian Transport Safety Bureau. (2010). *Serious injury on board United Treasure off Port Kembla, New South Wales on 7 July 2009* (Marine Occurrence Investigation 266-MO-2009-005). Canberra: ATSB.

## Safety actions

The majority of safety actions taken in response to an investigated marine accident or incident were proactive actions by the marine industry (Figure 25). However, there were more formal safety recommendations made by the ATSB following marine investigations than in either aviation or rail investigations.

**Figure 25: Safety actions in response to marine investigations completed in the 2010-2011 financial year**



### ATSB Safety Recommendations in marine investigations

There were three ATSB marine safety recommendations issued in the 2010-2011 financial year that resulted from a marine investigation. All were issued in response to safety issues of significant risk to continued safe maritime operations.

One of these safety recommendations was directed towards NOPSA, in relation to the fatality on board *Karratha Spirit*.<sup>21</sup> The ATSB investigation found that the consensus of the regulatory authorities was that *Karratha Spirit* was not in a navigable form at the time of the accident, and was therefore under NOPSA's jurisdiction according to the *Offshore Petroleum and Greenhouse Gas Storage Act 2006* (OPGGSA). However, the point at which *Karratha Spirit* became 'navigable' was not clearly defined in the OPGGSA, and was open to interpretation. Furthermore, had the accident occurred on board *Karratha Spirit* after it had departed the CALM buoy and while it was steaming off the coast to avoid a cyclone, without entering any ports, then it was possible that the ship would not have come under the jurisdiction of any Australian safety regulatory regime. In March 2011, NOPSA advised the ATSB that the regulatory authorities intended to make amendments to the OPGGSA to address this safety issue. These amendments are to be informed by a Department of Resources and Tourism (RET) decision on where the jurisdictional boundary lies between NOPSA and AMSA in cases similar to that of *Karratha Spirit*. The ATSB is satisfied that these actions will adequately address the safety issue.

The two remaining ATSB safety recommendations were issued to the Tosco Keymax International Ship Management Company in relation to the grounding of *Shen Neng 1*.<sup>23</sup> The ATSB investigation into this accident found that:

- There was no effective fatigue management system in place to ensure that the bridge watch keeper was fit to stand a navigational watch after the loading in Gladstone.
- The ship's safety management system did not contain procedures or guidance on the proper use of GPS route plans, and their relationship to the ship's passage plans.

In regards to the first recommendation, Tosco Keymax implemented additional inspection regimes, and provided information and further training to ship's staff relevant to issues arising from the grounding. The ATSB remains concerned that there is no proper guidance provided to the master or crew with regard to how fatigue levels should be managed, and when someone should make the fact known that they might not be fit to undertake a navigational watch.

In regards to the second recommendation, Tosco Keymax has not informed the ATSB of any specific actions that they have/are taking to address the significant risk that this safety issue poses to safe operations. The ATSB remains concerned that there is no proper guidance in the ship's safety management system to ensure that the defences offered by a GPS route planning system are used in conjunction with the passage plan.

### **Proactive industry safety action in marine**

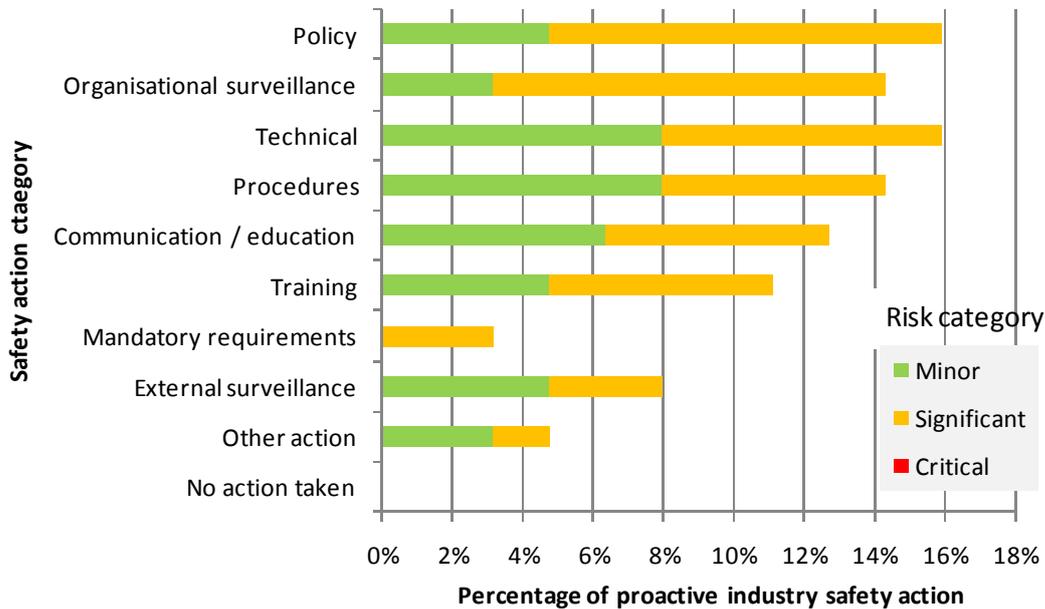
Of the 26 proactive industry safety actions, 14 were in response to significant safety issues. There were no critical safety issues identified in marine investigations completed in the 2010-2011 financial year.

Safety actions related to significant safety issues were spread across a wide variety of safety action categories, such as policy, organisational surveillance, technical, mandatory requirements, and communication and awareness activities (Figure 26).



Grounding of *Atlantic Blue* at Kirkcaldie Reef in the Torres Strait (MO-2009-001)

**Figure 26: Proactive industry safety actions in marine undertaken in the 2010-2011 financial year**



Policy and training improvements in response to significant safety issues involved the permit to work aloft system on *United Treasure*<sup>30</sup>, the inclusion of off-track limits in the passage plan on *Atlantic Blue* and other Fleet Management Limited ships<sup>22</sup>, and precaution measures taken against possible fire and explosion of empty drums on board *Cape Darnley* and other ships operated by NSC Schifffahrtsgesellschaft.

Most organisational surveillance safety actions were in response to significant safety issues concerning at AMSA and involved actions to monitor or audit organisations. In relation to the grounding of *Atlantic Blue*<sup>22</sup>, AMSA responded to safety issues with shore monitoring of shallow water areas and two-way routes by introducing an annual review of electronically-determined corridors that closely follow two-way routes, and an extension and annual review of shallow water area boundaries. These reviews will be conducted in conjunction with Maritime Safety Queensland and REEFVTS. New coastal pilotage training, marine orders, and check procedures are being introduced by AMSA to improve the rigour and independence of check pilot training, and enhance pilot training and licence renewal requirements. In response to the grounding of *Shen Neng I*<sup>23</sup>, AMSA has extended the coverage of REEFVTS to the southern parts of the Great Barrier Reef (the Particularly Sensitive Sea Area) in order to provide greater protections against grounding in shipping channels in these areas, such as off Gladstone. New navigational buoys are also being considered for the route taken by vessels transiting to and from Gladstone from the north.

Technical improvements by industry to address significant safety risks were largely conducted by AMSA, and were related to the circumstances surrounding the grounding of *Shen Neng I*<sup>23</sup>. These included the proposed enhancement of navigational aids in waters near Gladstone, and an extension of the area covered by the REEFVTS monitoring system. Following the investigation into the container loss and resulting oil leak from *Pacific Adventurer*<sup>20</sup>, Swire Navigation reviewed

the inspection and maintenance process for the container fitting systems in use on the ship, and replaced the system with an alternative approved system for all eight of its ships in that class.

Procedural improvements to address significant safety issues generally involved improvements to shipboard safety management systems (SMS), such as inclusion of off-track limits with limits for each leg of the passage in the SMS for *Atlantic Blue* following its grounding. Following the investigation into the fatality at sea on *Bow De Jin*<sup>27</sup>, which was the result of a crew member entering a cargo tank which contained hydrocarbon vapours and was deficient in oxygen, Fleet Management Limited improved the ship's enclosed space entry checklist system. This was done through a number of actions and new procedures, including:

- a fleet advisory notice regarding the accident
- formal training for fleet supervisors and all officers on the permit to enter system, and enclosed space entry
- enhancing warning signage at tank entrance to indicate that they may be deficient in oxygen
- more effective monitoring and control by the duty officer of personnel entering enclosed spaces
- a new electronic work permit issue system that prevents the issue of permits after work in an enclosed space has been completed
- introduction of spot checks of the permit to enter system and associated SMS procedures by fleet superintendents when they are sailing on a ship.



Fatality on board *Karratha Spirit*, off Dampier, Western Australia (MO-2008-013)

Communication and awareness activities that were undertaken by industry following marine investigations in the 2010-2011 financial year addressed significant safety issues identified in the investigations of *United Treasure*<sup>30</sup> (making crew aware of the dangers of using scaffolding in rolling seas, limiting the

size of scaffolding towers, and providing information to crew on identifying hazards when working aloft), *Cape Darnley* (increasing crew awareness of hot work safety, and increasing the frequency of safe work practices training), and *Atlantic Blue*<sup>22</sup> (revising the master-pilot information exchange checklist, and circulating a safety alert to managed ships emphasising the incident and the importance of bridge team management).

External surveillance action to address significant safety issues included a new cargo securing inspection regime that was introduced by AMSA following the loss of containers from *Pacific Adventurer*.<sup>20</sup> Since March 2009, AMSA has advised that over 300 inspections have been conducted, and has extended the training provided to their marine surveyors to include specialised modules on cargo securing and dangerous goods.

In addition to the organisational surveillance and policy improvements made by AMSA in response to the *Atlantic Blue* and *Shen Neng I* groundings, mandatory requirements were also reviewed by AMSA, NOPSA, and the Commonwealth Department of Resources, Energy, and Tourism (RET) following the investigation of the fatality on board *Karratha Spirit* in 2008<sup>21</sup>, and the subsequent jurisdictional disagreement over the point at which that ship became navigable.

## Significant and critical safety issues addressed

Of the 16 significant safety issues identified in marine investigations in the 2010-2011 financial year, 13 were considered to be adequately addressed through safety action undertaken which reduced the risk level to minor.

### ***Safety issues not addressed***

There was one significant safety issue arising from marine investigations completed where the action organisation did not take any action to improve marine safety.

This safety issue (in the form of an ATSB safety recommendation) was directed at the Tosco Keymax International Ship Management Company of Hong Kong, following the investigation into the grounding of *Shen Neng 1* in 2010.

<b>Investigation:</b>	<b>MO-2010-003</b> <i>Independent investigation into the grounding of the Chinese registered bulk carrier Shen Neng 1 on Douglas Shoal, Qld. on 3 April 2010.</i>
<b>Safety issue:</b>	The ship's safety management system did not contain procedures or guidance on the proper use of GPS route plans and their relationship to the ship's passage plans.
<b>Action organisation:</b>	Tosco Keymax International Ship Management Company
<b>Safety action:</b>	Since the incident, and in accordance with our policy of continuous improvement Tosco Keymax has Implemented additional inspection regimes and provided information and further training to ship's staff relevant to issues arising from the grounding.
<b>Safety recommendation:</b>	The ATSB remains concerned that there is no proper guidance in the ship's safety management system to ensure that the defences offered by a GPS route planning system are used in conjunction with the passage plan.  The Australian Transport Safety Bureau recommends that Tosco Keymax International takes further safety action to address this safety issue.  MO-2010-003-SR-006
<b>Further response:</b>	No correspondence has been received by the ATSB since the recommendation MO-2010-03-SR-006 was issued.
<b>ATSB justification for this safety issue not being addressed:</b>	The ATSB remains concerned that there is no proper guidance in the ship's safety management system to ensure that the defences offered by a GPS route planning system are used in conjunction with the passage plan.



Loss of containers from *Pacific Adventurer* off Cape Moreton, Queensland (MO-2009-002)

### **Safety issues partially addressed**

Following marine investigations completed in the last financial year, there were two significant safety issues identified that were only partially addressed by the action organisations involved. For each of these safety issues, the residual (post-safety action) risk was still considered to be at the significant level.

<b>Investigation:</b>	<b>MO-2009-001</b> <i>Independent investigation into the grounding of the Hong Kong registered products tanker Atlantic Blue at Kirkcaldie Reef, Torres Strait on 7 February 2009.</i>
<b>Safety issue:</b>	The pilotage system used by <i>Atlantic Blue's</i> pilot did not define off-track limits or make effective use of recognised bridge resource management tools in accordance with the Queensland Coastal Pilotage Safety Management Code and regular assessments of his procedures and practices under the code's check pilot regime conducted over a number of years had not resolved these inconsistencies.
<b>Action organisation:</b>	Australian Maritime Safety Authority (AMSA)
<b>Pro-active safety action:</b>	MO-2009-009-NSA-025
<b>Safety action:</b>	The Australian Maritime Safety Authority (AMSA) has advised the ATSB that a review of the coastal pilotage marine orders is being finalised. Changes will include an upgrade of check pilot procedures to promote more rigour and independence within the check pilot system. It is also intended to enhance pilot training and licence renewal requirements through the use of bridge simulators and additional testing and training requirements for trainee pilot licences. This training will focus on bridge team management, human factors and piloting to a passage plan. The marine orders will require standard passage plans to be employed and a consultative process to develop plans which are acceptable to all pilots is being progressed.  The review into Coastal Pilotage Services in the Torres Strait and Great Barrier Reef by AMSA and the Department of Infrastructure, Transport, Regional Development and Local

	<p>Government, commenced in July 2008, is being progressed. An independent, full review of the fatigue management plan is also to be completed.</p> <p>In its response, AMSA also advised that it has concerns that there may be systemic issues that could impact upon the safe operation of coastal pilots and the ability to fully develop a 'safety culture'. These concerns are based upon reports from pilots raising various issues about safety and certain aspects of pilotage operations.</p>
<b>ATSB justification for this safety issue being only partially addressed:</b>	<p>The ATSB is not satisfied that the action proposed by the Australian Maritime Safety Authority will, by itself, adequately address the safety issue because specific information obtained from AMSA in relation to its concerns about the operations of coastal pilots indicates that wider, significant safety issues may exist. Therefore, the ATSB will undertake a systemic, safety issue investigation into coastal pilotage which it aims to complete by the end of 2011. Safety issue investigation MI-2010-011 started 16/12/2010.</p>

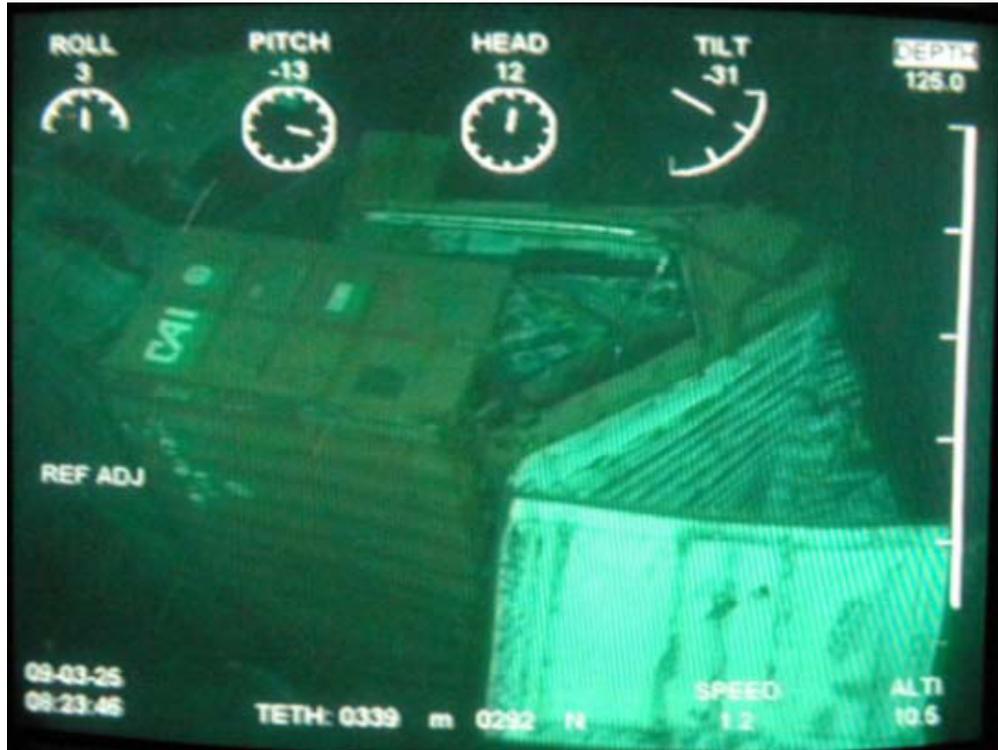
<b>Investigation:</b>	<p><b>MO-2010-003</b></p> <p><i>Independent investigation into the grounding of the Chinese registered bulk carrier Shen Neng 1 on Douglas Shoal, Qld. on 3 April 2010.</i></p>
<b>Safety issue:</b>	<p>There was no effective fatigue management system in place to ensure that the bridge watch keeper was fit to stand a navigational watch after the loading in Gladstone.</p>
<b>Safety action:</b>	<p>Since the incident, and in accordance with our policy of continuous improvement Tosco Keymax has Implemented additional inspection regimes and provided information and further training to ship's staff relevant to issues arising from the grounding.</p>
<b>Safety recommendation:</b>	<p>The ATSB remains concerned that there is no proper guidance provided to the master or crew with regard to how fatigue levels should be managed and when someone should make the fact known that they might not be fit to undertake a navigational watch.</p> <p>The Australian Transport Safety Bureau recommends that Tosco Keymax International takes further safety action to address this safety issue.</p>
<b>Further Response:</b>	<p>No correspondence has been received by the ATSB since the recommendation MO-2010-03-SR-005 was issued.</p>
<b>Action organisation:</b>	<p>Tosco Keymax International Ship Management Company</p>
<b>ATSB justification for this safety issue being only partially addressed:</b>	<p>The ATSB remains concerned that there is no proper guidance provided to the master or crew with regard to how fatigue levels should be managed and when someone should make the fact known that they might not be fit to undertake a navigational watch.</p>

## Summary of marine safety

- Individual actions were the most common type of safety factor identified in marine investigations, followed by local conditions and risk controls. Of these, the safety factors that contributed to accidents and incidents followed a similar pattern.
- Most individual actions of concern occurred during navigation or deck operation tasks. These were usually related to monitoring and checking problems, or to poor assessing and planning of tasks. They included ineffective bridge resource management and poor communication between different crew on the bridge, poor handover between crew on watches, and steep crew authority gradients<sup>31</sup> on the bridge.
- Safety issues, and in particular those that were assessed to pose a significant risk to safe ongoing operations, occurred in many functional areas. Many were related to navigation (both pilotage and deep sea navigation), and to deck operation practices.
- Most of the safety actions taken in response to significant safety issues were done so proactively by marine organisations and agencies. The actions taken were spread across various safety action categories such as policies, organisational surveillance, technical, procedures, communication and awareness activities, and training.
- Of the 16 significant safety issues identified in marine investigations in the 2010-2011 financial year, 13 were considered to be adequately addressed through safety action undertaken which reduced the risk level to minor
- There was one significant safety issue identified that was not addressed by the organisation, even though it was issued as an ATSB Safety Recommendation. This recommendation was directed at the operators of the bulk carrier *Shen Neng 1* (Tosco Keymax International Ship Management Company) following the grounding of that ship on the Great Barrier Reef off Gladstone, Qld. in 2010.
- There were also two significant safety issues identified by the ATSB in marine investigations in the last financial year that have only been partially addressed, and still pose some ongoing significant safety risk. One of these safety issues was directed to the operators of *Shen Neng 1*, Tosco Keymax International Ship Management Company. The other was directed to the Australian Maritime Safety Authority (AMSA) in relation to the grounding of the products tanker *Atlantic Blue* in Torres Strait in 2009.

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<sup>31</sup> 'Authority gradient' refers to the balance of decision-making power or the steepness of a command hierarchy between individuals in a given situation



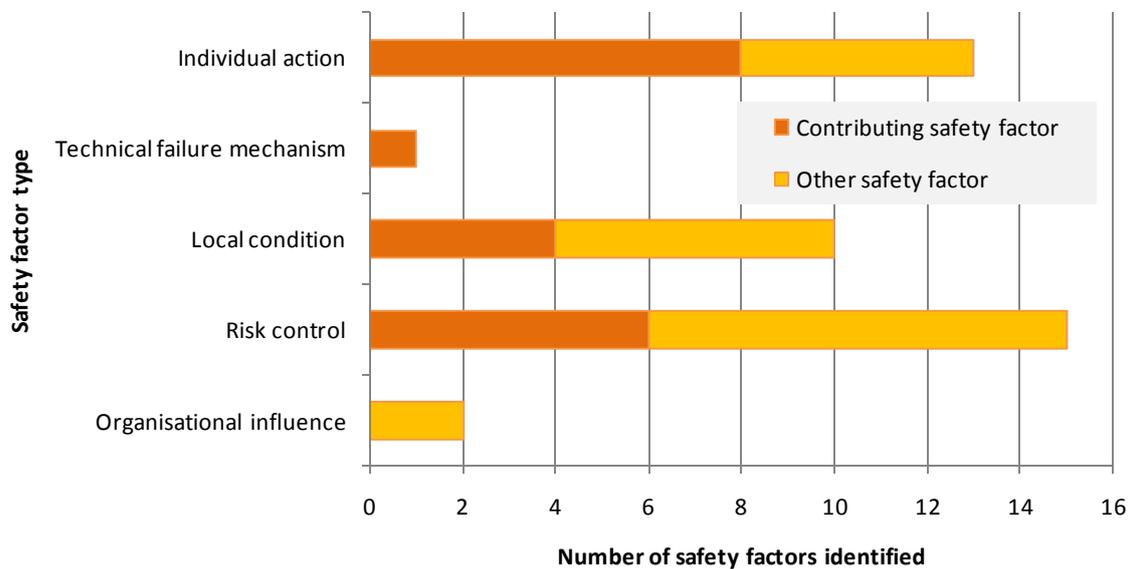
Loss of containers from *Pacific Adventurer* off Cape Moreton, Queensland (MO-2009-002)

## Safety factors

Most of the safety factors identified in rail investigations in the 2010-2011 financial year were risk controls, individual actions, and local conditions (Figure 27). Most of these safety factors were found to have contributed to the occurrence.

Individual actions made up 39 per cent of all contributing safety factors, followed by risk controls (33 per cent) and local conditions (22 per cent). A technical failure mechanism was also identified in a rail investigation as a contributing safety factor.

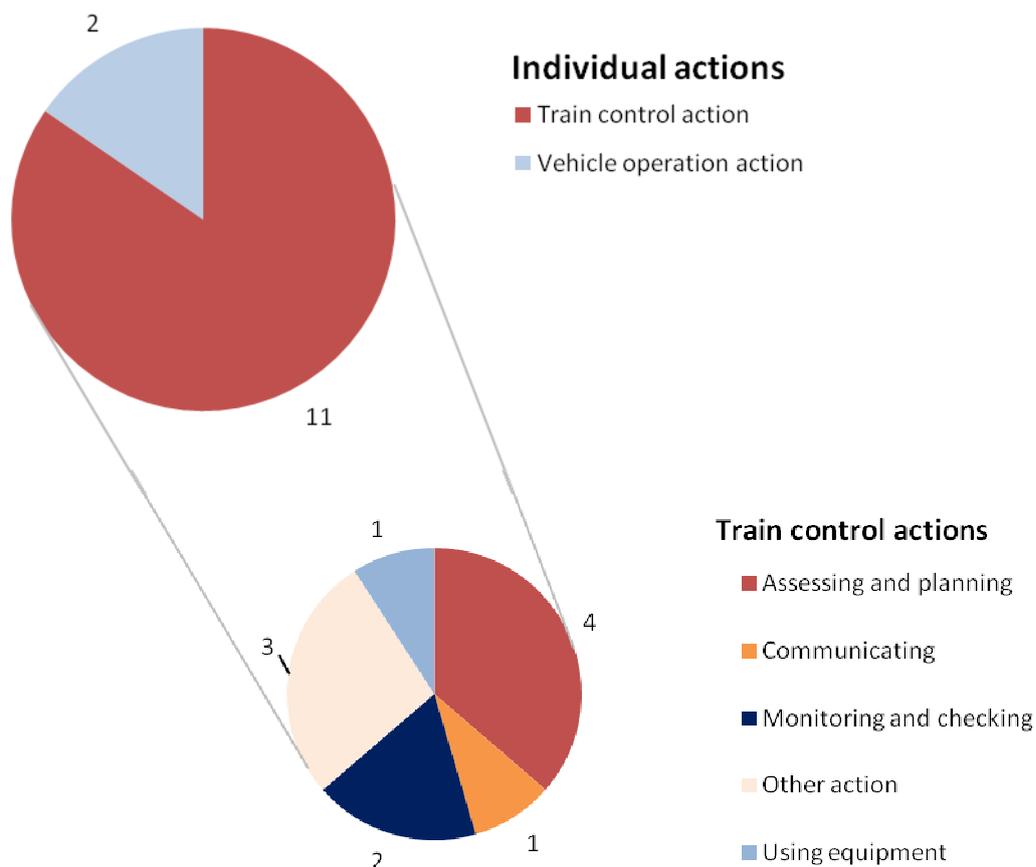
**Figure 27: Safety factors identified in rail investigations completed in the 2010-2011 financial year**



## Individual actions

Figure 28 shows the types of individual actions identified in rail accidents and incidents (both contributing and non-contributing) that were investigated in the last financial year.

**Figure 28: Individual action safety factors identified in rail investigations completed in the 2010-2011 financial year**



Of the 13 individual actions involved in investigated rail occurrences, almost all were train control actions. This is a change from investigations completed in the 2009-2010 financial year, where most individual action safety factors identified in rail investigations were vehicle operation actions.

Further investigation found that a mixture of individual train control actions contributed to rail incidents and accidents. They related to making assessments and plans; monitoring and checking systems, signals, and the environment; communicating with other drivers, crew, and rail personnel; and to the use of equipment.

All train control-related assessing and planning errors identified in rail investigations were decision errors. They sometimes involved a misidentification of a situation, or an incorrect assessment by a driver of the distance required to stop their train. In one case at Cootamundra, NSW, a signal design error allowed a PROCEED signal to be shown, even though the track in that signal block was

obstructed by the last wagon of a freight train. This signal state allowed an XPT passenger train to enter the signal block. The driver of the XPT observed the freight train wagon obstructing the track in front of him, and stopped the XPT just short of the freight train. No collision occurred, and the XPT continued its journey after the freight train was completely moved off the main line.<sup>32</sup> After the occurrence, the XPT driver contacted the ARTC operations manager requesting that the incident be investigated; however, based on screen events as observed, neither he nor the network controller on duty correctly interpreted the signalling irregularity as a wrong side failure. As a result, they did not respond in accordance with established ARTC procedures or in a timely manner.



Reported signal irregularity at Cootamundra, New South Wales (RO-2009-009)

In other cases, assessing and planning errors were actions taken by individuals that were not in accordance with network rules. For example, following a safeworking incident at Junee, NSW in 2010 where a locomotive was moved from one road to another without authority while a track occupancy authority (TOA) was in force, the investigation identified that the TOA that was in force was not appropriately protected.<sup>33</sup> The TOA had been issued due to track works that were being undertaken on several roads to repair damage caused by a derailment several weeks prior. To prevent trains from gaining access to the damaged track, temporary stop block barriers had been placed on the affected roads. However, there were no red flags or red lights, or detonators in place at the TOA boundary/limits, even though ARTC network rules required these to be used. Even though the investigation concluded that it was unlikely that this incident would have resulted in a breach of the worksite, the lack of the required protection systems meant that there were no systems in place to protect rail vehicles on that road from approaching the stop block barriers.

Monitoring and checking safety factors related to train control individual actions were both decision and action errors. They included a safeworking irregularity that

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<sup>32</sup> Australian Transport Safety Bureau. (2011). *Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7* (Rail Occurrence Investigation RO-2009-009). Canberra: ATSB.

<sup>33</sup> Australian Transport Safety Bureau. (2011). *Safeworking incident – Junee, NSW on 4 August 2010* (Rail Occurrence Investigation RO-2010-007). Canberra: ATSB.

occurred at Moss Vale, NSW in June 2010.<sup>34</sup> This occurrence involved a conflict between a suburban passenger train and a light engine<sup>35</sup> train. The passenger train had been authorised to access the Up<sup>36</sup> Platform at Moss Vale, passing two signals in the STOP position over points that were set reverse<sup>37</sup>. The light engine train had also been authorised to travel into the Moss Vale Up Refuge Siding over the same set of points, thereby placing the two trains into direct conflict. The network controller on duty at the time did not fully implement the requirements of ARTC network rule (ANTR) 418 (which relates to the safe movement of rail traffic within yards, and prescribes that network controllers shall not authorise conflicting movements), and ARTC network rule (signals and signs) (ANSG) 608 (which related to authorising rail traffic to pass an absolute signal at STOP) in regard to the movements of these two trains at Moss Vale. This second rule (ANSG 608) required the signaller to tell the driver or track vehicle operator whatever is known or not known about the condition of the block ahead before authorising them to pass an absolute signal at STOP. In this case, the network controller did not alert the driver of the passenger train that the light engine train had been authorised to travel on the Up Main line to Moss Vale. Had this occurred, the driver of the passenger train could have forewarned the network controller that they would come into direct conflict with the other train.

Three of the 13 individual actions related to train control fell into the *Other* category. All were identified in the investigation into a safeworking breach at Manildra, NSW in February 2010.<sup>38</sup> They involved two decision errors on the part of the network controller, which both contributed to a serious incident taking place between a freight train (which was standing on the main line after having recently completed shunting within the yard limits) and an empty passenger train (which was to pass through the Manildra Yard on the main line). While a collision was avoided, the event was a serious safeworking irregularity as one train had been authorised to proceed over track that was occupied by a second train. The network controller expected the train crew to contact him and log a freight train onto the train control system soon after the shunt order was fulfilled, but the crew had no requirement to contact the network controller until they were ready to depart Manildra. At the same time, the network controller had forgotten about the track occupancies when authorising the passenger train to travel through the Manildra Yard. Furthermore, authorisation had not been provided for rail vehicles to be stabled on a running line, which was required by the Australian Rail Track Corporation (ARTC) network rules at the time of the occurrence.

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<sup>34</sup> Australian Transport Safety Bureau. (2011). *Safeworking irregularity involving passenger train SN57 and train D231 at Moss Vale, NSW, 17 June 2010* (Rail Occurrence Investigation RO-2010-006). Canberra: ATSB.

<sup>35</sup> A *light engine* is common rail terminology for a locomotive travelling by itself (not hauling wagons or carriages). A light engine is still regarded as a train.

<sup>36</sup> Trains travel towards Sydney in the *Up* direction, and away from Sydney in the *Down* direction.

<sup>37</sup> A set of points are a mechanical switch that enables trains or track vehicles to be guided from one track to another track at a railway junction. The set normal position is the lie of the points defined by their design, and is usually set for the main line. The set reverse position is the opposite of normal position.

<sup>38</sup> Australian Transport Safety Bureau. (2011). *Safeworking breach at Manildra NSW 10 February 2010* (Rail Occurrence Investigation RO-2010-002). Canberra: ATSB.



Safeworking incident, Junee, NSW (RO-2010-007)

### **Technical failure mechanisms**

There was only one technical failure mechanism identified in rail investigations completed in 2010-2011. This contributed to the train derailment near Tottenham, Victoria.<sup>39</sup> In this accident, the train crew observed a small lateral misalignment in the track as they approach a left-hand curve. The passage of the train over this small buckle applied enough force to increase the size of the misalignment as each wagon passed over it. By the time the 31<sup>st</sup> wagon in the set (positioned near the end of the train) passed over the misalignment, it derailed.

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<sup>39</sup> Australian Transport Safety Bureau. (2010). *Derailed freight train 6MB2 at Tottenham Victoria, 30 January 2009* (Rail Occurrence Investigation RO-2009-004). Canberra: ATSB.

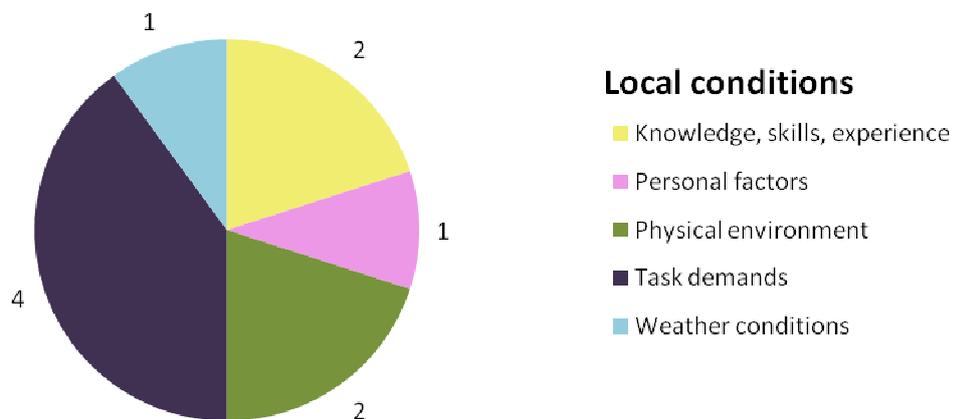


Safeworking irregularity involving a freight train and an empty passenger train, Manildra, NSW (RO-2010-002)

### Local conditions

In rail investigations where local conditions played a part in increasing the risk of safe operations, task demands were the most common (Figure 29). These included high workloads or pressure to complete tasks.

**Figure 29: Local condition safety factors identified in rail investigations completed in the 2010-2011 financial year**



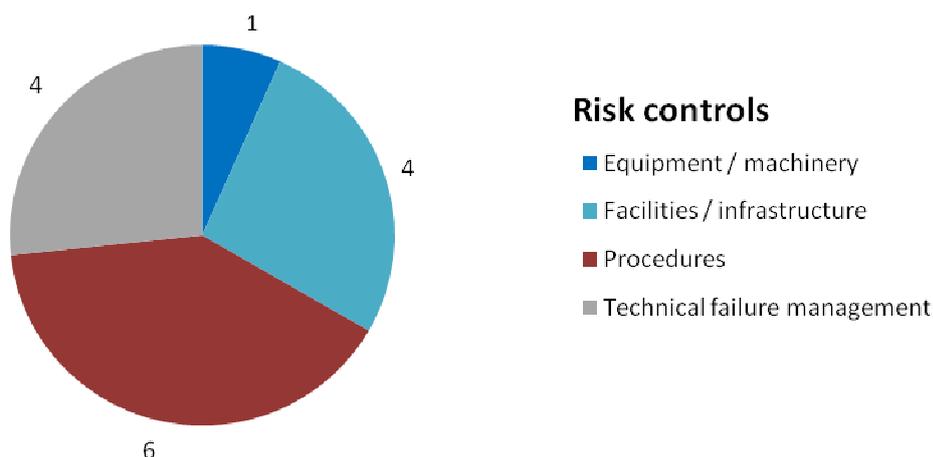
Most local condition-related safety factors in the last financial year were related to a signal passed at danger (SPAD) incident at Junee, NSW in September 2009, where an XPT passenger train passed a signal at STOP by about 33 metres.<sup>40</sup> In this incident, the driver perceived the preceding signal to be displaying a Medium Turnout indication while the signal almost certainly displayed a Caution Turnout indication. The train was then driven in a manner consistent with the driver's expectation that the next signal (where the SPAD occurred) would be showing a PROCEED indication. The investigation determined that it was almost certain that the driver's perception of the indication displayed by the initial signal was influenced by expectation and distraction, also known as 'inattention blindness'. It was also possible that the driver's perception of the indication displayed by this signal was influenced by fatigue.

<sup>40</sup> Australian Transport Safety Bureau. (2011). *Signal Passed at Danger by Train ST24 Junee, NSW, 9 September 2009* (Rail Occurrence Investigation RO-2009-008). Canberra: ATSB.

## Risk controls

Like aviation and marine investigations, risk control-related safety factors identified in rail investigations in the 2010-2011 financial year were dominated by procedural problems. There were also a number of safety factors identified in rail investigations relating to facilities and infrastructure acting as risk controls, and the management of technical failures (Figure 30).

**Figure 30: Risk control safety factors identified in rail investigations completed in the 2010-2011 financial year**



Procedural issues that reduced the effectiveness of train control/signalling as a defence against accidents and incidents occurred in a number of investigations. For example, in the Moss Vale safeworking occurrence presented earlier<sup>34</sup>, the investigation identified that the ARTC did not have a check list available for network controllers to assist in identifying risks associated with the verbal authorisation of train movements for an integrated yard. In this situation, such a checklist would probably have allowed the network controller to recognise his error in allowing the two trains to enter the same section of track before authorising the conflicting movement.

Some rail investigations in the last financial year identified issues with procedural risk controls in network operations. These are discussed later on in *Safety issues* on page 68.

Safety factors related to facilities and infrastructure that acted as risk controls were usually related to civil maintenance. The investigation into a train derailment near Tottenham, Victoria in January 2009<sup>39</sup>, in which several wagons of a freight train derailed due to a track misalignment, found that the section of track on which the train derailed was previously utilised as a standard gauge passing loop. It was not stress tested after it was converted to mainline operations (5 months before the derailment) to determine if any residual stress was present in the rails, and if any treatments were necessary to reduce the likelihood of track misalignments.

Technical failure management issues identified in rail investigations completed in the 2010-2011 financial year mostly involve the design of the complex signalling arrangements that contributed to the near collision of a freight train and passenger train at Cootamundra, NSW in November 2009<sup>32</sup>.



Derailment at Wodonga, Victoria (RO-2010-011)

### **Organisational influences**

There were only two organisational influence-related safety factors identified in rail investigations completed in 2010-2011. Neither of these safety factors contributed to accidents or incidents.

Both related to the investigation of the near-collision at Cootamundra, NSW due to a signal design error<sup>32</sup>. Two organisational influences were identified that may have allowed the signal design problem to be rectified during its design phase. These were greater participation by ARTC in the design and commissioning phases of the Cootamundra re-signalling project; and not undertaking control table<sup>41</sup> and software development concurrently to ensure that all control table logic is fully reflected in the final software and associated validation and testing processes.

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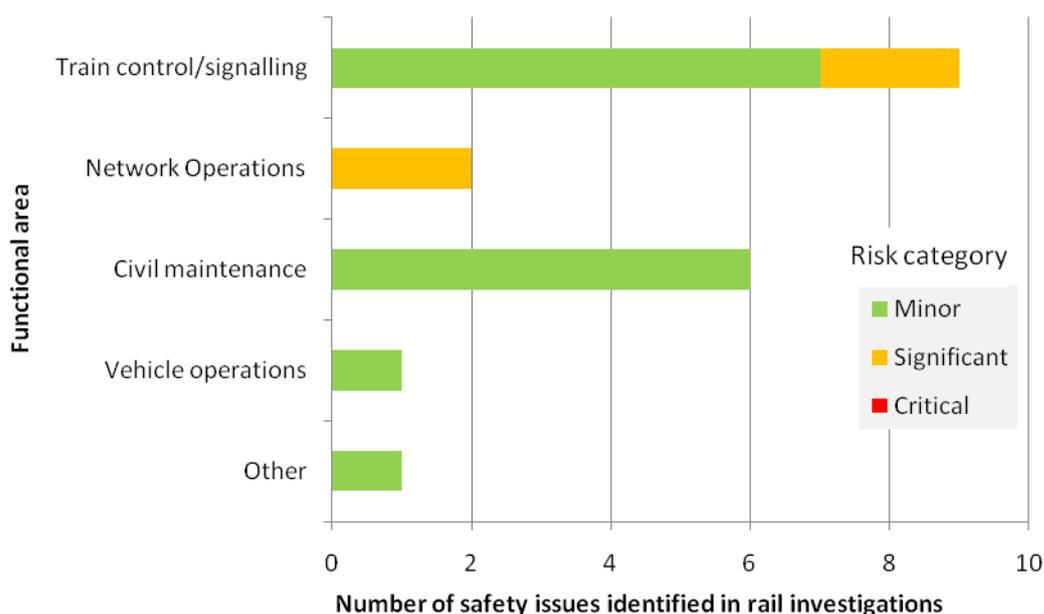
<sup>41</sup> 'Control tables' define the logic of how points, signals, and level crossings interlock.

## Safety issues

There were no critical safety issues identified in rail investigations completed in the 2010-2011 financial year, and only four of the 19 safety issues identified in rail investigations completed in the last financial year posed a significant risk to safe ongoing operations.

Most safety issues in rail investigations were associated with either train control, signalling, or with civil maintenance works (Figure 31). Significant safety issues occurred only in network operations and train control/signalling.

**Figure 31: Safety issues by functional area for rail investigations completed in the 2010-2011 financial year**

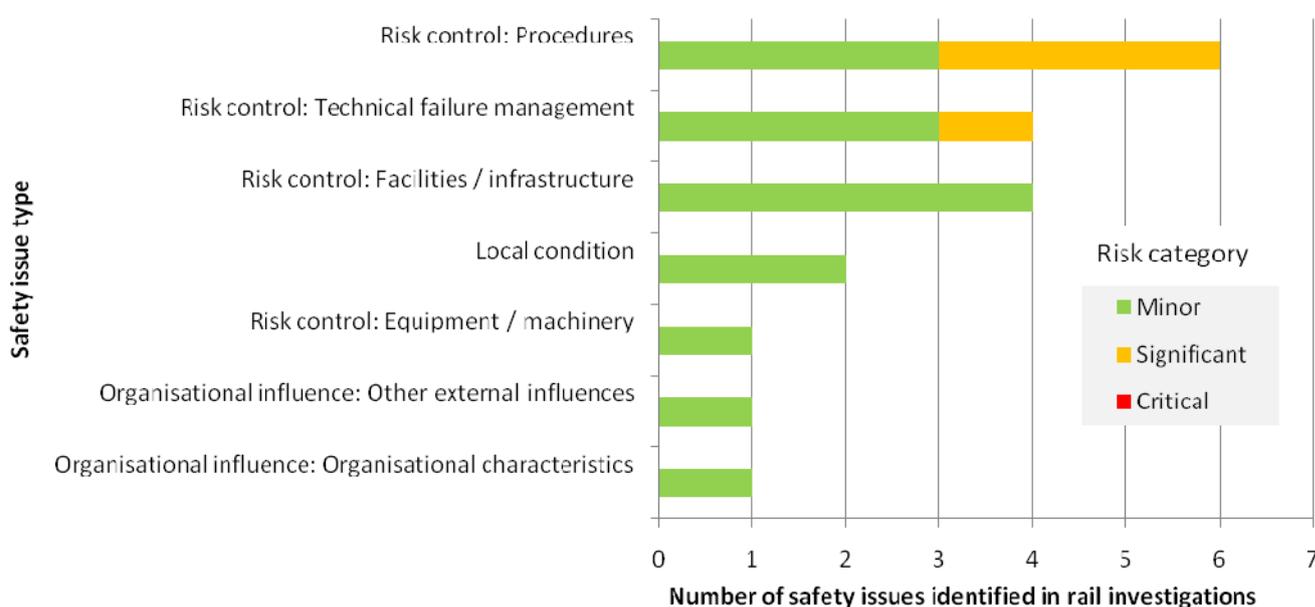


The *Other* functional area was associated with one minor safety issue, which was related to the sequence of software development and control table development for the Cootamundra re-signalling project (discussed earlier)<sup>32</sup>.

Procedural problems were the main source of safety concern identified in rail investigations, making up almost a third of all safety issues. Management of technical failures and problems with facilities and infrastructure were also more common safety issues identified in rail accidents and incidents investigated by the ATSB.

Figure 32 Procedural problems were the main source of safety concern identified in rail investigations, making up almost a third of all safety issues. Management of technical failures and problems with facilities and infrastructure were also more common safety issues identified in rail accidents and incidents investigated by the ATSB.

**Figure 32: Safety issues identified in rail investigations completed in the 2010-2011 financial year**



### Safety issues of significant risk in rail

Procedural problems were the main source of safety concern identified in rail investigations, making up almost a third of all safety issues. Management of technical failures and problems with facilities and infrastructure were also more common safety issues identified in rail accidents and incidents investigated by the ATSB.

Figure 32 (above) shows that most significant safety issues involved the design and operation of procedures. Two of the three procedural issues that posed significant safety risk to ongoing rail operations concerned network operations.

For example, at the time of the safeworking incident that occurred at Junee, NSW in August 2010<sup>33</sup>, ARTC network rule (work on track) (ANWT) 304 and RailCorp network rule (work on track) (NWT) 304 did not stipulate that the Protection Officer must inform all persons or work groups who may be within the boundaries of a track occupancy authority (TOA) of its existence. This was regardless of whether or not these persons or work groups were considered as ‘workers’ or ‘work parties’. On the day of the safeworking incident, there were personnel within the boundaries of the TOA that were not given any advice regarding the existence of

the TOA. While no one was injured in this incident (and there was a low potential for injury), it is feasible that in other circumstances track workers and drivers could be injured if persons are able to enter a TOA without being aware that they are doing so.

Another significant procedural safety issue was identified in the investigation of the XPT passenger train that passed a signal at danger at Junee in September 2009.<sup>40</sup> Leading up to the SPAD event, the driver was conducting a number of complex tasks simultaneously. These included departing the train from the Junee yard limits, as well as attempting to contact the network controller, and having a conversation with the onboard passenger services supervisor. These secondary tasks diverted the driver's attention from the principal task of safely departing the train from the yard, and likely contributed to the driver's misperception of the signal state. The investigation found that the train operator (RailCorp) did not have an instruction that specifically referred to the need for train crew to prioritise tasks at safety critical locations (such as when departing a station yard), or at times when workload is high.



Signal Passed at Danger, Junee, New South Wales (RO-2009-008)

In the investigation of the near-collision at Cootamundra, NSW due to a signal irregularity, a significant safety issue was identified related to the project to upgrade signalling at Cootamundra (which occurred from 2005 to 2007, prior to this occurrence). This project involved a consortium of ARTC and private partners (known as the South Improvement Alliance) replacing the manually operated signalling system at Cootamundra with a remote control system, and consolidating train control operations at Junee. Though the new signalling system had worked safely and reliably from 2007 to the time of this incident in 2009, the investigation found that the documentation and quality control processes used by the South Improvement Alliance for the Cootamundra re-signalling project were not sufficiently robust. In particular, the closing out of identified design issues was inadequate, and as a result the clearance issue at the interface of the two tracks which eventually led to the signal irregularity was overlooked.

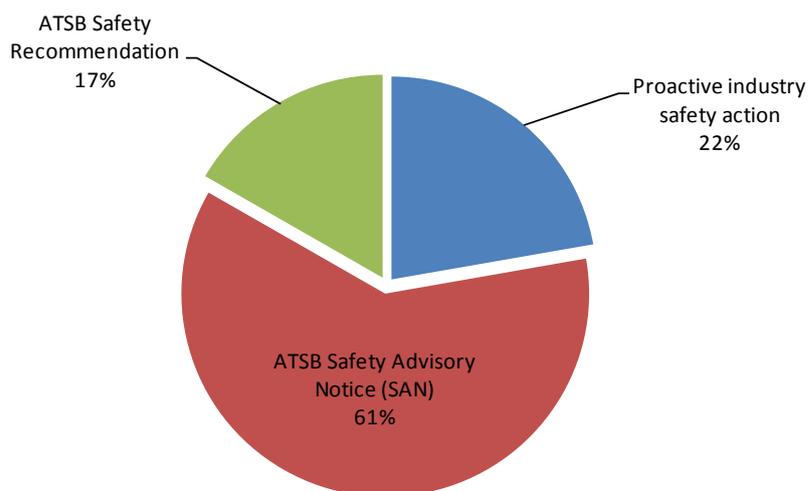
One technical failure management safety factor was considered by the ATSB to probably pose a significant risk to future safe rail operations. This was related to the monitoring of rail creep on the curve at Tottenham, Victoria where a freight train derailed in January 2009. When the passing loop track was converted to mainline operation in 2008, creep monuments had not been installed at the east end of the

curve near where the train derailed, and the rails had not been punch marked to allow track inspectors to detect rail creep. In addition, a record of two rail welds carried out on the same day as the derailment 560 metres from the derailment point had not been documented for future reference. Both of these items were required to have been conducted under V/Line Infrastructure Civil Engineering Circulars for the purposes of regular monitoring and accurate measurement of rail creep.

## Safety actions

The majority of safety actions taken in response to investigated rail occurrences were safety advisory notices issued by the ATSB (Figure 33). All 11 of the safety advisory notices were directed to the Australian Rail Track Corporation (ARTC). The notices are documented in Appendix D.

**Figure 33: Safety actions in response to rail investigations completed in the 2010-2011 financial year**



### ATSB safety recommendations in rail investigations

There were three ATSB safety recommendations issued in the 2010-2011 financial year from rail investigations. All were issued in response to safety issues of significant operational risk.

One of these safety recommendations was directed to RailCorp (NSW), following the investigation into the SPAD event involving an XPT passenger train at Junee, NSW<sup>40</sup>. In this investigation, the ATSB found that driver workload and competing task demands probably contributed to the driver misidentifying the signal. At the time of the incident, there was no RailCorp instruction that specifically referred to the need for train crew to prioritise tasks at safety critical locations or at times when workload is high. In response to this Safety Recommendation, RailCorp advised the ATSB that a driver's routine activities include speaking with network control. RailCorp questioned the need for an instruction for drivers to prioritise tasks as drivers are trained to respond to both planned and unexpected situations and conditions and, as such, practice prioritisation.

The ATSB acknowledges that communications of a safety critical nature with network controllers and others involved in railway safeworking is a routine, and very necessary, activity of a train driver. Upon reflection of the formal response from RailCorp, the ATSB agrees that a formal instruction to prioritise tasks would probably not reduce the risk of driver distraction.

The ATSB believes that safety could be improved in future if train crews were provided with guidance regarding prioritisation of critical tasks such as when

departing stations, running through station yards, or approaching track gangs or level crossings.

The other two safety recommendations related to the same significant safety issue in relation to the safeworking incident within the Junee station yard limits, when a locomotive was moved from one road to another without authority while a TOA was in force. The recommendations were directed to the ARTC and to RailCorp. The ATSB identified that ARTC network rule ANWT 304 and RailCorp network rule NWT 304 did not stipulate that the Protection Officer must inform all persons or work groups who may be within the boundaries of a Track Occupancy Authority of its existence. This is regardless of whether or not these persons or work groups fit the definition of 'work parties' or 'workers'.

While ARTC acknowledged the need for all affected workers to be aware of protection arrangements and limits associated with a TOA, it did not agree with this safety recommendation. In their formal response, ARTC suggested that it was neither feasible nor realistic to expect the Protection Officer to inform persons other than those associated with the TOA about the kinds and limits of protection in place.

RailCorp accepted the ATSB's recommendation, but considers that their SMS provides adequate protection against a safeworking breach through a procedure requiring all persons involved in activities at the work location to be given a pre-work brief, including details of worksite protection. Furthermore, RailCorp believes a TOA was inappropriate to protect the work party in this situation, and should have not been authorised based on the existing requirements of ANWT 304 / NWT 304.

### **Proactive industry safety action in rail**

There were only four proactive industry safety actions in the 2010-2011 financial year, two of which were in response to significant safety issues. Safety actions related to significant safety issues involved technical actions and changes to policies.

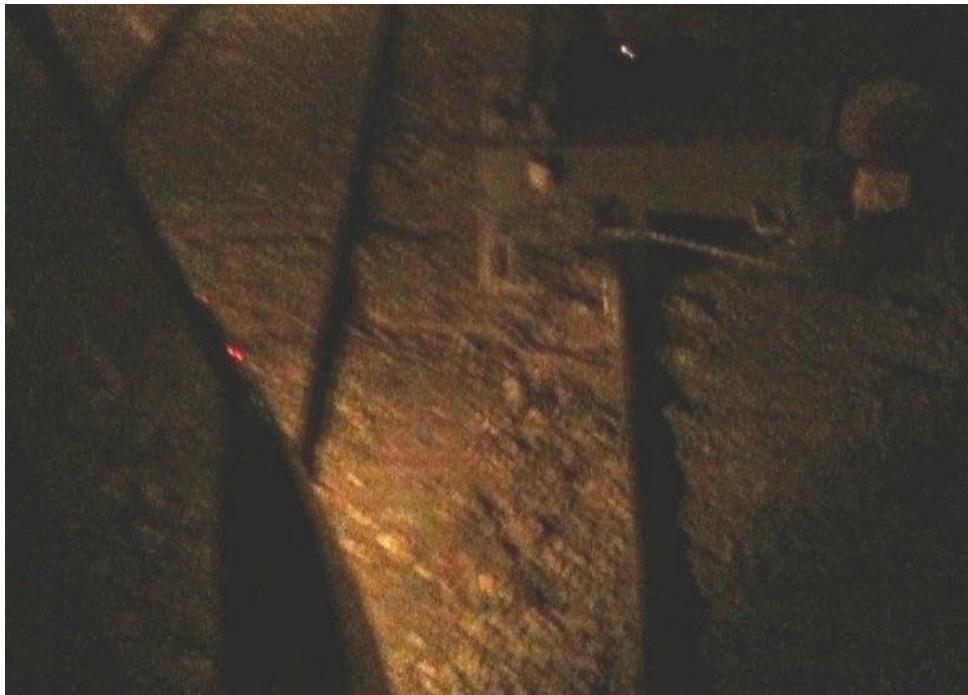
Safety actions were undertaken by industry in response to two significant safety issues identified in the investigation of the reported signal irregularity at Cootamundra that led to the near-collision of two trains.<sup>32</sup>

One safety issue was in relation to the identification of fouling and clearance points between different lines. The investigation determined that the South Improvement Alliance engineers did not effectively identify and record that the interface between the CA74C and CA74D tracks was the fouling point between the Up Main line and No.1 Platform Road, and thus did not recognise that the rear of a train sitting on the Up Main line at this location would foul No.1 Platform Road. This design deficiency was caused by a long standing practice of not explicitly recording the clearance point on the signal arrangement plan, track insulation plan, or in the control tables.

The other significant safety issue was related to the robustness of the documentation and quality control processes used by the South Improvement Alliance for the Cootamundra re-signalling project that had occurred several years before this incident. In particular, the investigation identified that the closing out of identified design issues was inadequate.

The ARTC advised that with future signal design work, a number of safety actions would be undertaken to eliminate both of these safety issues, or to reduce their risk to as low as reasonably practicable:

- Update the ARTC Track Standards to adequately identify the process for determining the fouling point, and provide consistent references in the Signals Standards to the Track Standard for the fouling point.
- Change rolling stock standards and approvals to include control measures for cases where the overhang exceeded three metres.
- Reinforce the role of the Track Design Engineer as the responsible authority for the design, calculation and identification of the location of the fouling point. Where the track design is not changed, then an appropriately competent Track Design Engineer will do this task based on the as-installed infrastructure. All of this information is now to be recorded and configuration managed.
- Use a plate to permanently identify the location of the fouling point.
- Amend the Track Maintenance Standards, Examination Standards and Work Schedules to include verification of the clearance after specific maintenance activities or events.
- Explicitly identify clearance points on the Signal Arrangement Plan and Track Insulation Plan. A table is now included in the control tables to identify clearance points and their associated requirements.
- Update Signal Design Standards accordingly, and ensure compliance with the Signals Standard so that Track Insulation Plans are drawn to scale in the longitudinal and lateral axes.



Reported signal irregularity and near collision between two trains at Cootamundra, NSW (RO-2009-009)

## **Significant and critical safety issues addressed**

Of the four significant safety issues identified by ATSB rail investigations in the 2010-2011 financial year, three were considered to have been adequately addressed through safety actions, with a residual (post-safety action) risk considered to be acceptable (minor).

### ***Significant safety issues withdrawn***

The fourth significant safety issue arising from a rail investigation completed in the 2010-2011 financial year was withdrawn. This safety issue led to an ATSB safety recommendation directed at RailCorp following the investigation into the SPAD event at Junee, NSW discussed previously. A review of the formal submission by RailCorp has led the ATSB to agree that a formal instruction to prioritise tasks (as was recommended) would probably not reduce the risk of driver distraction in similar situations in the future.

## Summary of rail safety

- Risk controls were the most common safety factor type identified in rail investigations, followed by individual actions. However, when looking at contributing safety factors only, individual actions were most common followed by risk controls.
- Safety issues with risk controls were prominent, particularly those that were procedures, facilities/infrastructure, and systems to manage technical failures.
- Safety issues often involved train control and signalling, or civil maintenance. However, network operations was the focus of half of the significant safety issues identified.
- Unlike in aviation and marine investigations, safety advisory notices issued by the ATSB were the most common rail safety actions rather than proactive safety actions taken by the rail industry.
- Most safety issues that posed a significant risk to future safe rail operations were addressed through policy changes. A reviews of parts, components, and other systems were also actions taken to address significant rail safety issues.
- Changes to procedures and policies were a common response to ATSB safety recommendations.
- Three of the four significant safety issues identified were deemed to be adequately addressed after safety action reduced the residual risk to an acceptable level. The fourth significant safety issue was withdrawn.

## APPENDIX A: Safety Actions Categories

Level 1 Safety Action	Level 2 Safety Action	Definition and examples
Technical	Inspection	<p>Safety actions where inspections of equipment or parts are conducted.</p> <p><b>Examples:</b></p> <p><b>Aviation:</b> Immediately following the occurrence, the aircraft operator conducted a detailed visual and non-destructive inspection of all axles in their 737 fleet with similar service history.</p> <p><b>Rail:</b> FreightLink will now undertake a stress testing program at 0.5km intervals from Newcastle Waters to Darwin. Based on the results, a further stress relief campaign will be undertaken during the 2009 dry season.</p> <p><b>Marine:</b> Since March 2009, AMSA has conducted in excess of 300 cargo securing inspections. In addition to the above, AMSA conducted a focused inspection campaign on cargo securing arrangements from February to May 2010.</p>
	Replace	<p>Safety actions where equipment or parts are replaced.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> Following the incident, Swire Navigation has reviewed the inspection and maintenance process for the container fitting system in use on the ship at the time of the incident and, although Class approved, has decided to replace the entire system with an alternative Class approved system for all eight ships of this class that it believes will be even more robust.</p> <p><b>Rail:</b> SCT has accelerated its schedule to replace the 50 tonne bogies with 70 tonne bogies. Under this process, all SCT freight wagons fitted with 50 tonne bogies and axle-box bearings were removed from service. The wagons were fitted with 70 tonne bogies and packaged bearings before being returned to service.</p> <p><b>Aviation:</b> The operator advised the ATSB that upon advice from CFMI, they were starting a campaign to replace the bushings and associated hardware on their owned engines (as per S/B 72-0581 and S/B 72-0665) at overhaul or whenever the engine had criteria that scheduled the next inspection at 800 hours or below (as per the service bulletin).</p>
	Repair/ modify	<p>Safety actions where equipment or parts are repaired or modified.</p> <p><b>Examples:</b></p> <p><b>Rail:</b> Following the derailment of train 1MP9, SCT scheduled their entire fleet of axle-box configured rolling stock to be regreased.</p> <p><b>Marine:</b> The company also stated that it is in the process of investigating the possibility of modifying Saldanha's oil firing unit.</p> <p><b>Aviation:</b> The aircraft manufacturer has certified the equivalent of Rockwell Collins SB No.4 for use on Airbus Industrie A330 type aircraft. The aircraft operator is modifying all company aircraft radars of this type to be capable of operating in the full MultiScan mode as well as incorporating SB No.4.</p>

	<i>New/ install</i>	<p>Safety actions where new equipment or parts are installed or added.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> <i>Following the collision, Ella's Pink Lady was fitted with a passive radar reflector.</i></p> <p><b>Aviation:</b> <i>The aircraft operator advised that the first electronic flight bag would be installed on each A330 by May 2010 and the second in July 2010.</i></p>
	<i>Design/ redesign</i>	<p>Safety actions which involve the design or redesign of equipment, parts, or workspace</p> <p><b>Examples:</b></p> <p><b>Marine:</b> <i>GL to provide protection covers for windlass operators and has suggested that another option would be the provision of a remote control stand in a safe position.</i></p> <p><b>Aviation:</b> <i>The aircraft manufacturer had identified the fuel system design issue and developed a new float vent valve design to eliminate the problem.</i></p>
<b>Policy</b>	<i>Amend</i>	<p>Safety actions where there is a change to policy (including changes to the SMS) affecting the organisation.</p> <p><b>Examples:</b></p> <p><b>Aviation:</b> <i>The operator has introduced a change to the safety management system such that any change to an aircraft operating procedure requires the completion of a formal risk analysis prior to that change being implemented.</i></p> <p><b>Marine:</b> <i>The Authority has increased its target frequency for inspections of normally occupied facilities (including Floating production storage and offloading units, and Floating storage and offloading units) from once a year to twice a year, and is actively addressing the consequential requirement for additional Occupational Health &amp; Safety Inspectors.</i></p>
	<i>New</i>	<p>Safety actions where there is an addition to policy affecting the organisation.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> <i>ASP Ship Management has advised the ATSB that random drug and alcohol testing is taking place fleet wide. The testing regime also includes 3 monthly alcohol testing of the crew by the master and testing in cases where the master has grounds to believe that an alcohol (or drug) test is required.</i></p> <p><b>Aviation:</b> <i>The aircraft operator now requires water spill issues to be reported to engineering</i></p> <p><b>Rail:</b> <i>As a result of Pacific National's investigations into this incident, Pacific National has now prohibited RQPW wagons being loaded with double stacked containers.</i></p>
	<i>Review</i>	<p>Safety actions where there is a review of policy affecting the organisation</p> <p><b>Examples:</b></p> <p><b>Marine:</b> <i>Port Phillip Sea Pilots has advised the ATSB that the guidance in its pilotage safety management system with respect to anchor positions will be reviewed to consider the existing qualifications/training of pilots and the need to prevent a further incident of this type.</i></p> <p><b>Aviation:</b> <i>Review company procedures to ensure crew are handled appropriately after a serious incident – Employee Assistance</i></p>

		<i>Program Implemented</i>
<b>Procedures</b>	<i>Amend</i>	<p>Safety actions where procedures affecting line operators are amended.</p> <p>It is assumed that any amendments to procedures are reflected in documentation as a matter of course. Therefore, do not count documentation as a safety action.</p> <p><b>Examples:</b></p> <p><b>Aviation:</b> <i>The operator has advised that the standard operating procedure for a go-around has been modified in line with the procedure promulgated by the aircraft manufacturer.</i></p> <p><u>and</u></p> <p><i>The operator advised the following: In addition to the information provided in response to item 4.1.2, the Normal Checklist was amended to require that the Captain also respond to the "Fuel" challenge item contained in the BEFORE START checklist. The "Fuel" item itself was also expanded to include an additional memory aid (not verbalised) that stated "...Verify CENTRE TANK FUEL PUMPS (as required)...ON."</i></p> <p><i>This would be coded as both procedures and documentation, as there was a change in both that was not directly related.</i></p> <p><i>In comparison, the example below is not coded as documentation as there is an associated change in procedure.</i></p> <p><i>The operator's stabilised approach criteria have been rewritten and incorporated into the operator's Flight Operations Manual.. In addition, the operator re-defined a stabilised approach in terms of meeting a number of criteria, including that: Sink rate is no greater than 1000 feet per minute below 1000 ft height above airport (HAA) on all approaches (VMC and IMC) An approach that becomes unstable below 1000 ft IMC or 500 ft VMC requires an immediate go-around.</i></p> <p><b>Rail:</b> <i>Pacific National has advised that the organisation is in the process of amending maintenance inspection procedure WMM04-01' Twistlocks and Container Devices' to include a specific task to inspect all container twistlock castings on RQPW and similar wagons.</i></p> <p><i>(Note: changes to the procedure of inspections – not conducting inspections)</i></p>
	<i>New</i>	<p>Safety actions where new procedures affecting line operators are added. It is assumed that any additional procedures are reflected in documentation as a matter of course. Therefore, do not count documentation as a safety action.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> <i>China Shipping Development has advised personnel on board all their managed ships that when a collision has, or may have, occurred, the bridge watch keeper should stop the ship on the spot to further check. When necessary, they should take proactive rescue measures and record the time and ship's position. In any case, they must call the master and report to the company to seek support.</i></p> <p><b>Rail:</b> <i>Examination of wagon RCPF-31882C revealed a crack on the tread of a wheel on the second axle of the leading bogie. While not contributing to this derailment, if the crack were to develop to such an extent that the wheel tread completely fractured, the risk of derailment would increase significantly. Pacific National Limited has train examination procedures in place for these items.</i></p> <p><b>Aviation:</b> <i>Airservices Australia subsequently issued an instruction to controllers in relation to the Airbus Industrie A380-800: When a Super wake turbulence category aircraft is making an approach to a parallel runway, provide wake turbulence distance separation to the adjacent runway when the aircraft approaching the adjacent runway has a maximum takeoff weight (MTOW) less than 25,000 kg.</i></p>

	Review	<p>Safety actions where there is only a commitment to review procedures affecting line operators.</p> <p><b>Examples:</b></p> <p><b>Aviation:</b> The aircraft operator evaluated the provision of additional formal guidance to 747 400 flight crew for operations on standby power, including a review of the non-normal checklists, section 6 - electrical, of the 747 400 quick reference handbook (QRH).</p> <p><b>Marine:</b> Orica has advised the ATSB that the company has taken two main actions relating to packing of ammonium nitrate for sea transport following the incident. Orica has worked with the Australian Maritime Safety Authority (AMSA) to agree on a revised packing procedure for ammonium nitrate prills.</p>
Training	New/ amend	<p>Safety actions where new or additional training is provided or conducted (does not include re-training of involved personnel).</p> <p><b>Examples:</b></p> <p><b>Aviation:</b> The aircraft operator has put in place a Continuous Descent Final Approach method training package. This package trains pilots so that they are able to achieve a stabilised approach to a landing once suitable visual reference to the runway environment has been established.</p> <p><b>Marine:</b> Develop an induction package that highlights high risk operational tasks to be viewed by unfamiliar facility personnel prior to task being undertaken. Trainer to ascertain facility personnel's understanding. Familiarisation to be recorded in current competency matrix. Drills to be undertaken on irregular high risk tasks (i.e. disconnection drill prior to cyclone season).</p>
	Review	<p>Safety actions where training (e.g. modules or curriculum) is reviewed.</p> <p><b>Examples:</b></p> <p><b>Aviation:</b> The operator has reported that it is conducting a review of existing flight training arrangements.</p> <p><b>Marine:</b> Enterprises Shipping and Trading has advised the ATSB that the company has revised its safety management system with regards to steering drills.</p>
	Re-training	<p>Safety actions where re-training of involved personnel is conducted or provided.</p> <p><b>Examples:</b></p> <p><b>Rail:</b> Refresher training and a formal reassessment of network rules knowledge was completed by the second driver on 27 March 2009 and a WestNet Rail Track Access Permit was issued to the driver for a further three years.</p>
Communication/ education	Awareness	<p>Safety actions where communication/ education is provided to raise awareness of safety issues to the organisation or crew. This may involve presentations, newsletters, articles in magazines etc.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> Issued company circulars to all company vessels, pertaining to the case of Great Majesty engine room flooding</p> <p><b>Aviation:</b> The operator released a flight staff instruction to company Bell 412 pilots, communicating that should they experience unusual or excessive vibrations during flight, that they land the helicopter and notify the company engineering personnel.</p>

	<p><i>Documentation (not procedure or policy related)</i></p>	<p>Safety actions where a change in documentation is made or additional documentation is created in response to a safety issue. This safety action does not include changes or additions to policy or procedures – assumes any changes in procedure or policy would involve a change in documentation.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> <i>Petra Marine recognises that the drill schedule may have lead to some confusion and that this document will be amended accordingly.</i></p> <p><b>Aviation:</b> <i>Two of the three out-of-hours contact telephone numbers for the duty Proserpine Aerodrome Airport Safety Officer, listed in the Jeppesen Airways Manual, were incorrect. Action taken by Jeppesen Following advice of this safety issue, Jeppesen revised their data for the aerodrome, including the telephone numbers, and published it in their next amendment cycle.</i></p>
	<p><i>Service bulletins, advisories, circulars</i></p>	<p>Safety actions where non-mandatory actions that should to be taken are communicated to an organisation or organisations. Examples of these safety actions include issuing a service bulletin, CAAP or safety advisories to organisations.</p> <p><b>Examples:</b></p> <p><b>Aviation:</b> <i>The second edition of the Air Transport Communication (AT com) 20 advised of impending amendments to Civil Aviation Advisory Publication (CAAP) 234. In amending CAAP 234, clear guidance will be given to industry regarding the two independent means of ensuring the correct amount of fuel is onboard an aircraft. The amended CAAP 234 will emphasise the responsibilities of the Pilot-in-Command and the operator in adhering to the manufacturer's guidance in determining the amount of fuel onboard an aircraft.</i></p> <p><b>Marine:</b> <i>On 17 February, the day after the fire, ASP Ship Management advised all chief engineers in the fleet of the incident on board River Embley and instructed them to check the operation of each screw air compressor and to test all associated safety devices. Subsequently, the planned maintenance schedules on board all ships in the fleet have been updated to include routine testing of compressor shutdown devices.</i></p>
<p><b>Mandatory requirements</b></p>	<p><i>Directives</i></p>	<p>Safety actions where directives are provided and it is mandatory that organisations follow these directives. These mandatory requirements may come from the manufacturer or the regulator. Some examples of these directives include worthiness directives and orders.</p> <p><b>Examples:</b></p> <p><b>Aviation:</b> <i>Subsequent to this occurrence, the United States (US) Federal Aviation Administration (FAA) adopted airworthiness directive AD 2009-22-14 (effective 8 December 2009), requiring the installation of larger dripshields and drain lines in the electrical/electronic equipment centres of aircraft manufacturer's 747-200C and 747-200F aircraft to prevent water contamination of essential electrical/electronic units.</i></p> <p><b>Marine:</b> <i>AMSA has advised the ATSB that a review of the coastal pilotage marine orders is being finalised. Changes will include an upgrade of check pilot procedures to promote more rigour and independence within the check pilot system.</i></p>

	<i>Legislation</i>	<p>Safety actions that involves a change or addition of acts and regulations (does not include reviews of legislation only).</p> <p><b>Examples:</b></p> <p><b>Marine:</b> Australian Maritime Safety Authority is currently undertaking a review of the Navigation Act 1912.</p> <p><b>Aviation:</b> CASA has advised the ATSB that the proposed Civil Aviation Safety Regulation Part 142 is under review as a matter of priority and has now been progressed to the Office of Legislative Drafting and Publishing.</p>
	<i>Review of requirements</i>	<p>Safety action where regulators or manufacturers have committed only to review the adequacy of current requirements</p> <p><b>Examples</b></p> <p><b>Aviation:</b> CASA has advised that it will review the requirements for initial pilot training and endorsement and recurrent training on all helicopters. This will include a review of the Helicopter Flight Instructors Manual.</p>
<b>Organisational surveillance</b>	<i>QA, audits, monitoring</i>	<p>Safety actions which involve the internal monitoring, quality assurance, or auditing of an organisation's policies and processes. These organisational surveillance actions are conducted by the organisation and not by an external party (see External Surveillance).</p> <p><b>Examples:</b></p> <p><b>Marine:</b> ATSB has been advised that the following safety actions have been taken by Parakou Shipping following the engine room flooding onboard Great Majesty: Ballast operation procedures have been modified and compliance with these procedures is being monitored.</p> <p><b>Rail:</b> FreightLink has advised that it will carefully monitor track performance, particularly during the high risk periods from October through to December.</p>
	<i>Risk assessment</i>	<p>Safety actions where risks are assessed – at any level of the organisation, by crew, managers etc.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> The Port of Melbourne Corporation has advised the ATSB that as a result of the incident a formal risk assessment was undertaken to address matters related to this safety issue.</p> <p><b>Aviation:</b> In response to this accident, the WA Department of Environment and Conservation conducted a risk assessment of all aviation activities conducted by the department, including the conduct of aerial culling programs. That assessment identified a number of areas of high risk associated with the current conduct of aviation activities within the WA Department of Environment and Conservation.</p>
	<i>Further research/ study</i>	<p>Safety actions that involve further research/ study into safety issues and associated projects etc.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> Conduct an operational audit of all Floating storage and offloading unit-specific practices to ensure validity, compliance and alignment of procedures.</p> <p><b>Aviation:</b> The French BEA issued the following recommendation to the European Aviation Safety Agency (EASA):</p> <ol style="list-style-type: none"> <li>1. undertake studies to determine with appropriate precision the composition of cloud masses at high altitude, and</li> <li>2. in coordination with the other regulatory authorities, based on the results obtained, modify the certification criteria.</li> </ol>

	<i>Other</i>	Safety actions involving organisational surveillance which is not covered by the above safety action categories.
<b>External surveillance</b>		<p>Safety actions conducted by external parties (e.g. regulator and government agencies) to monitor or audit an organisation or industry.</p> <p><b>Examples:</b></p> <p><b>Marine:</b> <i>The American Bureau of Shipping is also reviewing its files to determine any sister vessels which may require modifications if found with similar arrangements</i></p> <p><b>Aviation:</b> <i>CASA advised that they have brought the matter to the attention of their audit team for future review and compliance monitoring.</i></p> <p><u>and</u></p> <p><i>On 16 June 2009, CASA advised the following: CASA will follow up with the operator regarding their action on "4.1.2 Inadequate checklist procedures to verify position of switches" and "4.1.3 Absence of crosscheck in checklist".</i></p>
<b>No action</b>		Applicable only to when there was no proactive safety action taken in response to a safety issue or when no safety action was taken in response to a safety recommendation. Not applicable to Safety Advisory Notices.
<b>Other</b>		Safety actions which do not belong in any of the above safety action categories.

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## APPENDIX B: Investigations Completed - 2010-2011 Financial Year

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### Aviation

**AO-2007-065**

**Mid-air collision - Latrobe Valley Aerodrome - 01-Dec-07**

*Date completed:*  
25 Nov 2010

On 1 December 2007, a Cessna 172 aircraft and an Avid Flyer collided in midair while conducting circuit operations at Latrobe Valley Aerodrome, Victoria. The Cessna was being flown by a student pilot who was conducting a series of solo circuits and the Avid was being flown by an experienced pilot. The Cessna collided with the Avid from above and behind after both aircraft had turned onto the final leg of the circuit. The Avid descended uncontrolled and impacted the ground. The pilot was fatally injured. Although the Cessna sustained damage from the collision, the student pilot was able to land the aircraft. The investigation revealed that the student pilot was unaware of the Avid's presence before turning onto final, even though both aircraft had been in the circuit for some time prior to the collision. Whereas there was no evidence that the common traffic advisory frequency procedures at the aerodrome were a factor in the occurrence, a radio broadcast that was made prior to the collision possibly contributed to the student becoming unaware of the position of the Avid. The investigation also identified a safety issue in regard to the guidance contained in the flying school's operations manual. The flying school reported that, as a result of this accident, it has amended its operations manual to include guidance on competency-based training and risk management strategies for application to solo student flight operations. In addition, the flying school has implemented an electronic, competency-based training system and provided training on its use to the school instructors and students.

**AO-2008-003**

**Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438**

*Date completed:*  
13 Dec 2010

On 7 January 2008, a Boeing Company 747-438 aircraft, registered VH-OJM, was being operated on a scheduled international regular public transport service between London, England and Bangkok, Thailand. The aircraft had 346 passengers and 19 crew on board, including four flight crew. On descent to Bangkok International Airport, the customer service manager notified the flight crew that a substantial water leak had occurred in the forward galley. The cockpit indications progressively showed a number of electrical power-related malfunctions, and many of the aircraft's communication, navigation, monitoring and flight guidance systems were affected. A number of flight and navigation display and other instruments were available in degraded mode and the standby instruments and instrument landing system were also available. The aircraft's engines and hydraulic and pneumatic systems were largely unaffected and an approach was made to Bangkok in day visual meteorological conditions. The investigation found the galley leak was from an overflowing drain after a drain line had been blocked with ice that formed due to an inoperable drain line heater. The water flowed forward and through a decompression panel into the aircraft's main equipment centre before leaking onto three of the aircraft's four generator control units, causing them to malfunction and shut down. The investigation identified a number of safety issues in regard to the protection of aircraft systems from liquids, and other factors including the provision of information to flight crews. In response, the aircraft manufacturer and operator implemented a number of safety actions intended to prevent a recurrence. In addition, the United States Federal Aviation Administration issued a notice of proposed rulemaking to adopt a new airworthiness directive for certain 747-400 and 747-400D series aircraft to install improved water protection. The Australian Transport Safety Bureau has issued two safety recommendations and one safety advisory notice as a result of the investigation.

<b>AO-2008-006</b>	<b>Breakdown of separation - Tamworth Aerodrome, New South Wales - 07-Feb-08</b>
<i>Date completed:</i> 20 Aug 2010	<p>On 7 February 2008 at Tamworth Aerodrome, New South Wales, an air traffic controller issued a take-off clearance to the flight crew of a Bombardier Inc DHC-8-315 (DHC8) aircraft, registered VH-TQZ, for runway 30 right. At the same time, an airport operations officer was operating a vehicle on that runway. The controller had previously issued a clearance to the operations officer to conduct bird dispersal activities on the runway. The operations officer was monitoring his radio and heard the DHC8's take-off clearance. He advised the controller that he would vacate the runway. At the same time, the flight crew had observed the vehicle on the runway and did not commence the takeoff. The controller cancelled the take-off clearance until the runway was clear. While these secondary safety defences effectively prevented any possibility of an accident, the issue of the take-off clearance with the vehicle on the runway constituted a breakdown of separation. The investigation found that the controller's scan of the runway and flight strip board was not effective as a result of his pre-occupation with the management of current and pending traffic and the associated high volume of radio communications. It was also possible that the controller was experiencing some degree of fatigue at the time. The ATSB's investigation did not detect any safety issues that required consequent safety action.</p>
<b>AO-2008-014</b>	<b>Mid-air collision - 9 km NE Wee Waa, New South Wales - 26-Feb-08, VH-CJK, Air Tractor, VH-ATB, Air Tractor</b>
<i>Date completed:</i> 26 Jul 2010	<p>At about 0930 Eastern Daylight-saving Time on 26 February 2008, an Air Tractor Inc. 502, registered VH-CJK (CJK) that was aerial spraying 10 km north-east of Wee Waa, New South Wales and an Air Tractor Inc. 502B, registered VH-ATB (ATB) that had just departed from a nearby airstrip, collided at about 200 ft above ground level. The pilot of CJK was fatally injured and the pilot of ATB was seriously injured. Both aircraft were seriously damaged. Neither pilot was aware of the other aircraft, and although visibility at the time of the accident was reported as 'good', either one or both pilots did not see the other aircraft in sufficient time to avoid a collision. The limitations of an unalerted visual traffic scan could explain why both pilots may not have seen the other aircraft but, without the knowledge of one another's intended operations they lacked situational awareness. Generally, agricultural pilots relied on visual separation and vertical segregation to avoid collisions. In this instance, the proximity of the field being sprayed to the airstrip from which ATB took off and the aircraft's climb gradient from that airstrip, brought the two aircraft into conflict.</p>
<b>AO-2008-026</b>	<b>Loss of control - 19 km south-east of Sydney Airport, NSW - 09-Apr-08 - VH-OZA, Metroliner III</b>
<i>Date completed:</i> 16 May 2011	<p>On 9 April 2008, at 2325 Eastern Standard Time, a Fairchild Industries Inc. SA227-AC (Metro III) aircraft, registered VH-OZA, departed Sydney Airport, New South Wales on a freight charter flight to Brisbane, Queensland with one pilot on board. The aircraft was subsequently observed on radar to be turning right, contrary to air traffic control instructions to turn left to an easterly heading. The pilot reported that he had a 'slight technical fault' and no other transmissions were heard from the pilot. Recorded radar data showed the aircraft turning right and then left, followed by a descent and climb, a second right turn and a second descent before radar returns were lost when the aircraft was at an altitude of 3,740 ft above mean sea level and descending at over 10,000 ft/min. Air traffic control initiated search actions and search vessels later recovered a small amount of aircraft wreckage floating in the ocean, south of the last recorded radar position. The pilot was presumed to be fatally injured and the aircraft was destroyed. Both of the aircraft's on-board flight recorders were subsequently recovered from the ocean floor. They contained data from a number of previous flights, but not for the accident flight. There was no evidence of a midair breakup of the aircraft. The investigation determined that it was highly likely that the pilot took off without alternating current electrical power supplied to the aircraft's primary flight instruments, including the pilot's artificial horizon and both flight recorders. It is most likely that the lack of a primary attitude reference during the night takeoff led to pilot spatial disorientation and subsequent loss of control of the aircraft. A significant safety issue was identified in respect of the aircraft operator's training and checking of its pilots. As a result of audits conducted following the accident, the Civil Aviation Safety Authority imposed a number of conditions on the operator's air operator's certificate that were reportedly actioned by the operator.</p>

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**AO-2008-053**

**Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK**

*Date completed:*

22 Nov 2010

On 25 July 2008, a Boeing Company 747-438 aircraft carrying 369 passengers and crew rapidly depressurised following the forceful rupture of one of the aircraft's emergency oxygen cylinders in the forward cargo hold. The aircraft was cruising at 29,000 ft and was 55 minutes into a flight between Hong Kong and Melbourne.

Following an emergency descent to 10,000 ft, the flight crew diverted the aircraft to Ninoy Aquino International Airport, Manila, Philippines, where it landed safely. None of the passengers or crew sustained any physical injury.

A team of investigators, led by the Australian Transport Safety Bureau (ATSB) and including representatives from the US National Transportation Safety Board (NTSB), the US Federal Aviation Authority (FAA), Boeing and the Civil Aviation Authority of the Philippines (CAAP) examined the aircraft on the ground in Manila. From that work, it was evident that the oxygen cylinder (number-4 in a bank along the right side of the forward cargo hold) had burst in such a way as to rupture the adjacent fuselage wall and be propelled upwards; puncturing the cabin floor and impacting the frame and handle of the R2 door and the overhead cabin panelling. No part of the cylinder (other than the valve assembly) was recovered and it was presumed lost from the aircraft during the depressurisation.

The ATSB undertook a close and detailed study of the cylinder type, including a review of all possible failure scenarios and an engineering evaluation of other cylinders from the same production batch and of the type in general. It was evident that the cylinder had failed by bursting through, or around the base - allowing the release of pressurised contents to project it vertically upwards. While it was hypothesised that the cylinder may have contained a defect or flaw, or been damaged in a way that promoted failure, there was no evidence found to support such a finding. Nor was there any evidence found to suggest the cylinders from the subject production batch, or the type in general, were in any way predisposed to premature failure.

Several minor safety issues and areas for potential safety improvement identified during the flight operations and cabin safety investigations have been addressed by the operator's safety action, or were the subject of safety advisory notices (SAN's) issued by the ATSB

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**AO-2008-059**

**Midair collision - 3 km NW Moorabbin Aerodrome, Victoria - 27 Aug 2008 - VH-UPY, Cessna Aircraft Company A150M - VH-CGT, Piper Aircraft Corp PA-28-161**

*Date completed:*

31 May 2011

On 27 August 2008 at 1238 Eastern Standard Time, a solo student pilot in a Cessna Aircraft Company A150M aircraft, registered VH-UPY (UPY), and a student pilot and instructor in a Piper Aircraft Corp PA-28-161 aircraft, registered VH-CGT (CGT), were flying about 3 km north-west of Moorabbin Aerodrome, Victoria. The pilot of UPY conducted a touch-and-go on runway 31 left (31L) at Moorabbin as CGT was entering the control zone from the north-west at 1,000 ft above mean sea level (AMSL) to join the circuit on left downwind for runway 31L. As CGT approached the circuit pattern, the student pilot saw UPY, very close and climbing from his left on a collision course, and took avoiding action. However, the two aircraft collided, resulting in UPY colliding with terrain and fatal injuries to the solo student pilot. In the time leading up to the collision, the air traffic controller workload had been high and relevant traffic information was not issued to the pilots in sufficient time to assist self-separation. The investigation identified that the design of the then Moorabbin Aerodrome General Aviation Aerodrome Procedures (GAAP) airspace did not provide lateral or vertical separation between traffic flows, and that this increased the risk of a midair collision. In addition, Airservices Australia (Airservices) had not acted on a number of internal recommendations to manage a gradual increase in operations at Moorabbin. As a result of this investigation, Airservices have undertaken a review of their internal processes for reviewing safety performance. In addition, as a result of a number of midair collisions in the vicinity of GAAP aerodromes, the Civil Aviation Safety Authority (CASA) undertook several reviews of GAAP leading to improved training procedures and, as an interim measure, restrictions on the number of aircraft in the circuit. On 3 June 2010, CASA implemented Class D airspace procedures at all GAAP aerodromes throughout Australia.

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**AO-2008-062****Collision with terrain - 6 km NE Purnululu ALA, Western Australia - 14-Sep-08 - VH-RIO, Robinson Helicopter Company R44***Date completed:*

7 Jul 2010

On 14 September 2008, a Robinson Helicopter Company R44 Raven helicopter, registered VH-RIO, was being operated on a series of scenic flights in the Bungle Bungle ranges area of the Purnululu National Park, which was about 250 km south of Kununurra, Western Australia. At about 1230 Western Standard Time, the helicopter departed the Purnululu Aircraft Landing Area for an 18-minute scenic flight with the pilot and three passengers. When the helicopter did not return by the nominated time, a search was initiated. Shortly after, the burnt wreckage of the helicopter was located. The four occupants were fatally injured. The pilot had deviated from the regular scenic flight track, speed and profile to operate out of ground effect (OGE) in close proximity to the terrain at a low airspeed or at the hover. The helicopter's estimated OGE hover performance was marginal. It is likely that the high level of engine power required to sustain a hover in the local conditions was not available, or not fully utilised by the pilot, resulting in; an uncommanded descent, overpitching of the main rotor as a result of the pilot's attempts to arrest that descent, and a main rotor RPM decay that significantly increased the rate of descent. As a result of the investigation into this occurrence, two minor safety issues were identified:

- There was no Australian requirement for endorsement and recurrent training conducted on Robinson Helicopter Company R22/R44 helicopters to specifically address the preconditions for, recognition of, or recovery from, low main rotor RPM.
- There was a lack of assurance that informal operator supervisory and experience-based policy, procedures and practices minimised the risk of pilots operating outside the individual pilot's level of competence. In response, the aircraft operator has since formalised the operating parameters applicable to pilots conducting scenic flights.

In addition, the Civil Aviation Safety Authority will be reviewing the training requirements affecting R22/44 helicopters. The Australian Transport Safety Bureau has issued a Safety Advisory Notice to encourage operators to address the risk of their pilots operating outside the individual pilot's level of competence.

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**AO-2008-064****Stick shaker activation - Alice Springs, Northern Territory - 18 September 2008, VH-NXE, Boeing Company 717-200***Date completed:*

10 Mar 2011

On 18 September 2008, a Boeing Company 717-200 (717), registered VH-NXE, was being operated on a scheduled passenger flight from Cairns, Queensland to Alice Springs, Northern Territory. There were 70 passengers, four cabin crew and two flight crew on board. During the manually-flown visual approach by the pilot in command (PIC) to runway 30 at Alice Springs Aerodrome, the stickshaker activated. The pilot flying lowered the nose while continuing the turn onto final. The stickshaker activated again before the flight crew stabilised the approach to within the operator's criteria and landed without further incident.

The investigation found that the stickshaker activated because of a combination of bank angle, high nose-up pitch change rate and airspeed slightly below the approach speed. The aircraft was higher, faster and closer to the aerodrome than was suitable for the direct-to-final approach being attempted. The autothrottle was inadvertently not engaged by the flight crew after the automatic flight system was disconnected earlier in the approach, which contributed to the airspeed reduction. The PIC's response to the stickshaker did not conform to the aircraft manufacturer's procedures. The investigation also found that the PIC's judgement and monitoring ability were probably adversely affected by personal and work stress and associated fatigue, although the duty roster met the necessary standards. Pilots operating within flight and duty time limitations can still experience fatigue. Responsibility for adequate flight crew wellbeing before flight rests with both operators and their pilots. The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, in response to this occurrence, the operator proactively issued a number of notices to pilots to enhance pilot flight mode annunciator and auto mode awareness in the 717, to highlight the aircraft's buffet protection system and to discuss recent stickshaker events, and to describe the stall recovery procedure in the 717. In addition, the operator amended a number of its command upgrade and recurrent simulator training requirements and worked with the aircraft manufacturer to reduce the incidence of stickshaker events across the operator's 717 fleet.

<b>AO-2008-065</b>	<b>Collision with terrain - Luddenham, New South Wales, 24 September 2008, VH-CZX, Liberty Aerospace Incorporated XL2</b>
<i>Date completed:</i> 27 Apr 2011	<p>On 24 September 2008, at about 1606 Eastern Standard Time, a Liberty Aerospace Incorporated XL2 aircraft, registered VH-CZX, descended through trees and collided with terrain 2 km south of Luddenham, New South Wales. The sole occupant, a student pilot, was fatally injured and the aircraft sustained serious damage. No evidence of any mechanical fault that could have contributed to the accident was found. The weather was benign. A post-mortem examination of the pilot did not identify any pre-existing medical conditions that may have contributed to the accident. Traces of a cannabis metabolite were present in the pilot's blood, indicating previous use of, or exposure to cannabis. There was no evidence that the pilot was impaired by cannabis at the time of the accident; however, there is extensive evidence that the use of cannabis increases the risk of the impairment of pilot performance.</p>
<b>AO-2008-072</b>	<b>Missing aircraft, Buckingham Bay, Northern Territory, 16 October 2008, VH-WRT, GA-8 Airvan</b>
<i>Date completed:</i> 19 Jul 2010	<p>On the morning of 16 October 2008, a Gippsland Aeronautics GA-8 Airvan, registered VH-WRT, was being operated on a freight charter flight from Elcho Island and return, Northern Territory. At about 1230, it was realised that the aircraft was missing. A witness reported seeing the aircraft during the early stages of the flight and, shortly afterwards, a column of dark black smoke rising from the eastern side of the Napier Peninsula. On 17 October 2008, items of wreckage from the aircraft were found in the south-western part of Buckingham Bay. The pilot, who was the sole occupant of the aircraft, and the main wreckage of the aircraft have not been found. After consideration of the available evidence, the investigation was unable to identify any factor that contributed to the accident.</p>
	<p>Although the investigation did not identify any issues that had the potential to adversely affect the safety of future operations, the operator took proactive safety action in response to the accident. That action included changed procedures in the areas of cargo restraint and the carriage of dangerous goods, the supervision and oversight of flights, and to the operator's flight following requirements. In addition, the operator has acted to reduce pilot workload.</p>
<b>AO-2008-078</b>	<b>Wirestrike 13 km north of Murray Bridge, South Australia 19 November 2008 VH-PLJ McDonnell Douglas 369D</b>
<i>Date completed:</i> 9 Dec 2010	<p>On the morning of 19 November 2008, the pilot of a McDonnell Douglas 369D helicopter, registered VH-PLJ, and two lineworkers were conducting airborne joint-testing operations on an electricity transmission line between Mannum and Mobilong, South Australia. Joint testing involves closely approaching the transmission line to check joints in transmission wires. At about 1150 Central Daylight-saving Time, when about 13 km north of Murray Bridge, the helicopter's main rotor blades contacted a transmission line conductor. The pilot lost control and the helicopter impacted the ground. One lineworker was fatally injured, the other lineworker received minor injuries and the pilot was seriously injured. The helicopter was seriously damaged.</p> <p>The investigation found that the crew was not aware before the flight that there were transpositions (changes in the relative positions of individual wires) in the line and that they did not detect such a transposition during the approach for the joint test that led to the accident.</p> <p>Following the occurrence, the helicopter operator amended the guidance for conducting joint-testing and expanded training and supervision of new crews. The powerline owner reviewed the risk profile of its airborne operations and revised a number of hazard treatment options. The powerline maintenance provider made a number of operational changes and contracted an external auditor to examine its operation. All of the recommendations from that audit were adopted by the maintenance provider.</p> <p>In response to the failure of the recording lineworker's shoulder harness, the shoulder harness repair facility has upgraded relevant repair equipment and provided a replacement program for any incorrectly-stitched harness in the operator's helicopter fleet. In addition, the Civil Aviation Safety Authority took action to have a number of seat belt harnesses recalled and examined. No issues were found with any of the seat belts that were examined and they were able to be re-released without further rework.</p>

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**AO-2008-080**

**Operational event - Darwin Aerodrome, Northern Territory - 17 December 2008 - PK-GZJ, Boeing B737-4MO**

*Date completed:*

3 Mar 2011

On 17 December 2008, a Boeing Company 737-4MO aircraft, registered PK-GZJ, made a significant diversion around weather at night while en route to Darwin, Northern Territory from Denpasar, Indonesia. The aircraft was cleared to conduct the runway 11 very high frequency omnidirectional radio range (VOR) approach via the initial approach fix NASUX. After the weather diversion, it was more convenient for the flight crew to make a pilot intercept of the 285 radial from the VOR but there was a period of misunderstanding as a result of a breakdown in the application of standard radiotelephony readbacks.

The flight crew left the previously-cleared altitude of 3,000 ft on descent although they had not been cleared to do so. When this became apparent, no updated clearance for a pilot intercept of the 285 radial was issued by the controller. The aircraft continued to descend on the basis of the runway 11 VOR descent profile, even though it was not conducting the runway 11 VOR approach.

The flight crew used the position calculated by the aircraft's inertial reference system (IRS) to intercept the 285 radial, instead of using the signal from the VOR. The IRS position was not accurate enough for this, and the aircraft tracked to outside of the stipulated 5 degrees tolerance either side of the 285 radial. From then on, the aircraft was no longer 'established' on the 285 radial even though it was below the minimum sector altitude in cloud. When it broke through the cloud, the aircraft was clearly not aligned with the runway and a missed approach was carried out.

The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, in response to the occurrence, the aircraft operator developed a corrective action plan that addressed a number of crew resource management and non-precision approach training aspects to the event.

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**AO-2008-083**

**Collision with terrain, VH-EKS, 67 km WNW Scone Airport, New South Wales - 24 December 08**

*Date completed:*

14 Jul 2010

At about 1452 Eastern Daylight-saving Time on 24 December 2008, a Cessna Aircraft Company 172L aircraft, registered VH-EKS, with a pilot and one passenger, departed Mudgee on a private visual flight rules (VFR) flight to a property near Glen Innes, New South Wales. About 15 minutes after departure, the pilot encountered increasing cloud and, after climbing to assess the weather ahead, decided to descend visually through the cloud in order to maintain visual meteorological conditions. The pilot descended the aircraft into a valley that was enshrouded in cloud. After flying up the valley for a short time, the pilot decided to turn back. During the turn-back manoeuvre, the aircraft entered cloud. The pilot became disorientated and the aircraft collided with terrain. The pilot and passenger were seriously injured and the aircraft was seriously damaged. Shortly after, the passenger succumbed to his injuries. The pilot's decision not to obtain the relevant Bureau of Meteorology forecasts prevented a full understanding of the weather likely to affect the flight and what impact this might have on his flight planning, including alternate routes and fuel requirements. Similarly, the pilot's decision not to submit any form of formal flight notification, and to not replace the normally-carried portable Emergency Locator Transmitter, adversely affected the prompt commencement of a search and rescue following the accident. While not contributory to the accident, the investigation identified an error in the flight planning requirements in the Visual Flight Guide (VFG) for VFR flights away from a departure aerodrome. The Civil Aviation Safety Authority (CASA) has advised that the VFG has been withdrawn for amendment. The investigation also identified that the optional nature of the navigational component of the Aeroplane Flight Review (AFR) meant that a pilot's navigation skills could remain unassessed for an extended period. While this did not contribute to the accident, CASA has advised that the optional nature of the navigational component will be amended to being a recommended element of the AFR, and that guidance will be provided on its conduct.

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**AO-2009-004**

**Operational event - 89 km south-east of Townsville Aerodrome, Queensland - 2 February 2009 - VH-ESH - Augusta Westland AW139**

*Date completed:*

5 Oct 2010

On 2 February 2009, an Augusta Westland AW139 helicopter, registered VH-ESH, departed under the instrument flight rules (IFR) from Mackay Aerodrome, Queensland. The helicopter had been repositioned to Mackay the previous day from its Townsville Aerodrome base due to the threat posed by an approaching tropical cyclone. The purpose of the flight was to return the helicopter to Townsville following the passage of the cyclone. Shortly after departure from Mackay, the crew were presented with an increasing number of alert messages indicating the failure of various helicopter systems. While the crew were focussed on assessing these messages, the autopilot altitude hold function disengaged, leading to a descent that was not detected by either the flight crew or air traffic services (ATS). The helicopter descended undetected for over 6 minutes while flying towards an area of rising terrain, losing about 3,300 ft of altitude, before ATS observed the descent and alerted the crew. The investigation determined that the helicopter sustained two independent technical problems; one associated with water and particulate ingress and a second related to the probable susceptibility of the air data system to in-flight turbulence. These failures resulted in multiple erroneous alert messages and uncommanded disengagement of the altitude hold function. The investigation also identified a number of safety factors relating to workload and task management by the crew and monitoring of the aircraft by ATS. Following the occurrence, the helicopter manufacturer and operator, and the Civil Aviation Safety Authority (CASA) implemented a number of safety actions relating to the identified technical and operational safety issues. In addition, the manufacturer and operator of the helicopter, and CASA undertook proactive safety action in a number of cases for which no safety issues were identified. Finally, concurrent with the release of this report, the Australian Transport Safety Bureau has issued a Safety Advisory Notice suggesting that the Department of Defence should consider enabling the capability of the Australian Defence Air Traffic System in the Townsville area to alert air traffic controllers in the case of an aircraft altitude deviation.

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**AO-2009-007**

**Collision on ground - VH-SBW, Dash-8-315, Townsville Aerodrome, Qld - 11-Feb-09**

*Date completed:*

28 Jan 2011

On 11 February 2009 at about 1922 Eastern Standard Time, a Bombardier Inc DHC-8-315 commenced the take-off roll on runway 01 at Townsville Aerodrome for Cairns, Queensland. During the takeoff, the pilot in command realised that the aircraft was aligned with the left runway edge lighting. The aircraft was manoeuvred to the centre of the runway and the takeoff rejected. It was later determined that the aircraft's left mainwheel had damaged a runway edge light. There were no injuries to the 34 passengers or five crew members and no damage to the aircraft. The investigation found a number of factors that may have led to the pilot in command not aligning the aircraft on the runway centreline for the takeoff. Those factors included misinterpreting the normal runway cues, time pressure to depart, the weather conditions at Townsville Aerodrome and the associated delays during the aircraft's arrival, landing and departure. Following this occurrence, the operator amended their operational procedures to ensure aircraft were aligned on the centreline of the assigned runway. In addition, the Australian Transport Safety Bureau (ATSB) has released an Aviation Research and Analysis Report (AR-2009-033) that examined a number of domestic and international occurrences in which pilots commenced the takeoff while aligned with the runway edge lighting. In that examination, eight common factors were identified that increased the risk of a misaligned takeoff or landing occurrence, including: the distraction or divided attention of the flight crew; a confusing runway layout; the presence of a displaced threshold or the conduct of an intersection departure; poor visibility or weather; air traffic control clearance(s) issued during runway entry; no runway centreline lighting; flight crew fatigue; and recessed runway edge lighting. The ATSB has developed a Pilot Information Card that will alert pilots of the increased risk of a misaligned takeoff as a result of those factors. The Civil Aviation Safety Authority has indicated that it will distribute the information cards to all pilots in conjunction with an issue of the Flight Safety Australia magazine.

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**AO-2009-011**

**Weight and balance event, VH-QPJ - Sydney Aerodrome, New South Wales - 6 March 2009**

*Date completed:*  
22 Mar 2011

On 6 March 2009, an Airbus A330-303 aircraft, registered VH-QPJ, was being loaded for dispatch on a scheduled international passenger service between Sydney, New South Wales and Hong Kong. Operational changes prior to the aircraft's dispatch required an adjustment of the planned load, with the load controller electing to offload a pallet of freight originally scheduled for that flight, and substituting it with a lighter pallet in the load management system. Following the pallet substitution in that system, the load controller did not amend the loading instructions that had been previously issued to the ramp staff loading the aircraft. That resulted in the ramp staff being unaware of the changed loading requirement and the loading proceeded as initially planned. The discrepancy between the actual aircraft load and operator's load management system was not detected during the completion of the load controller's 'Final Distribution Check' prior to issuing the final load sheet to the flight crew. That resulted in the aircraft exceeding the structural maximum taxi weight by 384 kg and the maximum structural take-off weight by about 884 kg. It also resulted in the flight crew entering inaccurate centre of gravity and zero fuel weight data into a number of the aircraft's systems. Due to a delay in the notification of the loading error to the operator's relevant departments, the aircraft operated another 10 sectors before maintenance inspections for an overweight taxi were completed. As a result of this occurrence, the operator implemented several changes to the process for managing load control activities. Those changes included: implementing a procedure to ensure the immediate notification of loading-related incidents and changes to the operating procedures in load control, including the introduction of a read and sign process for important ramp and load control communications; the appointment of a load control standards officer; and the conduct of a training needs analysis for load control officers.

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**AO-2009-017**

**Wirestrike - Langkoop, Victoria - 20 April 2009 - VH-EZT, Robinson Helicopter Company R44 Raven II**

*Date completed:*  
13 Dec 2010

On 20 April 2009, a Robinson Helicopter Company R44 (Raven II) helicopter, registered VH-EZT (EZT), was conducting aerial spraying operations near Langkoop, Victoria. Spraying commenced at 0800 Central Standard Time with a load of 300 L of foliar fertiliser. There were two helicopters spraying the pine paddocks that morning and the operating crews were to break for lunch at about 1300 at a pre-arranged meeting place. Just prior to lunch, the pilot of EZT was tasked with a number of unplanned spray runs and a cleanup run to complete the morning's spraying. When the helicopter did not arrive at the pre-arranged meeting place, the pilot of the second helicopter commenced searching and located the wreckage of EZT in a paddock, near a powerline. The pilot of EZT was fatally injured.

Helicopter EZT contacted a powerline that intersected the northern half of the final spray paddock before colliding with the ground. An examination of the wreckage of the helicopter did not find any mechanical abnormalities that might have contributed to the accident. Recorded data from the helicopter's satellite navigation system showed that after completing the planned spray runs, the pilot did not conduct a reconnaissance of the unfamiliar area to the south of the plantation to identify any hazards. A reconnaissance flight may have alerted the pilot to the presence of the previously-identified powerline.

The investigation found that an additional hazard identification check prior to the conduct of a cleanup run was not routinely practiced by the pilots, or monitored by the operator. In response to that safety issue, the operator has advised that they will enhance the wire avoidance procedures in their operations manual and mandate that an additional hazard identification check shall be completed prior to any cleanup run. In addition, the investigation determined that there were no fluid quantity markings on the helicopter's spray tank, and that the spray system included unapproved modifications that increased the risk of overweight operations.

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**AO-2009-021**

**Flight control system event - 520 km NW Gold Coast Aerodrome, Queensland, 18 May 2009, VH-VNC, Airbus A320**

*Data completed:*

*24 Aug 2010*

On 18 May 2009, an Airbus Industrie A320-232 aircraft, registered VH-VNC was on a regular public transport flight from Mackay, Queensland (Qld) to Melbourne, Victoria when at about 1249 Eastern Standard Time, the aircraft started to vibrate. Cockpit indications showed that the left aileron was oscillating. The crew diverted the aircraft to the Gold Coast Aerodrome, Qld and landed.

The source of the aileron oscillation was an internal fault in one of the left aileron's hydraulic servos. The fault was introduced during manufacture by an incorrect adjustment of the servo, which caused internal wear in a number of the servo's hydraulic control components. The aileron servo manufacturer has incorporated a new method of adjusting the aileron servos during assembly to minimise the likelihood of a recurrence of the problem.

During the investigation, it was found that an identical fault had occurred to the same aircraft 8 months prior to this incident. The previous incident was not reported to the Australian Transport Safety Bureau by the operator as required by the Transport Safety Investigation Act 2003. The operator has improved the training of its staff and the reportable event requirements in its safety management system manual in an effort to address the non-reporting risk.

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**AO-2009-030**

**Wirestrike - 24 km NNE of Albury Aerodrome, New South Wales - 23 Jun 2009 - VH-CAP, Bell Helicopter Company 206B JetRanger III**

*Date completed:*

*14 Oct 2010*

At about 1100 Eastern Standard Time on 23 June 2009, a Bell Helicopter Company 206B JetRanger III helicopter, registered VH-CAP commenced agricultural spraying operations at a property located 24 km north-north-east of Albury Aerodrome, New South Wales. At 1223 the pilot repositioned to commence an impromptu spray run that resulted in the helicopter flight path crossing a powerline that was known to the pilot. The pilot reported that during the impromptu spray run, he was preoccupied with a request from the property owner to modify the planned spray sequence and forgot about the wire until he sighted it a short distance ahead. In response, the pilot initiated a climb to avoid the wire. He heard the helicopter contact the wire and felt the wire arrest the forward movement.

Although the helicopter was fitted with wire-strike protection system (WSPS) equipment, the wirestrike was outside the strike angle and cable span design parameters of the WSPS. The investigation was unable to determine whether the WSPS might have operated as intended, had the wire continued its initial movement towards the cutter blades before itself breaking.

The pilot's last recollection was seeing the ground rapidly approaching. He regained consciousness an unknown period of time later, still securely restrained in the wreckage. He managed to extricate himself and notify his ground crew. The pilot sustained minor injuries.

The investigation found that the inherent difficulty in visually detecting the wire, combined with the operating groundspeed required for chemical application meant that the pilot did not have sufficient time to avoid the wirestrike. Although no safety issues were identified as a result of this investigation, the protection afforded by the pilot's helmet and the secure restraint offered by the pilot's four-point harness, probably prevented serious, if not fatal injury. Operators and crew would benefit from the consideration of the use of flying helmets, and when feasible, installation of four-point harnesses in their aircraft; particularly during inherently higher risk operations.

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**AO-2009-031**

**Collision with terrain, VH-HXO - 120 km west of Paraburdoo, Western Australia - 25 or 26 June 2009**

*Date completed:*

*3 Jun 2011*

On 24 June 2009, the pilot of a Robinson Helicopter R22 Beta II, registered VH-HXO, departed Mareeba, Queensland on a private flight to Uaroo, Western Australia (WA) as the helicopter had been contracted to an operator for aerial mustering tasks. After an overnight stay at Alice Springs, Northern Territory, the pilot departed for Uaroo on 25 June 2009. The last known stop for the pilot was the night of 25 June 2009, at Newman, WA. After refuelling, the pilot departed some time during that night. The following morning, after the expected arrival time of the helicopter, and after several attempts to contact the pilot, Australian Search and Rescue commenced a search for the missing helicopter. The wreckage was located about 120 km west of Paraburdoo, WA. The pilot was fatally injured as a result of the accident. The investigation found no evidence of a pre-existing mechanical problem with the helicopter. After consideration of the available evidence, the investigation concluded that the accident may have been a function of the pilot's control inputs, possibly resulting from pilot fatigue, carburettor icing, night flight, or a combination of these factors. The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, the accident does provide a timely reminder of the need for pilots conducting private operations to consider the impact of fatigue; particularly, during a long flight over a number of days, as was the case in this occurrence.

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**AO-2009-032**

**Collision with terrain - Gold Coast Aerodrome, Queensland - 02-July-2009 - VH-OML - Robinson Helicopter Company R22 Beta II**

*Date completed:*

*28 Jul 2010*

On 2 July 2009, the pilot of a Robinson Helicopter Company R22 Beta II, registered VH-OML, was conducting solo circuit training from the Gold Coast Aerodrome, Queensland. Weather conditions in the area at the time were fine, with light and variable winds. At about 1015 Eastern Standard Time, the helicopter impacted terrain near the southern aerodrome boundary. The pilot was fatally injured and the helicopter seriously damaged. There was no evidence of a pre-existing mechanical problem with the helicopter. The pilot had extensive previous experience in aeroplanes and the flight was his sixth solo helicopter flight towards his Private Pilot (Helicopter) Licence. The investigation found that the accident may have been a function of the pilot's control inputs. As a result of this investigation, the helicopter operator has made a number of changes to their induction process, including the annotation in company records of instructors' ratings and their respective validity periods. In addition, the Civil Aviation Safety Authority has advised that it will review the requirements for initial pilot training and endorsement and recurrent training on Robinson R22 helicopters. Included will be a review of the Helicopter Flight Instructor's Manual to ensure that the required competencies are being covered by flight instructors and trained to students. The Australian Transport Safety Bureau has issued a Safety Advisory Notice suggesting that operators consider action to ensure the validity of pilots' qualifications and ratings, and that competency standards are met.

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**AO-2009-034**

**Aircraft loading event - VH-EBB, Airbus A330, Sydney Airport, NSW - 04-Jul-09**

*Date completed:*

19 May 2011

On 4 July 2009, an Airbus A330-202, registered VH-EBB, was being operated on a scheduled passenger/freight flight from Sydney, New South Wales to Denpasar, Indonesia via Melbourne, Victoria. During loading of the aircraft at Sydney International Airport, a unit load device (ULD) was loaded onto the aircraft without the proper authorisation. Prior to the aircraft taxiing for departure, loading personnel realised that the ULD had been mistakenly loaded. However, there was confusion in the communication of that information to the flight crew and they operated the flight to Melbourne without knowledge of the misloading. The investigation found that the pilot in command rejected the loading of the ULD before it was loaded in the forward cargo hold, but the status of that ULD was not clearly communicated to the ground handling team and it was returned to the outgoing freight holding area of the departure bay. Contrary to the aircraft operator's procedures, the ULD was subsequently loaded into the aircraft's aft cargo hold, in the absence of a leading hand and without reference on the loading instruction report or the authorisation of the pilot in command. Contributing to the occurrence was a lack of procedure or guidance for the segregation of freight that had been rejected during loading. The investigation identified a number of factors that did not contribute to the incident, but increased operational risk. Those factors related to the performance of the leading hand role, load-checking and procedures for communicating with flight crew after pushback. The aircraft operator initiated proactive safety action to improve the training and supervision of loading staff, including guidelines for all staff involved with the training and support of new ports or ground handling agents. The operator also implemented procedures to enable ground handling agents to make emergency contact with the aircraft crew after pushback and incorporated those procedures in the relevant manuals.

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**AO-2009-047**

**Nose landing gear axle fracture - Melbourne Aerodrome - VH-VBA - Boeing 737-7Q8 - 25-Jul-09**

*Date completed:*

30 Jul 2010

On 25 July 2009, a Boeing 737-7Q8 aircraft, registered VH-VBA, was taxiing toward the runway for departure at Melbourne aerodrome, Victoria, when the crew reported hearing a loud thud from the airframe. The crew of a passing company aircraft advised the crew of VH-VBA that they had lost a nose wheel tyre. It was subsequently discovered that the right wheel had detached from the nose landing gear (NLG) as a result of a fracture of the axle. An Australian Transport Safety Bureau investigation of the NLG failure determined that the nose wheel had separated as a result of the initiation and propagation of a fatigue crack through the right, inboard bearing journal. The fatigue crack had originated under the influence of residual stresses in the steel surface associated with grinding damage during manufacture, and its initiation was probably hydrogen-assisted from plating processes applied to the journal bearing surfaces. As a result of the occurrence, the aircraft operator conducted an immediate, fleet-wide inspection of axles with similar service history. To reduce the likelihood of future possible axle failures, the aircraft manufacturer conducted an audit of the landing gear supplier's processes and production records, in an attempt to establish the extent of the grinding problem. The aircraft manufacturer also released a communication to 737 operators and maintenance providers, detailing enhanced inspection recommendations for the identification of grinding damage.

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**AO-2009-053**

**Powerplant / propulsion event, Launceston aerodrome - 20 August 2009**

*Date completed:*

27 Jul 2010

At approximately 1137 EST on 20 August 2009, a Boeing 737-8BK aircraft, registered VH-VOC, departed Launceston, Tasmania on a scheduled passenger service to Sydney, New South Wales. Following takeoff, several loud bangs were heard from the left engine, consistent with a compressor surge. The left engine was reduced to flight idle and the aircraft returned to land at Launceston.

The compressor surge and damage to the left engine was the result of advanced variable stator vane bushing/shroud wear, which caused a seal retainer to dislodge from the inner shroud segment and move into the compressor gas path. The liberated seal segments then progressed downstream, causing significant impact damage to the remaining stages, resulting in a loss of compressor efficiency.

The manufacturer was aware of the propensity for inner bushing wear, and had previously released a number of service bulletins aimed at eliminating the issue. The operator had incorporated the relevant service bulletins into their inspection and maintenance program as required; however the event occurred prior to the engine reaching the earliest threshold for inspection.

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<b>AO-2009-054</b>	<b>Aircraft proximity event, VH-FKU and VH-HJH Bankstown Aerodrome, New South Wales, 25 August 2009</b>
<i>Date completed:</i> 23 Jul 2010	<p>On 25 August 2009, a Piper Cherokee PA28-161 aircraft, registered VH-FKU, was approaching Bankstown Aerodrome, New South Wales (NSW) from reporting point 2RN in the south-west to join on a crosswind leg for runway 29 right (29R). At the same time, a Piper Chieftain PA31-350 aircraft, registered VH-HJH, was approaching Bankstown Aerodrome from Cessnock to join on a downwind leg for runway 29R. Both aircraft were being operated under the visual flight rules.</p> <p>The pilot of the Cherokee was given traffic information by air traffic control and instructed to widen out to the left and told to expect to follow the Chieftain that was tracking to join on a downwind leg for runway 29R. The pilot of the Cherokee acknowledged the instruction, but subsequently turned downwind in front of and inside the flightpath of the Chieftain. Traffic information was passed to the pilots of both aircraft and the pilot of the Chieftain made a steep descending turn to avoid a collision.</p>
<b>AO-2009-056</b>	<b>Breakdown of separation - 60 km south-east of Mildura, Victoria - 03 September 2009</b>
<i>Date completed:</i> 24 Nov 2010	<p>On 3 September 2009 at about 1859 Eastern Standard Time, a Boeing Company 737-838 aircraft was en route from Sydney, New South Wales to Adelaide, South Australia and a Boeing Company 777-31H aircraft was en route from Melbourne, Victoria to Singapore. The aircraft were on crossing tracks and both were cruising at flight level 300. The air traffic control separation standard was infringed and there was a breakdown of separation. The air traffic controller responsible for separation of the aircraft had recently completed the air navigation service provider's approved training, but had not recognised the potential conflict between the two aircraft. As a result of this incident, Airservices Australia has amended the compromised separation recovery component of an air traffic controller's training, and introduced a compromised separation recovery element into its final controller field training.</p>
<b>AO-2009-060</b>	<b>Collision with terrain, VH-ODP, 5 km north-east of Wickepin, Western Australia - 3 October 2009</b>
<i>Date completed:</i> 23 Feb 2011	<p>At 1153 Western Standard Time on 3 October 2009, the pilot of an Air Tractor Inc. 502 aircraft, registered VH-ODP, took off from an agricultural airstrip on a property about 5 km north-east of Wickepin, Western Australia to conduct agricultural spraying operations. A short time later, the owner of the property discovered the wreckage of the aircraft, which had impacted the ground in an inverted attitude, fatally injuring the pilot. There were no witnesses to the accident; however, the investigation determined that the aircraft had made contact with the upper branches of a tall tree prior to impact with the terrain. No safety issues were identified as a result of this investigation.</p>
<b>AO-2009-061</b>	<b>Engine failure, VH-SBA - Wagga Wagga Aerodrome, New South Wales - 4 October 09</b>
<i>Date completed:</i> 12 Nov 2010	<p>On 4 October 2009, at 1217 Eastern Standard Time, the flight crew of a SAAB Aircraft Co 340B aircraft, registered VH-SBA noted abnormal left engine temperature indications during initial climb-out on a scheduled passenger flight from Wagga Wagga Aerodrome, New South Wales to Melbourne, Victoria.</p> <p>The flight crew later reported that they noticed abnormally high indications from the left engine inter-turbine temperature, before shutting down the left engine and returning to the aerodrome for landing. Subsequent inspection of the left engine indicated internal damage, specifically to the stage 1 compressor section blisk blade.</p> <p>The left engine damage was the result of the fatigue-related failure and separation of four of the stage 1 compressor blisk blades. There was no evidence that material defects or abnormalities contributed to the failures.</p>

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**AO-2009-062****Main landing gear failure - Melbourne Aerodrome- 20 October 2009**

*Date completed:*  
21 Jan 2011

Following landing at Melbourne Aerodrome on 20 October 2009, the crew of a Boeing 737-8FE aircraft, registered VH-VUI, reported that the aircraft was difficult to taxi, requiring more power and steering input than usual. A subsequent visual inspection revealed the number-4 wheel to be oriented at an angle with respect to the axle and, following disassembly, it was discovered that the inner wheel hub and bearing mount had broken away from the wheel assembly.

Examination of the wheel revealed that the inner hub had failed from fatigue cracking that had initiated in the area adjacent to the bearing cup. Fatigue cracking of the inboard bearing cup bore was an emerging issue for the 737 wheel type at the time of the failure. In May 2009, the wheel manufacturer issued a temporary revision to the Standard Practices Manual, with an updated inspection method for the susceptible area, and the aircraft manufacturer had issued a service letter in August 2009 with a periodic inspection requirement. The operator was in the process of reviewing and incorporating the changes into their own maintenance schedules at the time of the incident.

Immediately following the occurrence, the operator performed a fleet-wide examination, identifying those wheels potentially at risk of a similar failure. Subsequently, ten wheels were removed from service for immediate inspection. The operator also implemented an ultrasonic inspection program for wheels with over 4,000 cycles at every tyre change.

The manufacturers of both the aircraft and the wheel released updated information to operators and maintainers in early 2010, which included a revision to the recommended inspection interval.

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**AO-2009-063****In-flight engine failure - Christmas Island - 19 October 2009**

*Date completed:*  
2 Nov 2010

On 19 October 2009, a British Aerospace Avro-RJ70 aircraft sustained an in-flight engine failure shortly after taking off from Christmas Island. The investigation found that the number-2 engine failed due to severe overheating damage to the high-pressure turbine section components. The overheating was most likely related to a defective fuel injector nozzle that exposed the turbine nozzle guide vanes and blades to a sustained over-temperature condition and cumulative thermal damage.

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**AO-2009-065****Unreliable airspeed indication - 710 km S Guam, 28-October-09, VH-EBA, Airbus A330-202***Date completed:**27 Jan 2011*

On 28 October 2009, an Airbus A330-202 (A330) aircraft, registered VH-EBA (EBA), was being operated as Jetstar flight 12 on a scheduled passenger service from Narita, Japan to Coolangatta, Australia. Soon after entering cloud at 39,000 ft, there was a brief period of disagreement between the aircraft's three sources of airspeed information. The autopilot, autothrust and flight directors disconnected, a NAV ADR DISAGREE caution message occurred, and the flight control system reverted to alternate law, which meant that some flight envelope protections were no longer available. There was no effect on the aircraft's flight path, and the flight crew followed the operator's documented procedures. The airspeed disagreement was due to a temporary obstruction of the captain's and standby pitot probes, probably due to ice crystals. A similar event occurred on the same aircraft on 15 March 2009. The rate of unreliable airspeed events involving the make of pitot probes fitted to EBA (Goodrich 0851HL) was substantially lower than for other probes previously approved for fitment to A330/A340 aircraft. However, both of the events involving EBA occurred in environmental conditions outside those specified in the certification requirements for the pitot probes. The French Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA) has recommended the European Aviation Safety Agency (EASA) to review the certification criteria for pitot probes in icing environments. At the time of the occurrence, most of the operator's A330 pilots had not received unreliable airspeed training. Most of these pilots had transferred from the operator's A320 fleet, and the third-party training provider had not included the topic in its A320 endorsement training program, even though it was included in the aircraft manufacturer's recommended program since 2004. The operator identified the problem and included unreliable airspeed in its recurrent training program for the A320 from May 2009 and the A330 from October 2009. The training provider included the topic in its endorsement program from July 2010. The operator, training provider and the Civil Aviation Safety Authority all initiated safety action to minimise the likelihood of similar problems in the future.

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**AO-2009-068****Operational event - 132 km west of Horn Island Aerodrome, Queensland - 9 November 2009 - VH-EMZ - Bell Helicopter Company 412***Date completed:**21 Jan 2011*

At about 1500 Eastern Standard Time on 9 November 2009, a Bell Helicopter Company 412 helicopter, registered VH-EMZ and operating as call sign 'Rescue 700', departed Horn Island Aerodrome, Queensland to rendezvous with a container ship located about 132 km to the west of Horn Island. The purpose of the flight was to evacuate an ill crew member and transfer him to hospital. Prior to arrival, the flight crew had been advised that the patient would need to be recovered via rescue winch from the ship's forecastle. Approaching overhead the winching area, with the rescue crew officer (RCO) and paramedic being lowered by the winch and about 6 m above the deck, the pilot lost sight of the ship. Shortly after, the helicopter began drifting back towards a mast that was located on the forecastle. Despite assistance from the winch operator to re-establish the hover, the pilot was unable to arrest the helicopter's movement and the winch cable became fouled on the foremast while the helicopter continued to drift rearwards. The winch cable separated and the paramedic and RCO fell about 10 m to the ship's deck, seriously injuring both personnel. The investigation identified that the requirement to confirm adequate hover reference existed overhead an intended winch area, before deploying personnel on the winch, was left to the pilot's discretion. In this instance the pilot, despite his extensive experience, did not identify the possibility of losing sight of the ship, and therefore the necessary hover reference. Following the occurrence, the helicopter operator issued an instruction to aircrew emphasising the importance of ensuring that adequate hover reference exists during winching operations. The helicopter operator also commenced a review of its operations manual to ensure that it provides sufficient procedural guidance for winching operations and commenced the development of company-wide aviation risk management training that will commence in early 2011.

<b>AO-2009-070</b>	<b>Collision with terrain - VH-ZRR, 21 km SE of Kojonup, Western Australia - 17-November-2009</b>
<i>Date completed:</i> 26 Nov 2010	At about 0800 Western Standard Time on 17 November 2009, the pilot of a Cessna Aircraft Company A188B Agwagon, registered VH-ZRR was fatally injured when his aircraft impacted terrain during spraying operations near Kojonup, Western Australia. The aircraft sustained serious damage. The investigation determined that the aircraft stalled at an altitude from which the pilot was unable to recover before the aircraft impacted terrain. The investigation identified two safety issues in regards to the supervision of agricultural pilots. The first related to confusion within the aerial application industry concerning the required regulatory authorisation for a pilot that is the supervisor of a pilot holding an Agricultural Pilot (Aeroplane) Rating Grade 2 (Ag 2 pilot). In response to this issue, CASA provided an explanation of the relevant legislative material, which has been reproduced in this report, as well as an undertaking to provide education to industry on this matter. The second safety issue concerned the lack of guidance on the supervision of pilots with an Ag 2 rating. In response CASA has agreed to provide Advisory Circular guidance to industry on how to supervise Ag 2 pilots.
<b>AO-2009-073</b>	<b>In-flight cargo door separation - 28 km NW Sunshine Coast Airport - 1 December 2009</b>
<i>Date completed:</i> 11 Apr 2011	On 1 December 2009 at approximately 0730 EST, the forward, left-side cargo door of a Eurocopter AS350D helicopter (registered VH-PIH) separated from the helicopter fuselage during fire-fighting operations near Maryborough, Queensland. The helicopter subsequently landed safely and there were no injuries. It was probable that separation of the cargo door occurred as a consequence of replacement of the door seal during a recent overhaul. That replacement resulted in the door sitting proud of the mating surfaces when closed and latched. Elevated air loads acting on the door as a product of its overly proud position would subsequently have led to its fracture. It was considered that the installation of improved door locks per Service Bulletin SB 52.00.25 and SB 52.00.26 would likely address this safety issue and significantly reduce the likelihood of a future AS350 cargo door separation event. As a result of this occurrence the operator applied the cargo door lock modifications detailed in SB 52.00.25 and SB 52.00.26 to the new door installed on VH-PIH. In addition, the Australian Transport Safety Bureau has issued a Safety Advisory Notice to all operators of Eurocopter AS350 aircraft to consider the implications of the safety issue and take action where considered appropriate.
<b>AO-2009-075</b>	<b>Mid-air collision - 20 km south-east Orange, New South Wales - 08-Dec-09, VH-NFO, Aerospatiale AS.350B, VH-LXC, Kawasaki BK117</b>
<i>Date completed:</i> 29 Nov 2010	On 8 December 2009, at about 1840 Eastern Daylight-saving Time an Aerospatiale AS.350B helicopter, registered VH-NFO (NFO), and a Kawasaki BK117 helicopter, registered VH-LXC (LXC), were engaged in aerial firebombing operations about 20 km south-east of Orange Aerodrome, New South Wales (NSW). During one of the water drop sequences, while in the vicinity of the drop point, LXC's main rotor blade tip(s) contacted the trailing edge of NFO's vertical fin. There was light damage to NFO and there were no injuries, although the outcome could have been more serious. There were no published procedures for pilots to follow to ensure separation from other aircraft when there was no air attack supervisor present. Instead, the system relied on the airmanship and experience of pilots to mutually arrange separation. In this case, the water source was about 600 m from the fire front and NFO had departed the water source shortly before LXC. The investigation established that neither pilot was aware of the position of the other helicopter as they approached the drop point. In response to the occurrence, the NSW Rural Fire Service developed a series of mission management standard operating procedures, including the use of standard terminology for aerial firefighting activities. These were to be introduced to contracted and other operators via a series of workshops commencing in November 2010. After being approached by a number of firefighting authorities, in July 2009 the Civil Aviation Safety Authority (CASA) commenced a Firefighting Review. In November 2009, a Firefighting Operations Manual project team was established including five CASA staff, one fire authority staff member, 11 industry representatives and one consultant to draft a proposed manual. The aim was for the manual to standardise aerial firefighting procedures across the authorities. At the time of release of this report, the draft manual had been distributed to the various fire authorities for their review.

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**AO-2009-077**

**Visual flight into instrument meteorological conditions - Dorrigo, New South Wales, 9 Dec 2009, VH-MJO, Bell Helicopter Company 206L-1 LongRanger**

*Date completed:*  
11 May 2011

On 9 December 2009, at about 1120 Eastern Daylight-saving Time, the pilot of a Bell Helicopter Company 206L-1 LongRanger, registered VH-MJO, was conducting a visual flight rules flight from Dorrigo New South Wales (NSW), with one passenger on board. Shortly after takeoff, the pilot encountered reduced visibility conditions due to low cloud. Subsequently, all visual reference with the horizon and the ground was lost. The pilot attempted to land, but the helicopter impacted the ground in an uncontrolled state and with significant vertical force. The passenger was fatally injured and the pilot was seriously injured. The helicopter was seriously damaged.

Following the accident, a full review of the operational procedures was conducted jointly by the Department of Environment, Climate Change and Water, NSW Rural Fire Service and other NSW fire-fighting authorities. An action plan was implemented to make several safety enhancements to its aviation operations. In addition, National Parks and Wildlife Service ceased operations at the Dorrigo helicopter landing site.

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**AO-2009-080**

**Loss of separation assurance - 222 km NW of Tennant Creek, Northern Territory - 22 December 2009**

*Date completed:*  
24 Jun 2011

On 22 December 2009, at 0253 Central Standard Time, an air traffic controller took action to resolve a loss of separation assurance that occurred on airway route J30, 222 km north-west of Tennant Creek, Northern Territory between an Airbus A330-300 (A330) aircraft, registered B-HLV, and a Boeing Co. B737-800 aircraft, registered VH-VUJ. The aircraft were approaching each other at flight level 370 while tracking in opposite directions on the same airway route. The air traffic controller managing the airspace did not effectively control the resolution of the developing conflict. The flight crews of both aircraft identified the traffic conflict and initiated avoidance action to maintain separation. The investigation found that the controller did not implement a separation plan when the conflict was first identified and that action by the flight crew of the A330 prompted the controller to take action to re-establish separation assurance. In addition, a number of safety issues were identified, including that the controller had not received training in compromised separation recovery techniques and that there was no dedicated control room aisle supervisor during the then peak traffic period. Finally, ambiguity was identified between the Manual of Air Traffic Services (MATS) and the Aeronautical Information Publication (AIP) in relation to the assignment of non-standard cruising levels and the definition of an 'operational requirement'. In response to this occurrence, Airservices Australia (Airservices) conducted an internal investigation, which recommended a number of actions to address the safety factors and issues that were identified by the Airservices investigation. The Australian Transport Safety Bureau (ATSB) is satisfied that the action taken by Airservices to clarify the relevant content in the MATS and AIP, and recommended by the Airservices investigation will, when implemented, adequately address the safety issues identified in this ATSB safety investigation.

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**AO-2010-008**

**Turbulence event - Canberra Aerodrome, Australian Capital Territory - 31 Jan 2010 - VH-ERP, Grumman Traveller**

*Date completed:*

5 Apr 2011

On 31 January 2010, an American Aircraft Corporation Grumman Traveller AA-5 aircraft, registered VH-ERP, was being operated on a visual flight rules private flight from Temora, New South Wales to Canberra, Australian Capital Territory. At about 1630 Eastern Daylight-saving Time, on late final approach to runway 12 at Canberra Aerodrome, and at an altitude of about 150 ft above ground level, the aircraft experienced severe turbulence that resulted in a brief loss of control. The pilot recovered control and landed on runway 12. The investigation determined that it was probable that the severe turbulence was generated by a combination of the wind conditions on the day and the position of the two buildings located about 220 m and 290 m upwind from runway 12. In addition, there were no standard criteria for assessing the potential local wind effect of aerodrome building developments on aviation operations, and no national building codes for aerodrome developments that address the phenomena of building-induced turbulence. The aerodrome operator had commissioned pre-construction wind impact assessments of the two buildings to the north of runway 12. These reports concluded that the buildings would not result in adverse wind effects on aircraft operations. This conclusion was based in part on the assessment that use of runway 12 was unlikely in northerly wind conditions. However, operations to that runway remained possible in those conditions without any alert to affected pilots about possible risk. By contrast the Canberra Aerodrome information in the En Route Supplement Australia alerted pilots of the possibility of severe turbulence during touchdown on runway 35 in strong westerly winds. Subsequent to this occurrence, the Department of Infrastructure, Transport, Regional Development and Local Government established the National Airports Safety Advisory Group (NASAG). NASAG's role is to examine airport planning issues, including the potential local wind effects of buildings on aircraft operations, and to develop a set of universal guidelines and policy material for application at state and local levels. In addition, Airservices Australia is progressing the installation of wind shear detection technologies at several aerodromes. There is the potential that one of those installations could be at Canberra Aerodrome.

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**AO-2010-012**

**ATC information error, VH-BCQ, PA-31, Proserpine / Whitsunday Coast Aerodrome, Queensland, 25-Feb-10**

*Date completed:*

30 Nov 2010

On 25 February 2010, a Piper Aircraft Corp Chieftain PA-31-350 aircraft, registered VH-BCQ, was being operated on a charter passenger flight from Mackay to Clermont Aerodrome, Queensland. Unable to land at either Clermont or the planned alternate aerodrome of Mackay due to deteriorating weather conditions, the flight diverted to Proserpine/Whitsunday Coast Aerodrome.

The pilot in command requested air traffic services (ATS) to arrange for a person to be on the ground at Proserpine/Whitsunday Aerodrome to ensure that the aerodrome lighting would be on for their arrival. This request was not actioned, but ATS provided the crew with a frequency for the pilot activated lighting system at the aerodrome. However, that frequency was decommissioned 10 days earlier, and a new frequency introduced. On approach to Proserpine, the flight crew were unable to activate the aerodrome lighting. With critical fuel, and given weather considerations, the flight crew landed the aircraft without runway lighting at around 1957 Eastern Standard Time.

The investigation identified two minor safety issues; one relating to the practices used within the air traffic control group for the effective review and communication of notices to airmen, and the other the risk of out-of-date operational documentation.

The air navigation service provider advised that in response to this occurrence, it will conduct an internal education program to highlight the effect on safety when relevant information is not considered appropriately or reviewed before being provided to pilots. The incorrect operational documentation has since been updated and the regional council managing Proserpine Aerodrome has instigated safety action relevant to their organisation.

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**AO-2010-023**

**Loss of control - 43 km east of Perth Airport, Western Australia - 28 March 2010 - VH-KDS - Piper Aircraft Corp. PA-30-160B Twin Comanche**

*Date completed:*

2 Jun 2011

At 0826 Western Standard Time on 28 March 2010, a Piper Aircraft Corp. PA-30 Twin Comanche aircraft, registered VH-KDS, departed Jandakot Airport, Western Australia for a private flight under the visual flight rules (VFR). On board were two qualified pilots, both of whom were endorsed on the aircraft type. No details of the flight were submitted to Air Traffic Services nor left with any other person. At 1815, following the failure of the aircraft to return to Jandakot, the Australian Rescue Coordination Centre was notified and a search was initiated to locate the aircraft. Following examination of radar data, the aircraft was located the following morning by the crew of a search and rescue (SAR) helicopter. Upon landing, the helicopter crew established that the two occupants had sustained fatal injuries. Analysis of data recorded by onboard Global Positioning System equipment identified that while maintaining about 3,500 ft above mean sea level, the speed of the aircraft steadily decreased followed by a steep descent that continued to ground level. Examination of the aircraft identified that the propeller of the left engine was feathered prior to impact; however, no evidence of a defect or other circumstance that would have necessitated feathering of the propeller was identified. The investigation identified that the circumstances of the accident were consistent with a loss of control due to sufficient airspeed not being maintained. In addition, the investigation found that the lack of flight details available for the search and rescue authorities and the non-activation of the portable emergency locator transmitter hampered the SAR response.

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**AO-2010-025**

**Total power loss - VH-MTC, Victa Ltd Airtourer 115/A1 - Hobart, Tas - 04-Apr-10**

*Date completed:*

14 Dec 2010

On 4 April 2010, the pilot of a Victa Airtourer 115 aircraft, registered VH-MTC was conducting a private visual rules return flight from Cambridge Aerodrome, Tasmania. The flight consisted of some aerobatics, followed by some sight-seeing over Hobart. At about 1020, after the pilot commenced the return to Cambridge, the engine suddenly lost all power. The pilot conducted a forced landing onto a nearby road, seriously damaging the aircraft. The pilot, who was the sole occupant, was uninjured. The investigation found that the power loss was due to exhaustion of the aircraft's fuel supply. A number of safety issues were identified concerning the measurement of the quantity of fuel on board, and consumed before and during the flight. Those issues contributed to the pilot's belief that there was more fuel on board the aircraft than was actually the case. As a result of this accident the aircraft's type certificate holder, aircraft owner's association and the aircraft's operator have undertaken a number of safety actions. Those actions include a number of pilot education initiatives and the amendment of the operator's maintenance processes to ensure compliance with all airworthiness directives. In addition, the aircraft's type certificate holder is undertaking a number of enhancements in response to an unrelated Civil Aviation Safety Authority-initiated review of aspects of the aircraft's fuel system and concerns about the aircraft's original fuel system certification process. On 4 April 2010, the pilot of a Victa Airtourer 115 aircraft, registered VH-MTC was conducting a private visual rules return flight from Cambridge Aerodrome, Tasmania. The flight consisted of some aerobatics, followed by some sight-seeing over Hobart. At about 1020, after the pilot commenced the return to Cambridge, the engine suddenly lost all power. The pilot conducted a forced landing onto a nearby road, seriously damaging the aircraft. The pilot, who was the sole occupant, was uninjured. The investigation found that the power loss was due to exhaustion of the aircraft's fuel supply. A number of safety issues were identified concerning the measurement of the quantity of fuel on board, and consumed before and during the flight. Those issues contributed to the pilot's belief that there was more fuel on board the aircraft than was actually the case. As a result of this accident the aircraft's type certificate holder, aircraft owner's association and the aircraft's operator have undertaken a number of safety actions. Those actions include a number of pilot education initiatives and the amendment of the operator's maintenance processes to ensure compliance with all airworthiness directives. In addition, the aircraft's type certificate holder is undertaking a number of enhancements in response to an unrelated Civil Aviation Safety Authority-initiated review of aspects of the aircraft's fuel system and concerns about the aircraft's original fuel system certification process.

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<b>AO-2010-029</b>	<b>Ground strike - N-128UA, B747-400, Sydney Aerodrome, NSW, 07-May-10</b>
<i>Date completed:</i> 1 Apr 2011	<p>On 7 May 2010, at about 1458 Eastern Standard Time (EST), a Boeing 747-422 aircraft, registered N128UA was being operated on a regular public transport flight from Sydney, Australia to San Francisco, USA. Shortly after conducting a reduced-thrust takeoff, the crew was advised by Sydney Air Traffic Control that the aircraft had sustained a ground strike. After completing the appropriate checks and dumping fuel, the crew returned the aircraft to Sydney and landed. A subsequent inspection revealed scrape damage to the aircraft's lower rear fuselage consistent with contact with the runway surface. Analysis of recorded flight data by the aircraft manufacturer indicated that the aircraft was subject to a wind gust during rotation. That, combined with a high instantaneous pitch rate around the time of lift-off and a reduction in lift due to spoiler deployment, reduced the tail to runway clearance. Another contributing factor was the reduced-thrust takeoff, which increased the aircraft's exposure to wind variations during rotation. The manufacturer also noted that, had the crew applied a smaller left control wheel input at an earlier stage of the takeoff, it was possible that the spoilers would not have deployed, resulting in a small increase in tail clearance. Although the investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations, following the occurrence, the aircraft operator revised its flight manual for the 747-422.</p>
<b>AO-2010-032</b>	<b>Loss of control, VH-FPP - Jandakot Aerodrome, Western Australia - 12 May 2010</b>
<i>Date completed:</i> 18 Nov 2010	<p>On 12 May 2010, an instructor and student were conducting circuit training in an Eagle Aircraft Australia X-TS 150 aircraft, registered VH-FPP, at Jandakot Aerodrome, Western Australia. Soon after lift-off the engine started to run rough and lost power. The instructor took over control and, maintaining between 50 and 100 ft above ground level, turned the aircraft towards another runway. Near the end of that runway the aircraft pitched nose-up, stalled and collided with the ground, seriously damaging the aircraft and injuring the occupants. There was no evidence found of an aircraft defect or anomaly likely to have significantly affected engine power. The investigation found that the decision by the instructor to turn downwind significantly increased the aircraft's energy and therefore the risk of aircraft damage and occupant injury in the case of a forced landing.</p>
<b>AO-2010-033</b>	<b>Wirestrike – 37 km SSW of Latrobe Valley Aerodrome, Victoria – 20 May 2010 – VH OSU, Bell Helicopter Company 206L LongRanger III</b>
<i>Date completed:</i> 23 Jun 2011	<p>At about 1253 Eastern Standard Time on 20 May 2010, a Bell Helicopter 206L LongRanger III helicopter, registered VH-OSU, commenced forestry spraying operations about 37 km south-south-west of Latrobe Valley Airport, Victoria. At about 1354 the pilot commenced a final spray run that resulted in the helicopter's flightpath crossing a powerline that was known to the pilot. The helicopter contacted the wire, seriously damaging the helicopter's flight control system and main rotor mast, which likely rendered it uncontrollable. The helicopter subsequently impacted the ground. The pilot was fatally injured. The investigation found that it was likely that the pilot failed to recall the existence of the wire. The inherent difficulty of visually detecting the wire, combined with the operating groundspeed, meant that the pilot would not have had sufficient time to avoid the wire after seeing it. An examination of the wreckage of the helicopter did not find any mechanical abnormalities that might have contributed to the accident. No permanent or temporary high visibility devices were attached to the powerlines, nor were they required to be. The helicopter was not fitted with wirestrike protection system (WSPS) equipment, nor was it required to be by aviation regulation. The investigation was unable to determine if a WSPS might have altered the outcome of the wirestrike. As a result of this accident, Energy Safe Victoria issued a wire safety alert to aerial work operators and infrastructure providers. The Australian Transport Safety Bureau (ATSB) issued a Safety Advisory Notice to Energy Networks Australia and operators and pilots that are involved in low-level operations. The notice suggested that, where wires exist in areas where low-level activity occurs, operators and pilots consider the need for any powerlines to be marked in accordance with AS 3891.2, 2008, Part 2: Marking of overhead cables for planned low level flying operations. In addition, the ATSB has published an educational report aimed at increasing awareness among low-level operators and those agencies organising such activities. The ATSB has also commenced a research investigation that seeks to more fully understand the wirestrike risk in Australia.</p>

<b>AO-2010-042</b>	<b>Collision with terrain - VH-RPN, Robinson R22 Beta - 257 km ENE Derby, WA - 13 June 2010</b>
<i>Date completed:</i> 8 Jun 2011	<p>On 13 June 2010, a Robinson Helicopter Co. R22 Beta, registered VH-RPN, was engaged in aerial cattle mustering operations on a station property about 257 km east-north-east of Derby, Western Australia. During those operations, the helicopter collided with the ground and caught fire. The pilot, the sole occupant of the helicopter, sustained fatal injuries. The investigation found that the helicopter had a high descent rate and some forward speed at impact but, due to the lack of evidence as a function of the type and location of the operation, was unable to positively establish any further contributing factors. The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, the accident provides a reminder of the hazards involved in aerial mustering operations that result in, or add to a number of low-level risks that require close management. Any pilot distraction, aircraft or systems failure, adverse weather or aircraft performance, or handling inattention can reduce the margins for continued safe flight.</p>
<b>AO-2010-063</b>	<b>Depressurisation, VH-NGX, 120 km NNE Perth Aerodrome - 16 August 2011</b>
<i>Date completed:</i> 1 Jun 2011	<p>At about 0700 Western Standard Time on 16 August 2010, a Fairchild Industries Inc. SA226-TC (Metro II) aircraft, registered VH-NGX, departed Perth Aerodrome on a charter flight to Fortnam Mine, Western Australia. On board the aircraft were the pilot and 10 passengers. The aircraft was climbing through flight level 205 when the right cockpit side window suddenly failed and the cabin rapidly depressurised. The pilot donned his oxygen mask, activated the passenger oxygen system and transmitted a distress call to air traffic control. He commenced an emergency descent to 9,000 ft and returned to Perth. There were no reported injuries to the aircraft occupants and the aircraft sustained minor airframe damage as a consequence of the window failure. The investigation determined that the window failed as a result of cracks that had propagated laterally between the retainer holes along the upper edge of the window and significantly weakened its structural integrity. Inspection of the aircraft logbooks determined that the failed window was fitted as an outer window in 2006 by the previous aircraft owner. However, the window was manufactured as an inner window only and was not designed to safely withstand cabin pressurisation loads. The work practices during the installation of the incorrect window and its reduced material thickness had also contributed to the window's deterioration and failure under pressurisation loads. The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. Notwithstanding, the aircraft operator and Civil Aviation Safety Authority initiated proactive safety action to minimise the risk of a recurrence of the window failure.</p>
<b>AO-2010-067</b>	<b>Ditching - VH-LMT, 25 NM north-east of Gurney, Papua New Guinea, 26 September 2010</b>
<i>Date completed:</i> 16 Feb 2011	<p>At about 0935 Papua New Guinea local time on 26 September 2010, a Cessna Company T210L aircraft, registered VH-LMT, was being operated on a private, visual flight rules, flight from Tufi to Gurney, Papua New Guinea with the pilot and four passengers on board. When the aircraft was about 46 km north-east of Gurney, the engine lost power and the pilot conducted a ditching into shallow water adjacent to a beach. The aircraft was reported to have sustained minor damage and none of the occupants were injured. The Papua New Guinea Accident Investigation Commission delegated the conduct of the investigation to the Australian Transport Safety Bureau (ATSB) in accordance with International Civil Aviation Organization Annex 13 paragraph 5.1. The ATSB did not conduct an on-site investigation into the occurrence and the aircraft was not salvaged due to the remote location and limited access to salvage resources. As a result, the evidence available was limited and precluded determination of the factor(s) related to the power loss.</p>

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**AO-2010-080**

**Collision with terrain - VH-DQP - Flinders Island Tasmania - 15-October-2010**

*Date completed:*

*12 May 2011*

On 15 October 2010, the pilot of a Gippsland Aeronautics GA-8 Airvan, registered VH-DQP, was conducting a charter flight from Lady Barron, Flinders Island to Bridport, Tasmania with six passengers on board. The aircraft departed Lady Barron Aerodrome at about 1700 Australian Eastern Daylight-saving Time and entered instrument meteorological conditions (IMC) several minutes afterwards while climbing to the intended cruising altitude of about 1,500 ft. The pilot did not hold a command instrument rating and the aircraft was not equipped for flight in IMC. He attempted to turn the aircraft to return to Lady Barron Aerodrome but became lost, steering instead towards high ground in the Strzelecki National Park in the south-east of Flinders Island. At about 1715, the aircraft exited cloud in the Strzelecki National Park, very close to the ground. The pilot turned to the left, entering a small valley in which he could neither turn the aircraft nor out climb the terrain. He elected to slow the aircraft to its stalling speed for a forced landing and, moments later, it impacted the tree tops and then the ground. The first passenger to exit the aircraft used the aircraft fire extinguisher to put out a small fire that had begun beneath the engine. The other passengers and the pilot then exited the aircraft safely. One passenger was slightly injured during the impact; the pilot and other passengers were uninjured. During the night, all of the occupants of the aircraft were rescued by helicopter and taken to the hospital in Whitemark, Flinders Island.

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**AO-2010-092**

**Collision with terrain, VH-TCG - 44 km WSW Rolleston, Queensland - 9 November 2010**

*Date completed:*

*13 May 2011*

On 9 November 2010, the student pilot of a Robinson Helicopter Company R22 Beta II, registered VH-TCG, was engaged in a helicopter aerial stock mustering operation on a private station near Rolleston, Queensland. During the muster, after losing communication with the helicopter, one of the mustering party found the wreckage of the helicopter. The student pilot, who was the sole occupant, was fatally injured and the helicopter seriously damaged as a result of the collision with terrain. The investigation found that the pilot had not met the competency standards to operate a helicopter solo, and had not received any training towards low flying or aerial stock mustering. The investigation did not identify any organisational or systemic issues that might adversely affect the future safety of aviation operations. However, the accident does provide a timely reminder of the importance of ensuring that flight crews have the appropriate competencies and currency before engaging in highly-skilled tasks.

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## Marine

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**MO-2008-013**

**Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker *Karratha Spirit* off Dampier, Western Australia on 24 December 2008.**

*Date completed:*  
28 Sep 2010

At about 1815 on 24 December 2008, the Australian registered floating storage and offloading tanker, *Karratha Spirit*, began disconnecting from its mooring buoy at the Legendre Oil Field, about 60 miles north of Dampier, Western Australia, because of an approaching tropical cyclone. The master was on the forecastle, directly controlling the operation. Before the mooring hawsers could be released from the ship, the import hose drifted under the hawsers and he ordered the main engine to be run astern for about 1 minute in an attempt to pull the hose clear. At about 1954, after the wire suspending the oil import hose parted suddenly, the master ordered the crew to finish letting go the hawser pickup lines so that the ship could depart the mooring buoy. An integrated rating applied the port winch drum's brake to stop the drum moving and then stepped between the cheeks of the drum to cut the lashing that held the end of the heavy hawser pick line on the drum. At about 1958, when the lashing parted, the last three turns of heavy line rapidly unwound from the drum, striking the rating on the head and throwing him under the winch drum. He died as a result of his injuries. The ATSB investigation found the procedures for connecting and disconnecting from the mooring buoy had not always been followed and that the difference between the procedures and shipboard practice had not been identified during any shipboard review and the risks associated with this amended practice had not been assessed. The investigation also found that it is possible, under some circumstances, that facilities like *Karratha Spirit* can fall outside the jurisdiction of the safety regulators. The report issues one recommendation and one safety advisory notice to address these safety issues.

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**MO-2009-001**

**Independent investigation into the grounding of the Hong Kong registered products tanker *Atlantic Blue* at Kirkcaldie Reef, Torres Strait on 7 February 2009.**

*Date completed:*  
16 Dec 2010

At 2200 on 6 February 2009, a coastal pilot boarded the products tanker *Atlantic Blue* for its intended eastbound transit of the Torres Strait. The ship was nearly fully laden with a cargo of unleaded petrol and was bound for Townsville, Queensland. The passage progressed normally and at 0130 on 7 February, *Atlantic Blue*'s course was altered to 066° (T). The ship then made good a course of 070° (T) because no allowance was made for the 25 knot north-westerly wind abaft the port beam and the east-going tidal stream. By 0235, the ship was 1 mile south of the planned track. At 0237, 0246 and 0256, the pilot made course adjustments until *Atlantic Blue*'s heading was 059° (T). These small adjustments did not bring the ship back on track and it progressed towards Kirkcaldie Reef. After 0307, as the ship closed on a shoal about 1 mile ahead, the pilot began to alter course further to port. The alteration was too late and too slow to avert the grounding. At 0312, *Atlantic Blue*'s bow grounded on the sandy shoal. The hull remained intact and there was no pollution. At 0700, the ship refloated on the flooding tide and was manoeuvred clear of the reef. The investigation found that the ship grounded because its progress was not effectively monitored and inadequate action was taken to bring it back on track. Bridge resource management was ineffective because no limits were defined and the bridge team had no shared mental model. The draft report identifies safety issues in relation to: the ship's passage planning procedures; the coastal pilot check pilot regime; the coastal vessel traffic service's monitoring systems; and the ship's voyage data recorder.

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<b>MO-2009-002</b>	<b>Independent investigation into the loss of containers from the Hong Kong registered container ship <i>Pacific Adventurer</i> off Cape Moreton, Queensland, on 11 March 2009.</b>
<i>Date completed:</i> 27 Jan 2011	<p>At 0312 on 11 March 2009, the container ship <i>Pacific Adventurer</i> lost 31 containers overboard in gale force weather conditions and large swells off Cape Moreton, Queensland. All the containers sank, however, two of the ship's fuel oil tanks were holed as the containers went overboard.</p> <p>About 270 tonnes of oil leaked from the holed tanks and 38 miles of Queensland's coastline was affected by the oil.</p> <p>The ATSB investigation found that the ship was probably subjected to synchronous rolling at the time and that the severe and sometimes violent rolling motions caused the lashings on the containers, and possibly some the containers themselves, to fail. In addition, much of the fixed and loose container lashing equipment was in a poor condition and the inspection and replacement regime in the ship's safety management system had not been effectively implemented.</p> <p>The ATSB identified four safety issues during the investigation: the inspection and maintenance regime of the ship's fixed and loose lashing equipment had been deficient; there was no requirement for a third party to inspect this equipment; the cargo in the containers which were lost overboard was not packaged in accordance with international dangerous goods shipping requirements; and the dangerous goods shipping compliance audit regime did not pick up on this fact.</p> <p>Safety action to address the safety issues was taken by several of the responsible organisations. The ATSB has issued one safety advisory notice in regard to the outstanding safety issue concerning third party inspections of lashing equipment.</p>
<b>MO-2009-005</b>	<b>Serious injury on board <i>United Treasure</i> off Port Kembla, New South Wales on 7 July 2009</b>
<i>Date completed:</i> 17 Nov 2010	<p>On 7 July 2009, while <i>United Treasure</i> was anchored off Port Kembla, New South Wales, two seamen fell about 8 m in a cargo hold after the scaffolding on which they were working toppled over. Both men suffered compound fractures and were evacuated from the ship by helicopter and taken to hospital. The ATSB investigation found that the scaffolding had not been properly assembled or secured to the ship's structure. The investigation also found that an appropriate risk assessment for the work had not been carried out and the relevant ship's procedures were not followed. To avoid a further occurrence of this type on board their managed ships, <i>United Treasure's</i> managers have taken safety action by revising the relevant shipboard procedures. In addition, the ATSB has issued one safety advisory notice.</p>
<b>MO-2009-009</b>	<b>Independent investigation into the fire on board the Marshall Islands registered anchor handling tug supply vessel <i>Petra Frontier</i> at sea on 28 September 2009.</b>
<i>Date completed:</i> 14 Dec 2010	<p>Shortly before 0540 on 28 September 2009, a fire started in the steering gear compartment of the Marshall Islands registered anchor handling tug <i>Petra Frontier</i> while the ship was en route from the Timor Sea to Darwin, Northern Territory. The ship's crew were unable to extinguish the fire using portable fire extinguishers. Eventually, all of the compartment's access doors and vents were closed, the electrical power supply to the machinery in the space was cut off and the deck above was boundary cooled. As a result of these actions, the fire eventually burnt itself out. The investigation found that the fire probably started when rags, which had been soaked in oil that was leaking from a hydraulic unit, were ignited by heat generated by, or a spark emanating from, an electrical solenoid. The investigation also found that the ship's crew had not identified the numerous deficiencies that existed in the ship's emergency equipment, they were not familiar with the use of the emergency equipment and the on board response to the fire was not well managed. The investigation identified two safety issues: while <i>Petra Frontier</i> had undergone a series of flag State inspections and class surveys, neither authority was aware that the ship was unseaworthy in relation to critical safety equipment when it departed Singapore; and the ship's safety management system contained some contradictory information relating to the scheduling of fire and abandon ship drills.</p>

<b>MO-2009-010</b>	<b>Fatality on board the chemical tanker <i>Bow De Jin</i> at sea off New South Wales on 24 November 2009.</b>
<i>Date completed:</i> 10 Nov 2010	<p>On 24 November 2009, the chief mate on board the Hong Kong registered chemical tanker <i>Bow De Jin</i> died after entering a cargo tank which contained hydrocarbon vapours and was deficient in oxygen. The ATSB investigation was unable to determine why the chief mate, who had sailed on tankers for most of his seagoing career, did not follow industry standard and specific company safety procedures before he entered the cargo tank. The investigation found that while enclosed space entry checklists were being filled out by the crew members on board the ship, the checklist system was not being used as a proactive means to ensure that the necessary safety requirements were being met prior to tank entries.</p>
<b>MO-2009-011</b>	<b>Independent investigation into the engine room fire on board the Liberian registered container ship <i>Maersk Duffield</i> in Moreton Bay, Queensland on 10 December 2009</b>
<i>Date completed:</i> 17 Dec 2010	<p>On 10 December 2009, during <i>Maersk Duffield's</i> transit into Brisbane, Queensland, the ship's number four diesel generator (4DG) suffered a catastrophic failure, disabling the generator and starting a fire. The engine room was evacuated and the ship's fixed carbon dioxide (CO<sub>2</sub>) fire extinguishing system was operated. After the fire was extinguished, the crew were able to restart most of the ship's equipment and it berthed the following morning.</p> <p>The ATSB investigation found that it is possible that one or more of the connecting rod palm nuts or counterweight nuts had not been sufficiently tightened during recent overhauls and that the resultant failure of one of the retaining studs was the initiator of the catastrophic engine failure.</p>
<b>MO-2010-001</b>	<b>Independent investigation into the engine room fire on board the Australian registered bulk carrier <i>River Embley</i> off Gladstone, Queensland, on 16 February 2010</b>
<i>Date completed:</i> 25 Jan 2011	<p>At 0435 on 16 February 2010, the bulk carrier <i>River Embley</i> was at anchor off Gladstone, Queensland, when the ship's fire alarms sounded, alerting the crew to an engine room fire. A few minutes later, while the engineers were investigating the fire, there was an explosion in the engine room. The crew shut down the running machinery, the engine room vents were closed and the ship's electrical load was transferred to the emergency generator. The crew monitored the situation and by 1115, they had determined that the fire had been extinguished and that the engine room was safe to enter without the use of breathing apparatus. The ATSB investigation determined that the fire started inside a screw type air compressor and that the explosion that followed occurred when a cloud of hot oil vapour, which had been expelled from the compressor, was ignited by a hot metal surface on the compressor. The investigation found that the compressor did not shutdown before the fire occurred because its high temperature alarm/shutdown did not operate. The investigation also found that, during the emergency response, the crew worked as a team and demonstrated how effective a trained response to an unexpected emergency can be. The investigation identified two safety issues; routine testing of the compressor high temperature alarm/shutdown was not included in the ship's planned maintenance system; and routine testing of the alarm/shutdown was not included in the manufacturer's maintenance manual.</p>

<b>MO-2010-003</b>	<b>Independent investigation into the grounding of the Chinese registered bulk carrier <i>Shen Neng 1</i> on Douglas Shoal, QLD on 3 April 2010.</b>
<i>Date completed:</i> 14 Apr 2011	At 1705 on 3 April 2010, the Chinese registered bulk carrier <i>Shen Neng 1</i> grounded on Douglas Shoal, about 50 miles north of the entrance to the port of Gladstone, Queensland. The ship's hull was seriously damaged by the grounding, with the engine room and six water ballast and fuel oil tanks being breached, resulting in a small amount of pollution. The ATSB investigation found that the grounding occurred because the chief mate did not alter the ship's course at the designated course alteration position. His monitoring of the ship's position was ineffective and his actions were affected by fatigue. The ATSB identified four safety issues during the investigation: there was no effective fatigue management system in place to ensure that the bridge watchkeepers were fit to stand a navigational watch after they had supervised the loading of a cargo of coal in Gladstone; there was insufficient guidance in relation to the proper use of passage plans, including electronic route plans, in the ship's safety management system; there were no visual cues to warn either the chief mate or the seaman on lookout duty, as to the underwater dangers directly ahead of the ship; and, at the time of the grounding, the protections afforded by the requirement for compulsory pilotage and active monitoring of ships by REEFVTS, were not in place in the sea area off Gladstone. The ATSB has issued two safety recommendations to <i>Shen Neng 1</i> 's management company regarding the safety issues associated with fatigue management and passage planning and acknowledges the safety action taken by the Australian Maritime Safety Authority in relation to the extension of REEFVTS coverage to include the waters off Gladstone.
<b>MO-2010-005</b>	<b>Independent investigation into crew member fatality on board the Liberian registered general cargo ship <i>Cape Darnley</i> at sea on 8 July 2010</b>
<i>Date completed:</i> 17 Feb 2011	At about 0830 (local time UTC +10) on 8 July 2010, a crew member on board the multipurpose ship <i>Cape Darnley</i> was fatally injured following an explosion that occurred while he was attempting to cut the top off a 200 litre steel drum. When the oiler touched an angle grinder's cutting disk onto the top of the drum, the heat generated ignited the vapours inside the drum. Once ignited, the rapid expansion of the vapour/air mixture resulted in the drum exploding. The ATSB investigation found that an appropriate risk analysis was not undertaken and a hot work permit was not completed for the task. The investigation also found that the oiler was possibly not aware of the ship's work permit requirements or the risks associated with using an angle grinder to cut the top off a closed drum. The ATSB acknowledges the safety actions taken by the ship's managers to address the two safety issues identified during the investigation.
<b>MO-2010-009</b>	<b>Independent investigation into the grounding of the Liberian registered container ship <i>MSC Basel</i> in Moreton Bay, Queensland on 1 November 2010</b>
<i>Date completed:</i> 4 May 2011	At about 0937 on 1 November 2010, the Liberian registered container ship <i>MSC Basel</i> grounded in Moreton Bay, Queensland, while departing the port of Brisbane. <i>MSC Basel</i> was in the main shipping channel when its rudder unexpectedly moved to starboard without the application of any helm. The ship immediately began turning to starboard. The main engine was run astern and the port anchor was let go. However, these actions could not prevent the ship from grounding on Yule Banks, just to the north of the channel. The ATSB investigation found that the ship's rudder probably moved to starboard because of a malfunction of the steering control system. However, inspections and tests carried out following the grounding did not identify any steering control system faults. The investigation also found that <i>MSC Basel</i> 's steering system had not been tested in accordance with SOLAS requirements before the ship departed Brisbane. The investigation report identifies one safety issue and outlines the safety actions taken by <i>MSC Basel</i> 's managers to address it. The report also issues one safety advisory notice.

## Rail

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**RO-2009-004**

**Derailment of Train 6MB2 near Tottenham VIC on 30 January 2009**

*Date completed:*

22 Dec 2010

At about 1515 on 30 January 2009, northbound freight train 6MB2, owned and operated by Pacific National, derailed near the beginning of a left-hand curve located near the 8.915 track km point in Tottenham, Victoria. In total, 8 wagons derailed and about 400 m of timber sleepered track was damaged. Damage to rolling stock was minimal and there were no injuries as a result of the occurrence.

At the time of the derailment, major infrastructure works between Melbourne and Sydney were being carried out to improve the general track condition and operating efficiency on the standard gauge rail corridor.

Train 6MB2 derailed as it passed over a section of mainline track in the Tottenham Yard precinct that contained a build up of longitudinal rail stress after three consecutive days of very high ambient temperatures. Due to the extreme weather conditions, the Australian Rail Track Corporation had implemented heat speed restrictions for train operators between Tottenham and Albury, restricting trains to speeds not greater than 60 km/h.

When train 6MB2 approached the left-hand curve near the Ashley Street Bridge, the train crew observed that a small lateral misalignment had developed in the track. During the passage of the train the dynamic movement of the rail vehicles added sufficient force to increase the size of the misalignment as the train passed over it. A container flat wagon (NQKY 34695L), 31st in the consist, was the first vehicle to derail and it was positioned near the rear of the train.

No evidence was found that defective rolling stock components had contributed to the derailment and minor damage to the rolling stock was sustained during the derailment sequence.

The investigation found that as part of the project works, the Tottenham standard gauge passing loop was converted for mainline operation on 28 July 2008. A safety issue was identified where this section of track was not tested after the conversion to mainline to determine if any residual stress was present in the rails and if any treatments were necessary to reduce the likelihood of track misalignments.

Other safety issues identified that creep monuments had not been installed at the east end of the curve near where train 6MB2 derailed and the rails had not been punch marked to allow track inspectors to detect rail creep. In addition, a record of two rail welds carried out at the 8.351 km point on the 30 January 2009 had not been documented for future reference. Attention to both of these items were specific requirements of the V/Line Infrastructure Civil Engineering Circular 3/87.

Following the derailment, the Australian Rail Track Corporation reconstructed this section of track and replaced the timber sleepers with concrete sleepers as part of the Tottenham to Dynon infrastructure track upgrade.

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**RO-2009-008**

**Signal Passed At Danger by XPT ST24 on 9 September 2009 at Junee NSW**

*Date completed:*

11 Feb 2011

At about 1411 on Wednesday 9 September 2009, scheduled XPT passenger train ST24, en route from Melbourne to Sydney, passed signal JE02 at Junee by about 33 m while that signal was displaying a Stop (red) indication. No injuries or damage resulted from the occurrence. The driver of ST24 said that signal JE26, the signal before JE02, was displaying a Medium Turnout indication and this meant that signal JE02 would be showing a Proceed aspect. Several other rail employees also said that signal JE26 was displaying a Medium Turnout indication. However, the investigation concluded that it was almost certain that signal JE26 was displaying a Caution Turnout indication rather than a Medium Turnout indication, which would have resulted in signal JE02 displaying a Stop indication. The driver's perception of signal JE26 was influenced by expectation, distraction and possibly fatigue, and that the employee witnesses' perception of the signal was influenced by expectation, 'confirmation bias' and 'group think'.

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**RO-2009-009**

**Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7 on 12 November 2009**

*Date completed:*  
20 Jan 2011

At about 0217 on Thursday 12 November 2009, train ST22, an XPT passenger service, was being routed into No.1 Platform Road at Cootamundra, New South Wales. The driver of the XPT received a Medium Turnout indication on signal CA74 signifying that the route into No.1 Platform Road was set and unobstructed. Shortly after passing over the Gundagai Road level crossing and traversing 136 points set into No.1 Platform Road, the driver of the XPT observed the last wagon of freight train 4MB7, located on the Up Main line, was obstructing the path of his train. He applied the train brakes and stopped just short of train 4MB7.

The driver of the XPT immediately contacted the network controller and advised him of the problem. Shortly thereafter the freight train was moved forward, at the request of the network controller, to clear a path for the XPT into No.1 Platform Road.

The investigation determined that a signalling system design error allowed signal CA74 to be cleared for the passage of the XPT even though the route into No.1 Platform Road was obstructed by the last vehicle of freight train 4MB7 which was stationary on the adjacent Up Main line.

The Australian Transport Safety Bureau has determined that actions taken by the Australian Rail Track Corporation (ARTC) should mitigate the risk of a similar occurrence but has identified further issues relating to signal design, installation and commissioning where further action may enhance the strategies already put in place by the ARTC.

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**RO-2010-002**

**Safeworking breach at Manildra NSW 10 February 2010**

*Date completed:*  
18 May 2011

At approximately 1650 on 10 February 2010, empty passenger train WP46 was authorised to travel through Manildra Yard on the main line. However, at the same time a freight train was already standing on the main line, having recently completed shunting within the yard limits relating to preparation of train 8938. The driver of WP46 heard radio chatter relating to the freight train, so he broadcast that train WP46 was approaching and was authorised to travel through Manildra on the main line. The crew of the freight train immediately replied that they were standing on the main line and advised train WP46 to stop. Train WP46 had already passed the yard limit board but the driver had sighted and reacted to a main line indicator (MLI) showing a red (stop) indication. Train WP46 stopped before passing the MLI, which was located more than 530 m before the track occupied by the freight train. While a number of defences served to avoid a collision in this case, the event posed a serious safeworking irregularity where one train had been authorised to proceed over track occupied by a second train. The investigation concluded that the ARTC network controller fulfilled a shunt order without entering information into the computer system identifying that both the main line and loop were occupied. The controller had later forgotten about the track occupancies when authorising train WP46 to travel through the Manildra Yard. The ARTC, Pacific National and the Manildra Group have put processes in place to ensure shunt orders are not fulfilled unless all shunt operations have ceased and either the main line is clear or a form of train protection has been implemented in accordance with the network rules.

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**RO-2010-005**

**Collision between train 7MP7 and person near - Nantawarra South Australia - 22 May 2010**

*Date completed:*  
9 Nov 2010

At about 1303 on Saturday 22 May 2010, freight train 7MP7 collided with a young male child on the track adjacent to a level crossing near Nantawarra in the mid-north of South Australia. The child was fatally injured as a result of the collision. The investigation found that prior to the collision the child had wandered away from the family home and had unknowingly placed himself in a place of extreme danger on the railway track and there was little the train drivers could do to avoid the collision.

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<b>RO-2010-006</b>	<b>Safeworking irregularity involving trains SN57 and D231 at Moss Vale, New South Wales on 17 June 2010</b>
<i>Date completed:</i> 24 Jan 2011	<p>At about 1121 on 17 June 2010, a safeworking irregularity involving CityRail passenger service SN57 and train D231, a Pacific National light engine, occurred at Moss Vale in New South Wales. On the day of the occurrence, planned maintenance on the Argyle Street bridge, (southern end of Moss Vale) was being conducted in accordance with ARTC's SAFE Notice 2-1334/2010. By way of the SAFE Notice, the Australian Rail Track Corporation (ARTC) had promulgated that Down CityRail services would be routed from the Down Main via 140 points set reverse (an unsignalled movement) then terminate alongside the Moss Vale Up Platform before forming the return Up service to Campbelltown.</p> <p>The investigation determined that the network controller, in error, gave the driver of CityRail passenger train SN57 verbal authority to pass signals MV15 and MV39 in the Stop position, over 140 points set reverse, to access the Up Platform at Moss Vale. A little earlier, the controller had authorised train D231 to travel into the Moss Vale Up Refuge Siding, also over 140 points, thereby placing the two trains into direct conflict. Fortunately the network controller recognised the error and stopped train D231 about 200 m before 140 points, the potential point of conflict. There were no injuries or damage to rolling stock or infrastructure as a result of the incident.</p> <p>The investigation established that an error by the network controller was the main factor contributing to the incident. However, the ATSB considers that the use of a checklist or similar systemic defence measure by network controllers for this type of working may enhance the integrity of ARTC's current safeworking arrangements.</p>
<b>RO-2010-007</b>	<b>Safeworking Breach at Junee NSW on 4 August 2010</b>
<i>Date completed:</i> 18 Apr 2011	<p>At about 0840 on Wednesday 4 August 2010 a safeworking incident occurred within the Junee station yard limits when a locomotive was moved from one road to another without authority while a Track Occupancy Authority (TOA) was in force. No injuries or damage resulted.</p> <p>The investigation identified that there were non-conformances to the rules in regards to communication by the train drivers and protection of the fixed worksite; and deficiencies in the rules relating to lines of communication and protection of infrastructure booked out of service. The investigation concluded that it was unlikely the safeworking incident would have resulted in a breach of the worksite at Junee station yard.</p>
<b>RO-2010-009</b>	<b>Safeworking irregularity involving freight train 2CM3 at Bomen New South Wales, 6 September 2010</b>
<i>Date completed:</i> 7 Jun 2011	<p>At about 2307 on 6 September 2010 a safeworking irregularity involving freight train 2CM3 occurred at Bomen in New South Wales. The network controller attempted to set the route for freight train 2CM3 to depart Bomen Yard and proceed onto the mainline towards Melbourne. The network controller was unable to change absolute signal BN27 from a stop (red) aspect to a proceed aspect (green), so he gave verbal authorisation to the driver of train 2CM3 to depart Bomen and pass signal BN27 while it was displaying a stop indication. However, issuing a verbal authorisation was not in compliance with the safeworking rules in this case. The network controller should have issued a written Special Proceed Authority (SPA) to authorise train 2CM3 to pass signal BN27 at stop. The investigation found that a procedural error by the network controller was the main factor that contributed to the incident. There were no injuries or damage to rolling stock or other property as a result of the incident.</p>



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## APPENDIX C: ATSB Safety Recommendations

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### Aviation

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-SR-108
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The operator's flight crew quick reference handbook did not include sufficient information for flight crew to manage the emergency.
<b>Action organisation</b>	Boeing Co
<b>ATSB Safety Recommendation outcomes</b>	<p>On 21 Jan 2011, Boeing advised: <i>We accept this recommendation and are taking steps to make changes to the 747-400 Quick Reference Handbook (QRH). The change will include a note for flight crews to be aware of the expected duration of available battery power in the event of abnormal or unexpected battery discharge. This change will be incorporated at the next revision cycle of the QRH.</i></p> <p>On 21 Jun 2011, Boeing advised: <i>The change has been approved on all Boeing models. The 747 model change should still be in the September [2011] revision.</i></p> <p>The Australian Transport Safety Bureau is satisfied that the action proposed by the aircraft manufacturer will adequately address this safety issue.</p>
<b>Safety action release date</b>	21 Jan 2011
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-SR-109
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The Federal Aviation Administration regulations and associated guidance material did not provide detailed liquid protection requirements or guidance for electrical system units in transport category aircraft, increasing the risk of inadequate protection of those units.

<b>Action organisation</b>	Federal Aviation Administration (United States of America)
<b>ATSB Safety Recommendation outcomes</b>	<p>On 15 Mar 2011, the FAA advised:  <i>We are investigating the issue, considering the scope of the recommendation and planning the best course of action. We anticipate submitting a follow-on response updating our progress by 31 March 2012.</i></p> <p>The Australian Transport Safety Bureau recommends that the US FAA take safety action to address this issue.</p>
<b>Safety action release date</b>	15 Mar 2011
<b>Safety action status</b>	Open
<b>Safety issue addressed</b>	Safety issue not yet addressed
<b>Investigation completion date</b>	13 Dec 2010
<b>Investigation:</b>	<b>AO-2010-089 In-flight uncontained engine failure - overhead Batam Island, Indonesia - 4 November 2010 - VH-OQA - Airbus A380-842</b>
<b>Safety action number</b>	AO-2010-089-SR-012
<b>Risk category</b>	Critical
<b>Safety issue description</b>	<p>Examination of components removed from the failed engine at the Rolls-Royce plc facility in Derby, United Kingdom, have identified the presence of fatigue cracking within a stub pipe that feeds oil into the High Pressure (HP) / Intermediate Pressure (IP) bearing structure. While the analysis of the engine failure is ongoing, it has been identified that the leakage of oil into the HP/IP bearing structure buffer space (and a subsequent oil fire within that area) was central to the engine failure and IP turbine disc liberation event.</p> <p>Further examination of the cracked area has identified the axial misalignment of an area of counter-boring within the inner diameter of the stub pipe; the misalignment having produced a localised thinning of the pipe wall on one side. The area of fatigue cracking was associated with the area of pipe wall thinning.</p> <p>Misaligned stub pipe counter-boring is understood to be related to the manufacturing process. This condition could lead to an elevated risk of fatigue crack initiation and growth, oil leakage and potential catastrophic engine failure from a resulting oil fire.</p>
<b>Action organisation</b>	Rolls-Royce Plc
<b>ATSB Safety Recommendation outcomes</b>	<p>On 2 December 2010, Rolls-Royce plc issued revision 1 to NMSB 72-G595 (see subsequent Other party safety action - Rolls-Royce plc) incorporating assessment and engine rejection criteria for the measurement of potential counter-bore misalignment, and a tightening of the compliance time frame from 20 to 2 flight cycles.</p> <p>The ATSB is satisfied that the action taken by Rolls-Royce plc adequately addresses the immediate safety of flight concerns in respect of the operation of Trent 900 series engines.</p>
<b>Safety action release date</b>	2 Dec 2010
<b>Safety action status</b>	Closed

<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	N/A – Investigation is still underway at the time of writing

## Marine

<b>Investigation:</b>	<b>MO-2008-013</b> <b>Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker <i>Karratha Spirit</i> off Dampier, Western Australia on 24 December 2008.</b>
<b>Safety action number</b>	MO-2008-013-SR-067
<b>Risk category</b>	Significant
<b>Safety issue description</b>	In this instance, the consensus of the regulatory authorities is that <i>Karratha Spirit</i> was not in a navigable form at the time of the accident and was therefore under NOPSA's jurisdiction according to the OPGGSA. However, the point at which <i>Karratha Spirit</i> became 'navigable' is not clearly defined in the OPGGSA and is open to interpretation. Furthermore, had the accident occurred on board <i>Karratha Spirit</i> after it had departed the CALM buoy and while it was steaming off the coast to avoid a cyclone, without entering any ports, then it is possible that the ship would not come under the jurisdiction of any Australian safety regulatory regime.
<b>Action organisation</b>	National Offshore Petroleum Safety Authority (NOPSA)
<b>ATSB Safety Recommendation outcomes</b>	On 25 Mar 2011, NOPSA advised: <i>The Department of Resources Energy and Tourism (RET) have further considered the issue of jurisdiction between NOPSA and the Australian Maritime Safety Authority (AMSA). NOPSA is aware that RET have been discussing options with both these agencies and that RET are proposing to make clarifying amendments to the relevant legislation as part of a larger reform agenda and are targeting the winter 2011 session of Parliament.</i>  Based on the information provided by NOPSA on 25 March 2011 with regard to amendment of relevant legislation, the ATSB is satisfied that the proposed actions of NOPSA, AMSA and RET will satisfactorily address this safety issue.
<b>Safety action release date</b>	28 Sep 2010
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	28 Sep 2010

<b>Investigation:</b>	<b>MO-2010-003</b> <b>Independent investigation into the grounding of the Chinese registered bulk carrier <i>Shen Neng 1</i> on Douglas Shoal, QLD on 3 April 2010.</b>
<b>Safety action number</b>	MO-2010-003-SR-005
<b>Risk category</b>	Significant
<b>Safety issue description</b>	There was no effective fatigue management system in place to ensure that the bridge watch keeper was fit to stand a navigational watch after the loading in Gladstone.
<b>Action organisation</b>	Tosco Keymax International Ship Management Company (Hong Kong, China)
<b>ATSB Safety Recommendation outcomes</b>	On 21 Jul 2011, Tosco Keymax International Ship Management Company advised: <i>Since the incident, in accordance with the company's policy of continuous improvement, Tosco Keymax has implemented additional inspection regimes and provided information and further training to ship's staff relevant to issues arising from the grounding.</i> The ATSB remains concerned that there is no proper guidance provided to the master or crew with regard to how fatigue levels should be managed and when someone should make the fact known that they might not be fit to undertake a navigational watch. The Australian Transport Safety Bureau recommends that Tosco Keymax International takes further safety action to address this safety issue.
<b>Safety action release date</b>	14 Apr 2011
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue partially addressed
<b>Investigation completion date</b>	14 Apr 2011

<b>Investigation:</b>	<b>MO-2010-003</b> <b>Independent investigation into the grounding of the Chinese registered bulk carrier <i>Shen Neng 1</i> on Douglas Shoal, QLD on 3 April 2010.</b>
<b>Safety action number</b>	MO-2010-003-SR-006
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The ship's safety management system did not contain procedures or guidance on the proper use of GPS route plans and their relationship to the ship's passage plans.
<b>Action organisation</b>	Tosco Keymax International Ship Management Company (Hong Kong, China)
<b>ATSB Safety Recommendation outcomes</b>	The ATSB remains concerned that there is no proper guidance provided to the master or crew with regard to how fatigue levels should be managed and when someone should make the fact known that they might not be fit to undertake a navigational watch. The Australian Transport Safety Bureau recommends that Tosco Keymax International takes further safety action to address this safety issue.
<b>Safety action release date</b>	14 Apr 2011

<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue not addressed
<b>Investigation completion date</b>	14 Apr 2011

## Rail

<b>Investigation:</b>	<b>RO-2009-008 Signal Passed At Danger by XPT ST24 on 9 September 2009 at Junee NSW</b>
<b>Safety action number</b>	RO-2009-008-SR-034
<b>Risk category</b>	Significant
<b>Safety issue description</b>	There was no RailCorp instruction that specifically referred to the need for train crew to prioritise tasks at safety critical locations or at times when workload is high.
<b>Action organisation</b>	RailCorp (NSW)
<b>ATSB Safety Recommendation outcomes</b>	<p>On 1 Apr 2011, RailCorp advised:</p> <p><i>A driver's routine activities include speaking with network control and we question the need for an instruction for drivers to prioritise tasks as drivers are trained to respond to both planned and unexpected situations and conditions and, as such, practice prioritisation.</i></p> <p>It is acknowledged that communications of a safety critical nature with network controllers and others involved in railway safeworking is a routine, and very necessary, activity of a train driver. In this instance communication with the network controller related to obtaining a Condition Affecting the Network advice that was directly associated with the imminent passage of the train. This issue required the driver's immediate attention whereas communication with the Passenger Services Supervisor was not immediately associated with the safe passage of the train and was not safety critical in nature. Therefore this communication was not necessary at the time of departing Junee station yard.</p> <p>The ATSB believes that safety could be improved if train crews were provided with guidance regarding prioritisation of critical tasks such as when departing stations, running through station yards, approaching track gangs or level crossings and so on.</p>
<b>Safety action release date</b>	11 Feb 2011
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue withdrawn
<b>Investigation completion date</b>	11 Feb 2011

<b>Investigation:</b>	<b>RO-2010-007 Safeworking Breach at Junee NSW on 4 August 2010</b>
<b>Safety action number</b>	RO-2010-007-SR-006
<b>Risk category</b>	Significant
<b>Safety issue description</b>	Rule ANWT 304 (ARTC) / NWT 304 (RailCorp) does not stipulate that the Protection Officer must inform all persons or work groups who may be within the boundaries of a Track Occupancy Authority of its existence. This is regardless of whether or not these persons or work groups fit the definition of 'work parties' or 'workers'.
<b>Action organisation</b>	Australian Rail Track Corporation (ARTC)
<b>ATSB Safety Recommendation outcomes</b>	On 11 Jul 2011, ARTC advised: <i>The responsibilities of the Protection Officer are clearly defined in Rule ANWT304. ARTC acknowledges the need for all affected workers to be aware of the protection arrangements and limits associated with a Track Occupancy Authority. However ARTC suggests that it is neither feasible nor realistic to expect the Protection Officer to inform persons other than those associated with the Track Occupancy Authority about the kinds and limits of protection in place. In this instance, the Network Controller was not contacted by Pacific National personnel. Had they complied with Network Rules and spoken to the Network Controller, prior to commencing activities within the danger zone, they would have been made aware of the TOA. It was clearly not the responsibility of the Protection Officer to contact Pacific National.</i>  The Australian Transport Safety Bureau recommends that the Australian Rail Track Corporation take action to address this safety issue.
<b>Safety action release date</b>	18 Apr 2011
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	18 Apr 2011

<b>Investigation:</b>	<b>RO-2010-007 Safeworking Breach at Junee NSW on 4 August 2010</b>
<b>Safety action number</b>	RO-2010-007-SR-007
<b>Risk category</b>	Significant
<b>Safety issue description</b>	Rule ANWT 304 (ARTC) / NWT 304 (RailCorp) does not stipulate that the Protection Officer must inform all persons or work groups who may be within the boundaries of a Track Occupancy Authority of its existence. This is regardless of whether or not these persons or work groups fit the definition of 'work parties' or 'workers'.
<b>Action organisation</b>	RailCorp (NSW)
<b>ATSB Safety Recommendation outcomes</b>	RailCorp has accepted the ATSB's recommendation but RailCorp stated in their response that the incorrect rule was used to protect the worksite.

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<b>Safety action release date</b>	18 Apr 2011
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	18 Apr 2011

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## APPENDIX D: ATSB Safety Advisory Notices

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### Aviation

<b>Investigation:</b>	<b>AO-2008-062</b> Collision with terrain - 6 km NE Purnululu ALA, Western Australia - 14-Sep-08 - VH-RIO, Robinson Helicopter Company R44
<b>Safety action number</b>	AO-2008-062-SAN-098
<b>Risk category</b>	Minor
<b>Safety issue description</b>	There was a lack of assurance that informal operator supervisory and experience-based policy, procedures and practices minimised the risk of pilots operating outside the individual pilot's level of competence.
<b>Addressed to</b>	All operators
<b>SAN description</b>	The Australian Transport Safety Bureau (ATSB) draws the attention of all operators to the potential lack of assurance that informal operator supervisory and experience-based policy, procedures and practices minimise the risk of their pilots operating outside the individual pilot's level of competence. Operators are encouraged to consider the safety implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	7 Jul 2010

<b>Investigation:</b>	<b>AO-2009-032</b> Collision with terrain - Gold Coast Aerodrome, Queensland - 02-July-2009 - VH-OML - Robinson Helicopter Company R22 Beta II
<b>Safety action number</b>	AO-2009-032-SAN-019
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The helicopter operator's induction checklist did not include the notation of instructors' ratings and validity periods.
<b>Addressed to</b>	All pilots
<b>SAN description</b>	Unless operators actively track the qualifications, endorsements, ratings and recency of their staff, there is the risk that pilots and instructors may operate aircraft with invalid qualifications and not be at the specified competency standard required for the task. Pilots, including those who have gained their Australian ratings as part of the Trans Tasman Mutual Recognition Act 1997, need to be aware of the different requirements regarding rating renewals in Australia. A valid rating is an important measure of competency.  Operators need to be able to assure themselves that pilots' qualifications are valid, and their competence confirmed when allocating tasks. On that basis, the ATSB issues the following Safety Advisory Notice.

<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	28 Jul 2010

**Investigation:** **AO-2008-053**  
**Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK**

<b>Safety action number</b>	AO-2008-053-SAN-006
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Possible existence of a broad safety issue relating to the maintenance of oxygen cylinders. This SAN was issued early in the investigation timeframe, and is no longer relevant. Please refer to the explanatory text in section 4.3.2 of the Safety Investigation report.
<b>Addressed to</b>	Organisations conducting inspection, repair and / or recertification of aviation oxygen cylinders
<b>SAN description</b>	The Australian Transport Safety Bureau encourages all organisations performing inspection, testing, maintenance and repair activities on aviation oxygen cylinders, to note the circumstances detailed in this preliminary report, with a view to ensuring that all relevant procedures, equipment, techniques and personnel qualifications satisfy the applicable regulatory requirements and established engineering best practices.
<b>Safety action status</b>	N/A - SAN is no longer relevant (31 May 2011) Superseded by AO-2008-053-SAN-106 (see below).
<b>Investigation completion date</b>	22 Nov 2010

**Investigation:** **AO-2008-053**  
**Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK**

<b>Safety action number</b>	AO-2008-053-SAN-007
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Possible existence of a broad safety issue relating to the installation of oxygen systems within aircraft. This SAN was issued early in the investigation timeframe, and is no longer relevant. Please refer to the explanatory text in section 4.3.2 of the Safety Investigation report.
<b>Addressed to</b>	Operators of pressurised transport-category aircraft
<b>SAN description</b>	The Australian Transport Safety Bureau encourages other operators of transport category aircraft fitted with pressurised gaseous oxygen systems, to note the circumstances detailed in this preliminary report, with a view to ensuring that all oxygen cylinders, and cylinder installations, are maintained in full accordance with the relevant manufacturer's requirements, statutory regulations, and established engineering best practices.

<b>Safety action status</b>	N/A - SAN is no longer relevant (31 May 2011) Superseded by AO-2008-053-SAN-106 (see below).
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<b>Investigation completion date</b>	22 Nov 2010
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<b>Investigation:</b>	<b>AO-2009-053 Powerplant / propulsion event, Launceston aerodrome - 20 August 2009</b>
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<b>Safety action number</b>	AO-2009-053-SAN-038
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<b>Risk category</b>	Minor
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<b>Safety issue description</b>	The CFM56-7B engine had sustained bushing and shroud wear sufficient to cause rotor-to-stator contact, after a time in service that was less than the minimum threshold period specified by the manufacturer, for an initial inspection targeted at identifying this problem.
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<b>Addressed to</b>	Other
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<b>SAN description</b>	The Australian Transport Safety Bureau draws the attention of all operators of CFM56-7 and CFM56-5 engines and their variants to the safety issues identified by this investigation. In particular operators should be aware of the potential for premature wear within the compressor variable stator vane bushings and shroud to develop to levels where it may precipitate the failure of the engine while in-service, and within a timeframe that is less than the minimum threshold for the initial inspection for the problem (24,000 hours TSN, per S/B 72-0515). Operators are encouraged to review their procedures to ensure an appropriate awareness of the issues among maintenance personnel.
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<b>Safety action status</b>	Closed
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<b>Investigation completion date</b>	27 Jul 2010
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<b>Investigation:</b>	<b>AO-2008-053 Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK</b>
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<b>Safety action number</b>	AO-2008-053-SAN-105
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<b>Risk category</b>	Minor
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<b>Safety issue description</b>	The safety information provided to passengers did not adequately explain that oxygen will flow to the masks without the reservoir bag inflating.
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<b>Addressed to</b>	Operators of pressurised transport-category aircraft
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<b>SAN description</b>	The Australian Transport Safety Bureau advises that operators of transport category aircraft fitted with pressurised gaseous oxygen systems should consider the safety implications of these safety issues, with a view to ensuring that passenger briefings provide sufficient detail and instruction as to the functionality of the system and the actions necessary to appropriately activate the flow of oxygen.
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<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	22 Nov 2010
<b>Investigation:</b>	<b>AO-2008-053</b> <b>Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK</b>
<b>Safety action number</b>	AO-2008-053-SAN-106
<b>Risk category</b>	Minor
<b>Safety issue description</b>	While maintaining the appropriate general quality accreditation (ISO 9001) of its engineering facilities, the operator did not maintain independent accreditation of the specific procedures and facilities used for the inspection, maintenance and re-certification of oxygen cylinders.
<b>Addressed to</b>	Organisations conducting inspection, repair and / or recertification of aviation oxygen cylinders
<b>SAN description</b>	The Australian Transport Safety Bureau encourages all organisations performing inspection, testing, maintenance and repair activities on aviation oxygen cylinders, to note the circumstances detailed in this report, with a view to ensuring that all facilities establish and maintain independent external accreditation of their procedures, processes and equipment.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	22 Nov 2010
<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-SAN-107
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The priority level of the battery discharge messages that were provided by the engine indicating and crew alerting system did not accurately reflect the risk presented by the battery discharge status.
<b>Addressed to</b>	Boeing Co
<b>SAN description</b>	The ATSB reminds operators and flight crews of transport category aircraft that although battery discharge may occur routinely, immediate flight crew action may be necessary in the event of abnormal or unexpected battery discharge alerts if the battery discharge status cannot be immediately resolved in-flight. Multiple electrical system failures, including failures of critical flight systems, may occur in the event of battery power depletion.

<b>Safety action status</b>	N/A - SAN is no longer relevant (18 May 2011)
<b>Investigation completion date</b>	13 Dec 2010
<b>Investigation:</b>	<b>AO-2009-073</b> <b>In-flight cargo door separation - 28 km NW Sunshine Coast Airport - 1 December 2009</b>
<b>Safety action number</b>	AO-2009-073-SAN-048
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Installation of new cargo door seals resulted in the cargo door being held outside of the flushness requirement specified in the aircraft maintenance manual.
<b>Addressed to</b>	All operators of Eurocopter AS350 aircraft
<b>SAN description</b>	The Australian Transport Safety Bureau advises that all operators of Eurocopter AS350 aircraft should consider the implications of this safety issue and take action where considered appropriate. In particular, operators are encouraged to review the appropriate sections of the aircraft maintenance manual with regard to cargo door flushness and give consideration to the cargo door improved locking mechanism detailed in SB 52.00.25 and SB 52.00.26 to improve door security.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	11 Apr 2011

## Marine

<b>Investigation:</b>	<b>MO-2008-013</b> <b>Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker <i>Karratha Spirit</i> off Dampier, Western Australia on 24 December 2008.</b>
<b>Safety action number</b>	MO-2008-013-SAN-066
<b>Risk category</b>	Minor
<b>Safety issue description</b>	NOPSA does not undertake the audits necessary for maritime compliance and AMSA is only able to do so, while the facility is on station, with NOPSA's cooperation. NOPSA had carried out annual occupational health and safety inspections on board the ship and AMSA had carried out the necessary third party audits of the system to meet its certification requirements. However, none of these audits or inspections had identified the discrepancy between the mooring hawser procedures and actual shipboard practices or that the ship's internal review processes had not identified the discrepancy.
<b>Addressed to</b>	National Offshore Petroleum Safety Authority (NOPSA)

<b>SAN description</b>	<p>The Australian Transport Safety Bureau advises that the National Offshore Petroleum Safety Authority (NOPSA) should consider the safety implications of this safety issue and undertake further action where considered appropriate.</p> <p>In response to the ATSB draft report, the National Offshore Petroleum Safety Authority advised the ATSB that with regards to the Safety Advisory Notice: The Safety Authority has sought ongoing support from AMSA in the provision of marine surveyors to assist the Safety Authority in its inspection of facilities (that can become vessels upon exiting the offshore petroleum regime). AMSA have confirmed its ongoing willingness to assist. The Authority has reviewed and is using its 'sail-away preparedness' and 'cyclone response preparedness' checklists in inspections of selected facilities.</p> <p>The Authority has increased its target frequency for inspections of normally occupied facilities (including FPSOs and FSOs) from once a year to twice a year, and is actively addressing the consequential requirement for additional OHS Inspectors.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	28 Sep 2010
<b>Investigation:</b>	<b>MO-2009-005</b> <b>Serious injury on board <i>United Treasure</i> off Port Kembla, New South Wales on 7 July 2009</b>
<b>Safety action number</b>	MO-2009-005-SAN-024
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The tower was not assembled as designed. The outriggers and intermediate planks, both key components, were missing and the work platform guard rails were not used. The manufacturer's instructions were also missing but no attempt was made to obtain them, a parts list or the missing parts.
<b>Addressed to</b>	Ship's masters and crews
<b>SAN description</b>	The Australian Transport Safety Bureau advises that ships' masters and crew should consider the safety implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	17 Nov 2010

<b>Investigation:</b>	<b>MO-2009-009</b> <b>Independent investigation into the fire on board the Marshall Islands registered anchor handling tug supply vessel <i>Petra Frontier</i> at sea on 28 September 2009.</b>
<b>Safety action number</b>	MO-2009-009-SAN-021
<b>Risk category</b>	Minor
<b>Safety issue description</b>	While <i>Petra Frontier</i> had undergone an initial flag State inspection on 4 May 2009 and routine class surveys, the most recent being a class survey completed on 12 August 2009, neither authority was aware that the ship was unseaworthy in relation to critical safety equipment when it departed Singapore.
<b>Addressed to</b>	American Bureau of Shipping (ABS)
<b>SAN description</b>	<p>The Australian Transport Safety Bureau advises that the American Bureau of Shipping should consider the safety implications of this safety issue and take further action where considered appropriate.</p> <p>The American Bureau of Shipping advised the ATSB that: The class surveys of the PETRA FRONTIER in Singapore from 7 to 12 August 2009 were annual surveys which generally call for visual examination of machinery and equipment. Even if there had been more detailed surveys, similar to the renewal surveys, they would not have identified many of the deficiencies, some of them caused by subsequent work on the vessel.</p> <p>Furthermore, the American Bureau of Shipping stated that: Under ABS Rules, any damage, failure or deterioration of the hull, machinery or equipment of an ABS-classed vessel which affects or may affect classification is to be reported to ABS by the vessel owner at first opportunity. ABS received no notification of malfunctions of the vessel's fuel oil purifier, oily water separator or steering gear until advised of the 16 September 2009 PSC detention of the vessel. Nor was ABS advised of the early September attempted repairs to machinery items and the steering system, as also required by ABS Rules.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	14 Dec 2010

<b>Investigation:</b>	<b>MO-2009-002</b> <b>Independent investigation into the loss of containers from the Hong Kong registered container ship <i>Pacific Adventurer</i> off Cape Moreton, Queensland, on 11 March 2009.</b>
<b>Safety action number</b>	MO-2009-002-SAN-029
<b>Risk category</b>	Significant
<b>Safety issue description</b>	At the time of the incident, there was no requirement for any third party to inspect or survey the fixed and loose lashing equipment on a ship. Had this been done, the maintenance and replacement regime of such equipment on board <i>Pacific Adventurer</i> might have been more effective.
<b>Addressed to</b>	Flag and coastal states

<b>SAN description</b>	The Australian Transport Safety Bureau advises that coastal States, flag States and classification societies should consider the safety implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>MO-2010-009</b> <b>Independent investigation into the grounding of the Liberian registered container ship <i>MSC Basel</i> in Moreton Bay, Queensland on 1 November 2010</b>
<b>Safety action number</b>	MO-2010-009-SAN-011
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Preliminary inspections and tests of the <i>MSC Basel's</i> steering system did not identify any faults. However, more thorough examinations of the entire steering systems may identify any intermittent defects.
<b>Addressed to</b>	Laeisz Reederei
<b>SAN description</b>	The ATSB advises that Reederei F. Laeisz should consider taking further action to address this safety issue.  Reederei F. Laeisz has advised the ATSB that: The spherical bearing and pin which were found seized during the investigation were replaced by the manufacturer in Singapore on 15 November 2010 with genuine spare parts. Following the repairs, the steering gear was tested and found to operate satisfactorily.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	4 May 2011

## Rail

<b>Investigation:</b>	<b>RO-2009-004</b> <b>Derailment of Train 6MB2 near Tottenham VIC on 30 January 2009</b>
<b>Safety action number</b>	RO-2009-004-SAN-030
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The section of track where train 6MB2 derailed, was previously utilised as the Tottenham standard gauge passing loop. It was not stress tested after slewing and welding when it was converted to mainline operation on 28 July 2008, 5 months before the derailment.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	N/A - SAN is no longer relevant
<b>Investigation completion date</b>	22 Dec 2010

<b>Investigation:</b>	<b>RO-2009-004</b> <b>Derailment of Train 6MB2 near Tottenham VIC on 30 January 2009</b>
<b>Safety action number</b>	RO-2009-004-SAN-031
<b>Risk category</b>	Minor
<b>Safety issue description</b>	A record of the welds carried out at the 8.351 km point at Tottenham on the 30 January 2009 was not documented in accordance with the requirements of Civil Engineering Circular 3/87.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	N/A - SAN is no longer relevant
<b>Investigation completion date</b>	22 Dec 2010

<b>Investigation:</b>	<b>RO-2009-004</b> <b>Derailment of Train 6MB2 near Tottenham VIC on 30 January 2009</b>
<b>Safety action number</b>	RO-2009-004-SAN-032
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Regular monitoring and accurate measurement of rail creep was not carried out at the east end of the curve where train 6MB2 derailed in accordance with Civil Engineering Circular 3/87 - 70.2 and 70.3. Creep monuments were not installed on the east end of the curve following the work to convert the passing loop track to mainline operation in July 2008.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	N/A - SAN is no longer relevant
<b>Investigation completion date</b>	22 Dec 2010

<b>Investigation:</b>	<b>RO-2009-004</b> <b>Derailment of Train 6MB2 near Tottenham VIC on 30 January 2009</b>
<b>Safety action number</b>	RO-2009-004-SAN-033
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Punch marks were not made on the rail and documented with references to monuments at the 9 km mark following the realignment of track west of the Ashley Street rail bridge. This omission precluded the detection of rail creep that may have been present during the October 2008 maintenance inspection.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	N/A - SAN is no longer relevant
<b>Investigation completion date</b>	22 Dec 2010

<b>Investigation:</b>	<b>RO-2009-009</b> <b>Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7 on 12 November 2009</b>
<b>Safety action number</b>	RO-2009-009-SAN-024
<b>Risk category</b>	Minor
<b>Safety issue description</b>	A design based on using a clearance point at the interface of CA74C and CA74D should not have been implemented until it was established that the clearance between the Up Main line and No.1 Platform Road at the interface of CA74C and CA74D tracks was adequate.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	20 Jan 2011

<b>Investigation:</b>	<b>RO-2009-009</b> <b>Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7 on 12 November 2009</b>
<b>Safety action number</b>	RO-2009-009-SAN-026
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Although the Australian Rail Track Corporation was not resourced to actively participate in the design or commissioning phases of the Cootamundra re-signalling project, greater involvement by the Australian Rail Track Corporation (local knowledge of site geography and layout) during these phases may have assisted the South Improvement Alliance engineers in detecting the design error.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	20 Jan 2011

<b>Investigation:</b>	<b>RO-2009-009</b> <b>Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7 on 12 November 2009</b>
<b>Safety action number</b>	RO-2009-009-SAN-027
<b>Risk category</b>	Minor
<b>Safety issue description</b>	As the re-signalling of Cootamundra neared completion it became necessary to undertake control table and software development concurrently to meet the targeted commissioning date. Normally control table and software development is done sequentially to ensure that all the control table logic is fully reflected in the final software and associated validation/testing processes.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate. The Australian Rail Track Corporation has advised that the following action will be taken with respect to the programming of signal works. Mandate completion of design verification 8 days prior to commencement of Commissioning. Exceptions to be managed by Waiver process. The Australian Transport Safety Bureau acknowledges that the Australian Rail Track Corporation have developed procedures that will mandate design verification 8 days prior to commencement of signal system commissioning. However, the Australian Rail Track Corporation needs to ensure that all elements of a program have adequate time to safely implement all elements of a project.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	20 Jan 2011

<b>Investigation:</b>	<b>RO-2009-009</b> <b>Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7 on 12 November 2009</b>
<b>Safety action number</b>	RO-2009-009-SAN-028
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Where a design involves complex signalling arrangements, it may be beneficial to involve the designing engineer during the final onsite field testing phase as they have the best understanding of the interlocking principles. This places them in a strong position to identify any design omissions or deficiencies that may not have been evident during earlier phases of a project.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	Closed

<b>Investigation completion date</b>	20 Jan 2011
<b>Investigation:</b>	<b>RO-2010-006</b> <b>Safeworking irregularity involving trains SN57 and D231 at Moss Vale, New South Wales on 17 June 2010</b>
<b>Safety action number</b>	RO-2010-006-SAN-002
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The ARTC does not have a check list available for network controllers to assist in identifying risks associated with the verbal authorisation of train movements for an integrated yard.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	N/A - SAN is no longer relevant
<b>Investigation completion date</b>	21 Jun 2011
<b>Investigation:</b>	<b>RO-2010-007</b> <b>Safeworking Breach at Junee NSW on 4 August 2010</b>
<b>Safety action number</b>	RO-2010-007-SAN-004
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The NSW rules and procedures do not clearly address the requirements relating to protection of 'out of service' track infrastructure.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	18 Apr 2011

<b>Investigation:</b>	<b>RO-2010-007</b> <b>Safeworking Breach at Junee NSW on 4 August 2010</b>
<b>Safety action number</b>	RO-2010-007-SAN-005
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The current TOA form (ANRF 002) does not allow the user to record details of protection measures enacted or whether all persons or work groups within the boundaries of the Track Occupancy Authority have been informed of its existence.
<b>Addressed to</b>	Australian Rail Track Corporation (ARTC)
<b>SAN description</b>	The Australian Transport Safety Bureau advises that the ARTC should consider the implications of this safety issue and take action where considered appropriate.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	18 Apr 2011

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## APPENDIX E: Proactive Industry Safety Actions

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### Aviation

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-028
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Maintenance processes did not identify or correct the deterioration of the galley floor sealing
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	On 11 January 2008, Qantas advised that it would review the effectiveness of the stipulated galley floor sealing maintenance. In a response to the draft investigation report, the aircraft operator reported that, since the occurrence, and to provide better understanding and clarification for its maintenance personnel, it had made a number of revisions to its galley floor sealing specification document. The intent of those enhancements was to ensure the correct installation of the galley floor sealing. The ATSB is satisfied that the actions taken by Qantas adequately address the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-029
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The location of the decompression panel and absence of cabin floor sealing above the main equipment centre increased the risk of liquid ingress into the aircraft's electrical systems.
<b>Action taken by</b>	Boeing
<b>Safety action outcomes</b>	In response to this occurrence, Boeing advised the ATSB that it had taken the following action to address this safety issue: <ul style="list-style-type: none"><li>issued a multi-operator message containing a recommendation that operators review decompression panels that have been relocated after delivery to verify that they do not become a direct water path to the main equipment centre dripshield; and</li></ul>

	<ul style="list-style-type: none"> <li>is investigating a number of methods to improve floor sealing in 747-400 aircraft.</li> </ul> <p>The ATSB is satisfied that, when completed, the actions taken or that are being undertaken by Boeing will adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue partially addressed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-030
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The location of the decompression panel and absence of cabin floor sealing above the main equipment centre increased the risk of liquid ingress into the aircraft's electrical systems.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	<p>Qantas advised the ATSB that it had taken the following action in response to this safety issue:</p> <ul style="list-style-type: none"> <li>installed a water barrier gutter at the rear of the forward galley bulkhead on all of its 747-400 fleet; and</li> <li>installed an additional bead of sealant around the first-class seat pods to protect the decompression panel on all of its 747-400 fleet.</li> </ul> <p>The ATSB is satisfied that the actions taken by the aircraft operator adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue partially addressed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-031
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The galley drain operation and maintenance processes did not adequately prevent blockage and overflow of the aircraft's drain lines.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	<p>Following this occurrence, Qantas advised the ATSB that they had taken the following action to address this safety issue:</p> <ul style="list-style-type: none"> <li>• increased the frequency of maintenance to clean and flush the forward galley drain lines to every A-check;</li> <li>• increased the frequency of maintenance to clean behind the ice drawers every A-check;</li> <li>• added procedures to remove and clean the forward galley 'Y' connector during scheduled maintenance;</li> <li>• changed the maintenance procedures to require the replacement of soft galley drain lines on every D-check;</li> <li>• promulgated cabin crew standing orders to provide guidance on the appropriate methods of disposal for different types of liquids;</li> <li>• initiated a review of toilet design, maintenance, and signage to reduce the frequency and impact of blockages - some changes had already been implemented when this report was drafted;</li> <li>• initiated a project to implement high-pressure waste line cleaning;</li> <li>• is investigating a number of proposals to improve galley operation, including the replacement of coffee grounds with coffee bags and the provision of liquid absorption and disposal products;</li> <li>• initiated a review of its fleet's aircraft drain systems to improve reliability, eliminate the risk of blockages, review maintenance practices, eliminate safety risks to engineers, and consider future product selection;</li> <li>• issued service bulletins to modify the drain behind the coffee machine and water boiler to ensure that the drain line is now directed into the galley drain port to prevent water spilling over the top of the galley;</li> <li>• promulgated a cabin standing order and a flight standing order to all 747-400 cabin and flight crews, requiring them to identify, treat and report abnormal water accumulation in galley areas, and modified the cabin crew operating manual accordingly; and</li> <li>• promulgated a flight standing order to all flight crew, requiring them to treat and report abnormal water accumulation in galley areas and requiring crews to treat substantial water leaks as airworthiness items (which the operator defined as items that have the potential to affect the aircraft's ability to operate safely if unserviceable).</li> </ul> <p>The ATSB is satisfied that the actions taken by Qantas adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-032
<b>Risk category</b>	Significant
<b>Safety issue description</b>	Maintenance processes did not identify or correct the inoperability of the forward drain line heater.
<b>Action taken by</b>	Boeing
<b>Safety action outcomes</b>	Boeing initiated a review of continuing maintenance of 747-400 drain system and ribbon heaters. The ATSB is satisfied that the action taken by the aircraft manufacturer adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue partially addressed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety issue number</b>	AO-2008-003-NSA-033
<b>Risk category</b>	Significant
<b>Safety issue description</b>	Maintenance processes did not identify or correct the inoperability of the forward drain line heater.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	In response to this safety issue, Qantas advised the ATSB that they had: <ul style="list-style-type: none"> <li>• conducted a fleet inspection of 747-400 drain mast heaters, drain line heaters and drain mast hoses, and of 30 aircraft inspected, identified 11 failed drain ribbon heaters and four split drain hoses;</li> <li>• performed fleet-wide drain mast heater inspections on 747-300 aircraft, and identified one failed drain ribbon heater of 4 aircraft inspected; and</li> <li>• increased the frequency of forward drain mast ribbon heater checks to every A-check. Results of the inspections will be analysed and an appropriate check interval will be established into the system of maintenance in accordance with the findings.</li> </ul> The ATSB is satisfied that the actions taken by the aircraft operator adequately address the safety issue.
<b>Safety action status</b>	Closed

<b>Safety issue addressed</b>	Safety issue partially addressed
<b>Investigation completion date</b>	13 Dec 2010
<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-034
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Maintenance processes did not identify or correct the corrosion in the generator control units.
<b>Action taken by</b>	Other
<b>Safety action outcomes</b>	<p>The GCU/BCU manufacturer implemented procedures for a more thorough inspection of the external chassis of GCUs and BCUs received for repair for signs of liquid contamination, and a circuit card removal and inspection for any suspect units. The GCU/BCU manufacturer drafted a service information letter to operators and maintenance providers advising that:</p> <p><i>Unexplained EICAS [engine indicating and crew alerting system] messages and aircraft electrical system anomalies may result from the presence of corrosion and contamination within the GCU or BCU circuitry. Operators suspecting water ingress of the GCU or BCU should remove the units to an avionics repair shop and request a physical inspection and a careful cleaning of the Printed Wiring Assemblies [PWA], the motherboard, and all interconnections to ensure contamination of the circuitry is not present. A test validation is not sufficient to detect corrosion and contamination of the internal circuitry. Avionic repair stations should examine the NVM [non-volatile memory] of each unit and perform a visual examination of PWAs for corrosion and contamination.</i></p> <p>The ATSB is satisfied that the actions taken and proposed by the GCU/BCU manufacturer adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	13 Dec 2010
<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-035
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Maintenance processes did not identify or correct the corrosion in the generator control units.

<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	As a result of this occurrence, Qantas is planning to include additional guidance on liquid management in its engineering design guide. The ATSB is satisfied that the action proposed by Qantas will, when the guidance is included in their engineering design guide, adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	13 Dec 2010

**Investigation:** **AO-2008-003**  
**Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438**

<b>Safety action number</b>	AO-2008-003-NSA-037
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The aircraft operator's documented design objectives did not explicitly require protection of non-structural systems from liquid contact or ingress.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	As a result of this occurrence, Qantas is planning to include additional guidance on liquid management in its engineering design guide. The ATSB is satisfied that the action proposed by Qantas will, when the guidance is included in their engineering design guide, adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	13 Dec 2010

**Investigation:** **AO-2008-003**  
**Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438**

<b>Safety action number</b>	AO-2008-003-NSA-039
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The operator's flight crew quick reference handbook did not include sufficient information for flight crew to manage the emergency.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	As a result of this occurrence, Qantas advised the ATSB that they had taken the following actions to address this safety issue: <ul style="list-style-type: none"> <li>evaluated the provision of additional formal guidance to 747-400 flight crew for</li> </ul>

operations on standby power, including a review of Section 6 – electrical of the non-normal checklist within the 747-400 quick reference handbook (QRH). On 30 April 2009, the aircraft operator reported that it did not plan any changes to the QRH unless recommended to do so by the aircraft manufacturer;

- has drafted an addition to the 747-400 flight crew operations manual to provide guidance to flight crews on the effect and management of multiple AC electrical bus loss, including battery life, major systems affected, and recommended crew actions.

The ATSB acknowledges the reviews already undertaken by Qantas and Boeing and action to amend Qantas's operations manual to include guidance to flight crews on the effect and management of multiple AC electrical bus loss, including on battery life. The ATSB recognises that the various crew alerting systems in the 747-400 should inform flight crews of any aircraft systems that are be affected by electrical systems failures. However, there is currently limited assurance that 747-400 flight crews would be aware of the expected duration of available battery power or of the possible need to expedite appropriate actions such as aircraft diversion that should be undertaken in the event of abnormal or unexpected battery discharge. The inclusion of a note or caution associated with the battery discharge message entry in the QRH to alert crews of the restricted battery life in such cases would help crews select and prioritise the most appropriate actions to recover from the emergency. The Australian Transport Safety Bureau recommends that Boeing undertake further work to address this safety issue.

<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	13 Dec 2010
<b>Investigation:</b>	<b>AO-2008-003 Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-110
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The galley drain operation and maintenance processes did not adequately prevent blockage and overflow of the aircraft's drain lines.
<b>Action taken by</b>	Boeing
<b>Safety action outcomes</b>	In response to this occurrence, Boeing changed the drain overflow troubleshooting procedures to improve the identification of blocked drains.  The ATSB is satisfied that the action taken by Boeing adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-115
<b>Risk category</b>	Significant
<b>Safety issue description</b>	Maintenance processes did not identify or correct the deterioration of the drip shield.
<b>Action taken by</b>	Federal Aviation Administration (FAA)
<b>Safety action outcomes</b>	<p>Subsequent to this occurrence, the United States (US) Federal Aviation Administration (FAA):</p> <ul style="list-style-type: none"> <li>• adopted airworthiness directive AD 2009 22 14 (effective 8 December 2009), requiring the installation of larger dripshields and drain lines in the electrical/electronic equipment centres of aircraft manufacturer's 747 200C and 747 200F aircraft to prevent water contamination of essential electrical/electronic units. The aircraft manufacturer's procedure referenced by the airworthiness directive was first published on 15 February 2007 and revised on 9 October 2008.</li> <li>• issued a notice of proposed rulemaking (NPRM) on 5 May 2010 stating: <p><i>We propose to adopt a new airworthiness directive (AD) for certain Model 747-400 and 747-400D series airplanes. This proposed AD would require installing aluminium gutter reinforcing brackets to the forward and aft dripshield gutters of the main equipment centre (MEC); and adding a reinforcing fiberglass overcoat to the top surface of the MEC dripshield, including an inspection for cracking and holes in the MEC dripshield, and corrective actions if necessary. This proposed AD also provides for an option to install an MEC dripshield drain system, which, if accomplished, would extend the compliance time for adding the reinforcing fiberglass overcoat to the top surface of the MEC dripshield. This proposed AD results from a report indicating that an operator experienced a multi-power system loss in-flight of 1, 2, and 3 alternating current (AC) electrical power systems located in the MEC. We are proposing this AD to prevent water penetration into the MEC, which could result in the loss of flight critical systems. Comment on the NPRM was required by 6 July 2010.</i></p> <p>The ATSB is satisfied that the action taken by the US FAA will, when finalised and promulgated, adequately address the safety issue.</p> </li> </ul>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue partially addressed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-116
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The floor sealing around the forward galley was not of sufficient extent to prevent liquids from passing through to the under floor area.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	<p>On 11 January 2008, Qantas advised that it would review the effectiveness of the stipulated galley floor sealing maintenance.</p> <p>The ATSB acknowledges the intent by Qantas in January 2008 to review the galley floor sealing maintenance requirements. During the investigation, the ATSB discussed the background for this safety issue and the associated safety risk with Qantas. The potential for a reduction in the associated risk to as low as reasonably practicable by proactive safety action by Qantas was highlighted. In a response to the draft investigation report, Qantas reported that, since the occurrence, and to provide better understanding and clarification for its maintenance personnel, it had made a number of revisions to its galley floor sealing specification document. The intent of those enhancements was to ensure the correct installation of the galley floor sealing.</p> <p>The ATSB is satisfied that the actions taken by Qantas adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	13 Dec 2010

<b>Investigation:</b>	<b>AO-2008-003</b> <b>Electrical system event - 25 km NNW of Bangkok International Airport, Thailand - 7 January 2008 - VH-OJM - Boeing Company 747-438</b>
<b>Safety action number</b>	AO-2008-003-NSA-118
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The operator's flight crew quick reference handbook did not include sufficient information for flight crew to manage the emergency.
<b>Action taken by</b>	Boeing
<b>Safety action outcomes</b>	<p>On 21 January 2011, Boeing advised:</p> <p><i>We accept this recommendation and are taking steps to make changes to the 747-400 Quick Reference Handbook (QRH). The change will include a note for flight crews to be aware of the expected duration of available battery power in the event of abnormal or unexpected battery discharge. This change will be incorporated at the next revision cycle of the QRH. On 21 June 2011, the aircraft manufacturer advised: The change has been approved on all Boeing models. The 747 model change should still be in the September revision.</i></p> <p>The Australian Transport Safety Bureau is satisfied that the action proposed by the</p>

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aircraft manufacturer will adequately address this safety issue.

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**Safety action status** Closed

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**Safety issue addressed** Safety issue adequately addressed

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**Investigation completion date** 13 Dec 2010

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**Investigation:** **AO-2008-026**  
**Loss of control - 19 km south-east of Sydney Airport, NSW - 09-Apr-08 - VH-OZA, Metroliner III**

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**Safety action number** AO-2008-026-NSA-122

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**Risk category** Significant

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**Safety issue description** The pilot's Metro III endorsement training was not conducted in accordance with the operator's approved training and checking manual, with the result that the pilot's competence and ultimately, safety of the operation could not be assured.

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**Action taken by** Airtex Air Services Pty Ltd

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**Safety action outcomes** In response to the issues that were identified in CASA's risk-based audit of June 2008, on 30 July 2008 Airtex advised CASA of the following actions to rectify those issues:

- *the operations manual was being rewritten to: - bring the operator's training and checking into line with the regulations and address multi-crew operations – ensure that base and line checks accurately reflected the operator's procedures and testing requirements by reference to specific test-content forms – include the requirement for all inducted pilots to complete 'wet drill' training on the use of life jackets and life rafts. The results of that training would be recorded and renewed annually – ensure the review of ground course theory examinations and that they were corrected to 100% knowledge of the subject – ensure the completion of formal ground courses and that the training and syllabuses were documented – ensure that pilots undertook pressurisation endorsement with a minimum training criteria;*
- *several pilots were being retrained as required to meet the operator's endorsement training requirements;*
- *the operator's computer-based flight and duty time records were password protected and a monthly copy of each crew member's record would be printed out and placed on the individual's file;*
- *flight crews had been informed about the importance of accurately completing paperwork;*
- *the head of training and checking had resigned and a new individual had been approved by CASA;*
- *one pilot who had been identified as not having sufficient in command under supervision hours had been recertified. Subsequently, on 17 September 2008, the operator provided an amended operations manual to CASA for review. That included amendments to Part C of the manual. On 16 December 2008, CASA issued a new Air Operators Certificate to the operator.*

The ATSB is satisfied that in combination, the action taken by CASA, and response to the CASA action by Airtex, adequately addresses the safety issue.

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<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	16 May 2011

**Investigation:** **AO-2008-053**  
**Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK**

<b>Safety action number</b>	AO-2008-053-NSA-056
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The safety information provided to passengers did not adequately explain that oxygen will flow to the masks without the reservoir bag inflating.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	Qantas indicated that the standard pre-flight safety video / briefings provided to passengers have been modified to reinforce the message that users must pull down on the mask firmly to activate oxygen flow, and to include the comment 'Oxygen will flow without the bag inflating'.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	22 Nov 2010

**Investigation:** **AO-2008-053**  
**Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK**

<b>Safety action number</b>	AO-2008-053-NSA-057
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Cabin crew training facilities did not appropriately replicate the equipment installed within the aircraft, including the drop-down oxygen mask assemblies.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	Qantas has advised the ATSB that all facilities used to train cabin and flight crew-members now have appropriate drop-down oxygen mask assemblies, so as to accurately simulate the aircraft cabin during a depressurisation. All training modules relating to depressurisation have been revised and upgraded, and have been implemented into all training programs undertaken by staff.
<b>Safety action status</b>	Closed

<b>Investigation completion date</b>	22 Nov 2010
<b>Investigation:</b>	<b>AO-2008-053</b> <b>Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK</b>
<b>Safety action number</b>	AO-2008-053-NSA-092
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The operator's cabin emergency procedures did not include specific crew actions to be carried out in the event of a PATR failure.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	Qantas advised the ATSB that emergency procedures have been changed to require the flight crew to make a direct passenger address in the event of a cabin depressurisation and failure of the PATR system.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	22 Nov 2010
<b>Investigation:</b>	<b>AO-2008-053</b> <b>Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK</b>
<b>Safety action number</b>	AO-2008-053-NSA-093
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Some cabin crew-members did not have an appropriate understanding of the aircraft's emergency descent profile, leading to misapprehensions regarding the significance of the situation.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	Qantas advised the ATSB that material used during emergency procedures training has been enhanced to improve awareness of likely emergency descent profiles.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	22 Nov 2010

<b>Investigation:</b>	<b>AO-2008-053</b> <b>Oxygen cylinder failure and depressurisation - 475 km north-west of Manila, Philippines - 25-Jul-08 - Boeing Company 747-438, VH-OJK</b>
<b>Safety action number</b>	AO-2008-053-NSA-104
<b>Risk category</b>	Minor
<b>Safety issue description</b>	While maintaining the appropriate general quality accreditation (ISO 9001) of its engineering facilities, the operator did not maintain independent accreditation of the specific procedures and facilities used for the inspection, maintenance and re-certification of oxygen cylinders.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	Qantas has advised the ATSB that their engineering component workshop has embarked upon a program of equipment replacement and staff training revalidation, with an estimated completion date of 15 November 2010. The program includes: <ul style="list-style-type: none"> <li>• inspection and certification of new hydrostatic test equipment by a US DOT-certified inspector;</li> <li>• revalidation of the training of seven existing cylinder test workshop staff by a DOT-certified authority; and</li> <li>• training of three new cylinder test workshop staff by a DOT-certified authority.</li> </ul>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	22 Nov 2010

<b>Investigation:</b>	<b>AO-2008-059</b> <b>Midair collision - 3 km NW Moorabbin Aerodrome, Victoria - 27 Aug 2008 - VH-UPY, Cessna Aircraft Company A150M - VH-CGT, Piper Aircraft Corp PA-28-161</b>
<b>Safety action number</b>	AO-2008-059-NSA-095
<b>Risk category</b>	Significant
<b>Safety issue description</b>	Moorabbin GAAP airspace design did not assure lateral or vertical strategic separation between traffic flows. This increased the risk of a mid-air collision.
<b>Action taken by</b>	Civil Aviation Safety Authority (CASA)
<b>Safety action outcomes</b>	A review of the utility of General Aviation Aerodrome Procedures airspace across Australia was carried out by an independent contractor on behalf of CASA. Following stakeholder feedback, a report was released on 15 December 2009. The contractor's report produced 24 recommendations covering a wide range of potential safety enhancements, including the following: <ul style="list-style-type: none"> <li>• the establishment of strategic expert oversight for all Australian GAAP operations;</li> <li>• future strategic safety enhancements, specific safety enhancements;</li> <li>• planning to monitor changes to future airport activity that may affect safety, and methods for implementing change if it is deemed necessary;</li> <li>• the acquittal of relevant ATSB recommendations issued in 2004; and</li> </ul>

- limits on aircraft numbers operating GAAP circuit patterns.

On 15 July 2009, CASA issued a direction that had effect from 21 July 2009. The direction required that the number of aircraft in the circuit for one runway be limited to six, but allowing for one more aircraft to operate in the circuit with the intent of departing. The direction required all aircraft to obtain an Air Traffic Control clearance to enter, taxi along or cross any runway.

On 24 December 2009, the direction was amended so that the limiting number of aircraft would be increased to eight from 18 January 2010. That limit was to remain in force until Class D procedures were implemented at previously GAAP airspace aerodromes on 3 June 2010. On 3 June 2010, Class D procedures were implemented at all aerodromes where GAAP procedures had previously been implemented.

On 21 April 2011, the ATSB sought an update from CASA of its actions in response to the recommendations of the above report. In response, on 9 May 2011, CASA provided the following update:

*I refer to your email dated 21 April 2011 seeking a Civil Aviation Safety Authority (CASA) update on any completed/planned actions in relation to recommendations from The Utility of General Aviation Aerodrome Procedures (GAAP) to Australian-administered Airspace Review Report (Version 2 – 15 December 2009). The GAAP to Class D project involved an extensive national pilot education program focussed primarily upon operations at the then GAAP aerodromes. The program was widely acknowledged by industry as one of the most comprehensive and effective education processes ever undertaken by CASA. The transition at these locations has provided the following safety enhancements:*

- *increased alignment with international practice together with greater standardisation of procedures nationally;*
- *increased Air Traffic Control Tower staffing through the requirement to establish a permanent Surface Movement Control position, thus both providing increased capacity to monitor airborne traffic and enhancing ground movement safety;*
- *an ongoing program to remove compulsory Control Zone entry points providing additional flexibility for traffic management; and*
- *reduction in airborne radio congestion through the extended use of abbreviated clearances.*

*A Post Implementation Review has been undertaken to examine the outcome of the changes and is expected to be completed by mid 2011.*

The ATSB is satisfied that the action implemented by Airservices Australia, in conjunction with the change of GAAP aerodromes to Class D that was implemented by the Civil Aviation Safety Authority on 3 June 2010 will adequately address the safety issue.

<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	31 May 2011

<b>Investigation:</b>	<b>AO-2008-059</b> <b>Midair collision - 3 km NW Moorabbin Aerodrome, Victoria - 27 Aug 2008 - VH-UPY, Cessna Aircraft Company A150M - VH-CGT, Piper Aircraft Corp PA-28-161</b>
<b>Safety action number</b>	AO-2008-059-NSA-123
<b>Risk category</b>	Significant
<b>Safety issue description</b>	Moorabbin GAAP airspace design did not assure lateral or vertical strategic separation between traffic flows. This increased the risk of a mid-air collision.
<b>Action taken by</b>	Airservices Australia
<b>Safety action outcomes</b>	<p>In response to this safety issue, on 31 March 2011, Airservices Australia (Airservices) advised that:</p> <p><i>Airservices Australia thanks you for the opportunity to provide additional feedback in respect of the Safety Actions identified in draft report, as requested during our meeting on 21 March 2011. As stated in Airservices' initial response, we consider that there is insufficient weight of evidence or depth of analysis in the report to conclude, 'The Moorabbin Aerodrome General Aviation Aerodrome Procedures [GAAP] airspace design did not assure lateral or vertical strategic separation between traffic flows. This increased the risk of a mid-air collision'. GAAP environments were not designed to provide strategic "separation assurance" between traffic flows. Separation within the GAAP environment was see-and-avoid and principally the responsibility of the pilot. Post incident, the change to Class D has removed the GAAP arrival routes and although designated inbound reporting points exist, aircraft can request clearance into the airspace from any point. In addition, consequent to the change to Class D, CASA implemented a change as per AIP [Aeronautical Information Publication] ENR [En Route] 12.3.6; unless ATC [air traffic control] specifically instructs otherwise, establishment of two-way communications permits a pilot, intending to land at an aerodrome within Class D airspace, to descend as necessary to join the aerodrome traffic circuit. Thus, the current airspace design and rule set means that strategic separation between traffic flows is not possible. To improve safety at Moorabbin, Airservices has, as stated in our original response, implemented the following:</i></p> <p><i>Traffic, staffing levels and other identified threats at Moorabbin are now routinely monitored and reviewed in conjunction with the 'Metro D' and location specific Operational Risk Assessment (ORA).</i></p> <p><i>Increased staffing at Moorabbin has alleviated the operational need to combine positions. The ADCW [aerodrome control – west] position at Moorabbin is now routinely operated as a standalone position except where low workload allows it to be combined with other positions. This enables the controllers to provide timely traffic information to aircraft.</i></p> <p><i>Although prior to the incident controllers were assessed on workload management, the National ATS Procedures Manual (NAPM) now provides strengthened formal traffic management guidance to controllers. It includes a list of the factors a tower controller should consider in assessing the appropriate number of aircraft for circuit operations.</i></p> <p>The ATSB is satisfied that the action implemented by Airservices Australia, in conjunction with the change of GAAP aerodromes to Class D that was implemented by the Civil Aviation Safety Authority on 3 June 2010 will adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed

<b>Investigation completion date</b>	31 May 2011
<b>Investigation:</b>	<b>AO-2008-062</b> <b>Collision with terrain - 6 km NE Purnululu ALA, Western Australia - 14-Sep-08 - VH-RIO, Robinson Helicopter Company R44</b>
<b>Safety action number</b>	AO-2008-062-NSA-099
<b>Risk category</b>	Minor
<b>Safety issue description</b>	There was no Australian requirement for endorsement and recurrent training conducted on Robinson Helicopter Company R22/R44 helicopters to specifically address the preconditions for, recognition of, or recovery from, low main rotor RPM.
<b>Action taken by</b>	Civil Aviation Safety Authority (CASA)
<b>Safety action outcomes</b>	The Civil Aviation Safety Authority (CASA) has advised that it will review the requirements for initial pilot training and endorsement and recurrent training on all helicopters. This will include a review of the Helicopter Flight Instructors Manual. ATSB assessment of response/action The ATSB is satisfied that, depending on the outcome of CASA's review, it could be expected that any action taken by CASA would address the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	7 Jul 2010
<b>Investigation:</b>	<b>AO-2008-083</b> <b>Collision with terrain, VH-EKS, 67 km WNW Scone Airport, New South Wales - 24 December 08</b>
<b>Safety action number</b>	AO-2008-083-NSA-075
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The current advice in Civil Aviation Advisory Publication 5.81-1(0) Flight Crew Licensing Flight Reviews in relation to the assessment of navigation skills, represents a missed opportunity to identify a pilot's capacity to make safe and appropriate decisions during cross country flying.
<b>Action taken by</b>	Civil Aviation Safety Authority (CASA)
<b>Safety action outcomes</b>	The Civil Aviation Safety Authority (CASA) has advised that it has reviewed the guidance in Civil Aviation Advisory Publication 5.81-1(0) Flight Crew Licensing Flight Reviews concerning the conduct of navigational exercises during an Aeroplane Flight Review. CASA will amend the CAAP to recommend that a navigational exercise is considered for inclusion in an AFR. The frequency of those navigational exercises will also be addressed.

<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	14 Jul 2010

**Investigation:** **AO-2008-083**  
**Collision with terrain, VH-EKS, 67 km WNW Scone Airport, New South Wales - 24 December 2008**

**Safety action number** AO-2008-083-NSA-085

**Risk category** Minor

**Safety issue description** The flight planning requirements at page 88 of the Visual Flight Guide included a transcription error that inadvertently limited the application of the requirements of Civil Aviation Regulation 239.

**Action taken by** Civil Aviation Safety Authority (CASA)

**Safety action outcomes** CASA advise that the VFG has been removed from the CASA website and that a revised edition is being considered for later in 2010.  
On 3 June 2010, CASA advised the ATSB that the Visual Flight Guide has been withdrawn for amendment.

**Safety action status** Closed

**Investigation completion date** 14 Jul 2010

**Investigation:** **AO-2009-004**  
**Operational event - 89 km south-east of Townsville Aerodrome, Queensland - 2 February 2009 - VH-ESH - Agusta Westland AW139**

**Safety action number** AO-2009-004-NSA-021

**Risk category** Significant

**Safety issue description** The design and relative positioning of the external air vent and avionics modules permitted the ingress of moisture and particulates that led to corrosion and contamination of electronic avionics components and consequently the generation of multiple erroneous crew alerting system (CAS) messages due to electrical shorting.

**Action taken by** Agusta Westland

**Safety action outcomes** Following a number of reports of AW139 helicopters experiencing erroneous crew alerting system messages, the helicopter and avionics system manufacturers established that the design and relative positioning of the external air vent was the source of the problem. Once identified, the helicopter manufacturer issued mandatory service bulletin (SB) 139-166 that was applicable to 'short nose configuration' helicopters.<sup>16</sup> The bulletin provided instructions to identify the presence of corrosion on the Modular Avionics Unit (MAU) modules and also detailed modification of the MAU2 ventilation duct to ensure that the modules were not subject to the direct flow of air from the duct outlet. In addition,

	<p>following notification of instances of moisture ingress following exposure to heavy rain, the helicopter manufacturer has developed a number of modifications to improve the overall water proofing of AW139 helicopters. Service bulletin 139-105 is currently being prepared to provide the required detail to operators.</p> <p>The ATSB is satisfied that the action taken by the helicopter manufacturer adequately addresses the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	5 Oct 2010
<b>Investigation:</b>	<b>AO-2009-004 Operational event - 89 km south-east of Townsville Aerodrome, Queensland - 2 February 2009 - VH-ESH - Agusta Westland AW139</b>
<b>Safety action number</b>	AO-2009-004-NSA-023
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The lack of formalised procedures in place requiring the Air Crew Officer (ACO) to monitor key instrument indications probably contributed to the undetected altitude loss.
<b>Action taken by</b>	Emergency Management Queensland
<b>Safety action outcomes</b>	<p>Shortly after this occurrence, the operator issued a safety bulletin to all flight crews emphasising the importance of effective crew resource management (CRM) during all phases of normal and emergency flight. This was followed by the development of crew standard operating procedures that were implemented at all of the operator's bases via a standards directive on 3 July 2009. Those procedures formalised the duties and responsibilities of the air crew officer while occupying the front left seat, including the monitoring of flight tolerances and provision of alerts to the pilot. The directive also detailed the introduction of sterile cockpit procedures and altitude management procedures relating to setting and monitoring the helicopter's barometric and radio altimeters. The operator also indicated that they intended to utilise this event in future CRM training.</p> <p>The ATSB is satisfied that the action taken by the helicopter operator adequately addresses the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	5 Oct 2010

<b>Investigation:</b>	<b>AO-2009-004</b> <b>Operational event - 89 km south-east of Townsville Aerodrome, Queensland - 2 February 2009 - VH-ESH - Agusta Westland AW139</b>
<b>Safety action number</b>	AO-2009-004-NSA-041
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Interruption of electrical power to the multi purpose flight recorder due to water ingress removed of an important source of information used to identify safety issues.
<b>Action taken by</b>	Agusta Westland
<b>Safety action outcomes</b>	The helicopter manufacturer has developed modifications to improve the overall water proofing of AW139 helicopters and is currently developing service bulletin 139-105 to provide the required detail to operators.  The ATSB is satisfied that the action by the helicopter manufacturer will, once in place, adequately address the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	5 Oct 2010

<b>Investigation:</b>	<b>AO-2009-004</b> <b>Operational event - 89 km south-east of Townsville Aerodrome, Queensland - 2 February 2009 - VH-ESH - Agusta Westland AW139</b>
<b>Safety action number</b>	AO-2009-004-NSA-042
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Interruption of electrical power to the multi purpose flight recorder due to water ingress removed of an important source of information used to identify safety issues.
<b>Action taken by</b>	Emergency Management Queensland
<b>Safety action outcomes</b>	Following the occurrence, the operator developed a modification, in accordance with an engineering order, to prevent moisture ingress affecting the multi-purpose flight recorder power supply. Details of the modification were supplied to the helicopter manufacturer.  The ATSB is satisfied that the action taken by the helicopter operator adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	5 Oct 2010

<b>Investigation:</b>	<b>AO-2009-004</b> <b>Operational event - 89 km south-east of Townsville Aerodrome, Queensland - 2 February 2009 - VH-ESH - Agusta Westland AW139</b>
<b>Safety action number</b>	AO-2009-004-NSA-044
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The design and relative positioning of the external air vent and avionics modules permitted the ingress of moisture and particulates that led to corrosion and contamination of electronic avionics components and consequently the generation of multiple erroneous crew alerting system (CAS) messages due to electrical shorting.
<b>Action taken by</b>	EMQ Helicopter Rescue
<b>Safety action outcomes</b>	Following the occurrence, and prior to the issue of the manufacturer's SB [Safety Bulletin], the operator developed a modification, in accordance with an engineering order, to prevent contamination of the modular avionics system. That modification was fitted to the operator's AW139 aircraft until the release of SB 139-166.  The ATSB is satisfied that the action taken by the helicopter operator adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	5 Oct 2010

<b>Investigation:</b>	<b>AO-2009-004</b> <b>Operational event - 89 km south-east of Townsville Aerodrome, Queensland - 2 February 2009 - VH-ESH - Agusta Westland AW139</b>
<b>Safety action number</b>	AO-2009-004-NSA-049
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The design and relative positioning of the external air vent and avionics modules permitted the ingress of moisture and particulates that led to corrosion and contamination of electronic avionics components and consequently the generation of multiple erroneous crew alerting system (CAS) messages due to electrical shorting.
<b>Action taken by</b>	Civil Aviation Safety Authority (CASA)
<b>Safety action outcomes</b>	The Civil Aviation Safety Authority (CASA) identified that, under the current system of maintenance applicable to AW139 helicopters on the Australian register, compliance with a manufacturer's SB is not mandatory in all circumstances. Compliance is only mandatory for aircraft on the Australian register if an Airworthiness Directive (AD), issued by the National Airworthiness Authority (NAA) responsible for the type design of the aircraft, calls for compliance with a manufacturer's SB. At the time of writing, no such AD had been issued regarding compliance with SB 139-166. Following this occurrence, CASA contacted the relevant NAA and ascertained that the NAA intends issuing an AD that will mandate compliance with SB 139-166. CASA is presently monitoring the development of this directive and, in the event that the relevant NAA does not issue the AD, CASA will consider if the issue of an Australian AD is warranted.  The ATSB is satisfied that the action taken by CASA adequately addresses the safety issue.

<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	5 Oct 2010

**Investigation:** **AO-2009-004**  
**Operational event - 89 km south-east of Townsville Aerodrome, Queensland - 2 February 2009 - VH-ESH - Agusta Westland AW139**

<b>Safety action number</b>	AO-2009-004-NSA-059
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The absence of an altitude deviation alert within the Australian Defence Air Traffic System increases the risk of undetected altitude variation and contributed to the significant loss of altitude.
<b>Action taken by</b>	Airservices Australia

**Safety action outcomes** In May 2010, the Australian Government announced that the replacement Air Traffic Services (ATS) system for the Australian Defence Air Traffic System and the Australian Advanced Air Traffic System (TAAATS) would be via a joint acquisition project that would result in a common ATS system throughout Australia. It could be expected that the system would include common alert functions, such as the existing cleared level adherence monitoring (CLAM) alert in TAAATS.

The ATSB is satisfied that, on the basis that the replacement common ATS services system will retain some form of CLAM-like alert, the action taken by the Australian Government will, once in place, adequately address this safety issue.

<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	5 Oct 2010

**Investigation:** **AO-2009-021**  
**Flight control system event - 520 km NW Gold Coast Aerodrome, Queensland, 18 May 2009, VH-VNC, Airbus A320**

<b>Safety action number</b>	AO-2009-021-NSA-036
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The servo valve within the left green aileron servo was incorrectly adjusted during manufacture.
<b>Action taken by</b>	Goodrich

**Safety action outcomes** The manufacturer has introduced a semi-automated setting of the null bias, which replaced the previous manual setting. This will prevent the incorrect adjustment of the

	<p>null bias during the assembly of the servo valve.</p> <p>The ATSB is satisfied that the action taken by the servo valve manufacturer adequately addresses the safety issue.</p>
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<b>Safety action status</b>	Closed
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<b>Investigation completion date</b>	This investigation has not been completed at the time of writing.
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<b>Investigation:</b>	<b>AO-2009-021</b> <b>Flight control system event - 520 km NW Gold Coast Aerodrome, Queensland, 18 May 2009, VH-VNC, Airbus A320</b>
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<b>Safety action number</b>	AO-2009-021-NSA-039
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<b>Risk category</b>	Minor
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<b>Safety issue description</b>	The aircraft operator did not comply with the reporting requirements of the Transport Safety Investigation Act 2003.
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<b>Action taken by</b>	Tiger Airways
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<b>Safety action outcomes</b>	<p>The aircraft operator has advised that in response to this incident, the content of the operator's safety management system in respect of incident reporting has been revised, and additional training in that regard has been incorporated into the operator's cabin and flight crew induction processes.</p> <p>The ATSB is satisfied that the action taken by the aircraft operator adequately addresses the safety issue.</p>
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<b>Safety action status</b>	Closed
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<b>Investigation completion date</b>	This investigation has not been completed at the time of writing.
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<b>Investigation:</b>	<b>AO-2009-032</b> <b>Collision with terrain - Gold Coast Aerodrome, Queensland - 02-July-2009 - VH-OML - Robinson Helicopter Company R22 Beta II</b>
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<b>Safety action number</b>	AO-2009-032-NSA-020
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<b>Risk category</b>	Minor
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<b>Safety issue description</b>	The helicopter operator's induction checklist did not include the notation of instructors' ratings and validity periods.
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<b>Action taken by</b>	Heli-Biz (helicopter operator)
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<b>Safety action outcomes</b>	<p>As a result of this occurrence, the operator has advised of the adoption in its manuals of a:</p> <ul style="list-style-type: none"> <li>• Formal checklist requiring certification by either the Chief Flying Instructor or an approved Base Manager for each pilot inducted into the operator's system.</li> </ul>
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	<ul style="list-style-type: none"> <li>Time-limited validity period, which will trigger a revalidation process on procedures as well as an interim check flight.</li> </ul> <p>The ATSB is satisfied that the action taken by the operator adequately addresses the safety issue.</p>
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<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	28 Jul 2010

**Investigation:** **AO-2009-047**  
**Nose landing gear axle fracture - Melbourne Aerodrome - VH-VBA - Boeing 737-7Q8 - 25-Jul-09**

<b>Safety action number</b>	AO-2009-047-NSA-028
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<b>Risk category</b>	Minor
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<b>Safety issue description</b>	Fatigue cracking originated within the aircraft nose landing gear (NLG) right axle as the result of surface damage associated with grinding during manufacture, and was probably assisted in its initiation by hydrogen evolved during plating processes.
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<b>Action taken by</b>	Boeing
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<b>Safety action outcomes</b>	As a result of their own internal and ongoing investigations into the axle failure, the aircraft manufacturer was working with the landing gear supplier to determine the extent of the problem. The aircraft manufacturer also released a communication to designated 737 stakeholders informing of three (including the subject) recent NLG inner cylinder fractures and their likely origin being related to grinding operations. To reduce the likelihood of future possible NLG axle failures, the manufacturer recommended that inspections for thermal damage be undertaken during overhaul of the NLG inner cylinder. This was to be achieved by Nital etch inspection after stripping the plating from the bearing journals, or by Barkhausen inspection in lieu of stripping the chrome plate. ATSB assessment of action The ATSB is satisfied that the action taken by the aircraft manufacturer adequately addresses the safety issue.
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<b>Safety action status</b>	Closed
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<b>Investigation completion date</b>	30 Jul 2010
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**Investigation:** **AO-2009-047**  
**Nose landing gear axle fracture - Melbourne Aerodrome - VH-VBA - Boeing 737-7Q8 - 25-Jul-09**

<b>Safety action number</b>	AO-2009-047-NSA-029
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<b>Risk category</b>	Minor
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<b>Safety issue description</b>	Fatigue cracking originated within the aircraft nose landing gear (NLG) right axle as the result of surface damage associated with grinding during manufacture, and was probably assisted in its initiation by hydrogen evolved during plating processes.
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<b>Action taken by</b>	Virgin Blue Airlines
<b>Safety action outcomes</b>	Immediately following the occurrence, the aircraft operator conducted a detailed visual and non-destructive inspection of all axles in their 737 fleet with similar service history. Particular attention was paid to the area underneath the bearing spacer. No defect indications were found.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	30 Jul 2010

**Investigation: AO-2009-053  
Powerplant / propulsion event, Launceston aerodrome - 20 August 2009**

<b>Safety action number</b>	AO-2009-053-NSA-030
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The CFM56-7B engine design was susceptible to VSV bushing and shroud wear that can lead to internal mechanical damage and potential in-flight performance difficulties.
<b>Action taken by</b>	CFM International (General Electric / SNECMA)
<b>Safety action outcomes</b>	The engine manufacturer has issued a number of service bulletins to operators highlighting the need for on-wing borescope inspection (S/B 72-0515) to look for inner shroud / J-hook wear. Additionally, the manufacturer has introduced new part numbers (S/B 72-0665 and S/B 72-0851) that appear to eliminate the root cause of the compressor surge. ATSB assessment of response/action The ATSB considers the safety action taken by the engine manufacturer adequately addresses this safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	27 Jul 2010

**Investigation: AO-2009-053  
Powerplant / propulsion event, Launceston aerodrome - 20 August 2009**

<b>Safety action number</b>	AO-2009-053-NSA-031
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The CFM56-7B engine design was susceptible to VSV bushing and shroud wear that can lead to internal mechanical damage and potential in-flight performance difficulties.
<b>Action taken by</b>	Virgin Blue Airlines
<b>Safety action outcomes</b>	As a result of this incident, the operator approached the manufacturer to enquire if the recommended schedule of 24,000 TSN for the first inspection (as per S/B 72-0515) should be reviewed based on this occurrence. They were given a similar response to that provided to the ATSB. The operator was satisfied with this response, and further justified

not changing the recommended schedule based on the findings of inspections performed on their fleet. The operator advised the ATSB that upon advice from CFMI, they were starting a campaign to replace the bushings and associated hardware on their owned engines (as per S/B 72-0581 and S/B 72-0665) at overhaul or whenever the engine had criteria that scheduled the next inspection at 800 hours or below (as per the service bulletin). The operator further stated that they currently had 19 engines in service with new modified bushings factory installed and S/B 72-0581 had been incorporated to one engine at the shop visit. The majority of shop visits so far had been for lease engines (i.e., returned to the vendor well before 24,000 hours since new/repair), and as such, new pre-modification bushings had been installed unless the lease company specifically requested the hybrid or new metallic bushings. Since the incident, the operator has carried out a significant number of inspections in accordance with S/B 72-0515 and observed that the extent of VSV damage appeared to be greater on the high thrust engines. As such, the operator has recently implemented Engine Plan Phase 2 which prioritises the replacement of the bushings and associated hardware of these high thrust engines, and includes a plan to replace the VSV components on over 40 engines within their inventory.

**Safety action status** Closed

**Investigation completion date** 27 Jul 2010

**Investigation:** **AO-2009-053**  
**Powerplant / propulsion event, Launceston aerodrome - 20 August 2009**

**Safety action number** AO-2009-053-NSA-032

**Risk category** Minor

**Safety issue description** The CFM56-7B engine had sustained bushing and shroud wear sufficient to cause rotor-to-stator contact, after a time in service that was less than the minimum threshold period specified by the manufacturer, for an initial inspection targeted at identifying this problem.

**Action taken by** CFM International (General Electric / SNECMA)

**Safety action outcomes** The TSN of the subject engine was lower than the 24,000 hours specified in the service bulletin. As such, this engine was not required to have undergone borescope inspection in accordance with the service bulletin. The manufacturer responded to the ATSB that the recommended inspection period is not necessarily set to prevent every event; but is based on the consequence of that event. The manufacturer used Weibull analysis to meet a combination of safety goals and operator needs (scheduling, costs etc). The manufacturer also stressed that only one other of the IFSD events (March 2009) occurred at less than the 24,000 threshold, at 23,700 and went on to state that; "While it may be desirable to prevent every event, a single-engine event is not in itself a threat to continued safe flight, and the aircraft are certified to fly with a single IFSD. Thus, thresholds are set to ensure that dual-engine events are extremely improbable, while not imposing an undue burden on the operators. In this case, the events are being monitored and Weibull's updated and it is not considered necessary to reduce the inspection threshold at the moment." ATSB assessment of response/action The ATSB is satisfied that the action taken by the engine manufacturer adequately addresses the safety issue at this stage. The ATSB will continue to monitor the issue in regard to future related occurrences and the outcome of ongoing updated Weibull analyses by the engine manufacturer. At the same time, in the interests of ensuring awareness of the safety issues identified in this investigation, the ATSB issues the following Safety Advisory Notice to all operators of CFM56-7 and CFM-56-5 engines and their variants.

<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	27 Jul 2010

<b>Investigation:</b>	<b>AO-2009-062 Main landing gear failure - Melbourne Aerodrome- 20 October 2009</b>
<b>Safety action number</b>	AO-2009-062-NSA-033
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The post-2005 main landing gear wheel design had shown a susceptibility to fatigue cracking at the inner hub bearing bore shoulder radius.
<b>Action taken by</b>	Honeywell

<b>Safety action outcomes</b>	The wheel manufacturer made a change to the design of new production wheel components, incorporating shot peening of the entire bearing bore area to help prevent the fatigue cracks from developing. This change was introduced at wheel assembly serial number B15419. The improved wheels were intended for delivery on new aircraft at line number 3099; scheduled for November 2009.  The ATSB is satisfied that the action taken by the wheel assembly manufacturer adequately addresses the safety issue.
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<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	21 Jan 2011

<b>Investigation:</b>	<b>AO-2009-062 Main landing gear failure - Melbourne Aerodrome- 20 October 2009</b>
<b>Safety action number</b>	AO-2009-062-NSA-035
<b>Risk category</b>	Minor
<b>Safety issue description</b>	At the time of the last tyre change, crack initiation at the bearing bore shoulder radius was an emerging issue with no requirement for mandatory inspection of this area during a tyre change.
<b>Action taken by</b>	Virgin Blue Airlines

<b>Safety action outcomes</b>	Immediately following the occurrence, Virgin Blue reviewed the information supplied by the wheel and aircraft manufacturers and assessed the wheels on their fleet. Subsequently, the Virgin Blue elected to remove ten wheels from service that fell within an identified risk profile.  Virgin Blue has further reported to the ATSB that since this occurrence, it has altered its non-destructive wheel inspection procedure to include an ultrasonic inspection in accordance with Honeywell Standard Practices Manual, ATS Number 32-49, Temporary Revision No 32-1, dated 1 May 2009. Initially, Virgin Blue performed the inspection at
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each tyre change after the 11th change.

However, following the results of a number of inspections, and in conjunction with the Honeywell Service Bulletin (2612311-32-003), Virgin Blue has since altered the inspection in line with the Service Bulletin and performs an ultrasonic inspection of the bearing bore at every fifth tyre change. As a result of the occurrence, Virgin Blue also performed a review of its engineering change evaluation procedure which resulted in changes to the process flow chart to include additional steps and a more structured risk assessment.

The ATSB is satisfied that the action taken by Virgin Blue adequately addresses the safety issue.

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**Safety action status** Closed

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**Investigation completion date** 21 Jan 2011

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**Investigation:** **AO-2009-062**  
**Main landing gear failure - Melbourne Aerodrome- 20 October 2009**

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**Safety action number** AO-2009-062-NSA-054

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**Risk category** Minor

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**Safety issue description** At the time of the last tyre change, crack initiation at the bearing bore shoulder radius was an emerging issue with no requirement for mandatory inspection of this area during a tyre change.

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**Action taken by** Honeywell

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**Safety action outcomes** Following the occurrence, the wheel manufacturer (Honeywell) released Service Bulletin 2612311-32-003 in February 2010, which provided specific non-destructive inspection requirements for wheel part number 2615480. The Service Bulletin required mandatory non-destructive inspection of wheel halves SN B7900-B15418 to be performed on a yearly basis or every fifth tyre change.

The ATSB is satisfied that the action taken by Honeywell adequately addresses the safety issue.

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**Safety action status** Closed

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**Investigation completion date** 21 Jan 2011

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**Investigation:** **AO-2009-062**  
**Main landing gear failure - Melbourne Aerodrome- 20 October 2009**

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**Safety action number** AO-2009-062-NSA-055

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**Risk category** Minor

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**Safety issue description** At the time of the last tyre change, crack initiation at the bearing bore shoulder radius was an emerging issue with no requirement for mandatory inspection of this area during a tyre change.

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<b>Action taken by</b>	Boeing
<b>Safety action outcomes</b>	<p>In November 2009, the aircraft manufacturer (Boeing) updated the inboard hub fracture issue to a safety service related problem (safety-SRP) and advised operators to incorporate the recommended inspections and inspection intervals as soon as practical.</p> <p>Boeing released a further Service Bulletin (SB-737-32-1444, issued 8 April 2010) and an update to its previous Service Letter (737-SL-32-162-A, issued 4 May 2010) that summarised the issue, and contained the recommended non-destructive checks and intervals. The service bulletin urged operators to perform inspections as per the Honeywell Service Bulletin and standard practices manual mentioned previously.</p> <p>The ATSB is satisfied that the action taken by Boeing adequately addresses the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	21 Jan 2011
<b>Investigation:</b>	<b>AO-2009-065</b> <b>Unreliable airspeed indication - 710 km S Guam, 28-October-09, VH-EBA, Airbus A330-202</b>
<b>Safety action number</b>	AO-2009-065-NSA-060
<b>Risk category</b>	Significant
<b>Safety issue description</b>	Although the pitot probes fitted to A330/A340 aircraft met relevant design specifications, these specifications were not sufficient to prevent the probes from being obstructed with ice during some types of environmental conditions that the aircraft could encounter.
<b>Action taken by</b>	European Aviation Safety Agency (EASA)
<b>Safety action outcomes</b>	<p>In its second Interim Report on the investigation into the Air France A330-200 accident on 1 June 2009, the French Bureau d'Enquêtes et d'Analyses pour la sécurité de l'aviation civile (BEA) issued the following recommendations to the European Aviation Safety Agency (EASA):</p> <ol style="list-style-type: none"> <li><i>1. undertake studies to determine with appropriate precision the composition of cloud masses at high altitude; and</i></li> <li><i>2. in coordination with the other regulatory authorities, based on the results obtained, modify the certification criteria.</i></li> </ol> <p>Given the comprehensive scope of the BEA investigation, there is no need for the ATSB to make any additional recommendations regarding this safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>AO-2009-065</b> <b>Unreliable airspeed indication - 710 km S Guam, 28-October-09, VH-EBA, Airbus A330-202</b>
<b>Safety action number</b>	AO-2009-065-NSA-061
<b>Risk category</b>	Minor
<b>Safety issue description</b>	By the time of the 28 October 2009 occurrence, many of the operator's A330 flight crew had not received unreliable airspeed training. Such training started being introduced in the operator's recurrent training program before the occurrence.
<b>Action taken by</b>	Jetstar Airways
<b>Safety action outcomes</b>	Jetstar included an introduction to unreliable airspeed situations in its A330 recurrent (cyclic) training session for the period October 2009 to March 2010. Further training is being included in the following cyclic session (April to September 2010).  The ATSB is satisfied that that the action by Jetstar adequately addresses this safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>AO-2009-065</b> <b>Unreliable airspeed indication - 710 km S Guam, 28-October-09, VH-EBA, Airbus A330-202</b>
<b>Safety action number</b>	AO-2009-065-NSA-062
<b>Risk category</b>	Minor
<b>Safety issue description</b>	By the time of the 28 October 2009 occurrence, many of the operator's A330 flight crew had not received unreliable airspeed training. Such training started being introduced in the operator's recurrent training program before the occurrence.
<b>Action taken by</b>	Qantas Airways
<b>Safety action outcomes</b>	The associated Australian A330 operator (Qantas) advised that its A330 cyclic training session from 19 June 2009 to January 2010 included discussion items and a simulator exercise applying the unreliable airspeed / ADR check procedure.  The ATSB is satisfied that that the action by Qantas adequately addresses this safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>AO-2009-065</b> <b>Unreliable airspeed indication - 710 km S Guam, 28-October-09, VH-EBA, Airbus A330-202</b>
<b>Safety action number</b>	AO-2009-065-NSA-063
<b>Risk category</b>	Minor
<b>Safety issue description</b>	When revising or maintaining its A320 endorsement training program, the third party training provider did not use or have access to current versions of the aircraft manufacturer's recommended training program.
<b>Action taken by</b>	Boeing Training and Flight Services
<b>Safety action outcomes</b>	In July 2010, the training provider (Boeing Training and Flight Services) received approval from the Civil Aviation Safety Authority (CASA) for a revised A320 endorsement training program that included unreliable airspeed training. The operator and the training provider also reported that they were examining options to enable the training provider to directly access the aircraft manufacturer's recommended training program.  The ATSB is satisfied that that the action taken to date, and action proposed to be taken, by the various organisations will, when completed, adequately address this safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>AO-2009-065</b> <b>Unreliable airspeed indication - 710 km S Guam, 28-October-09, VH-EBA, Airbus A330-202</b>
<b>Safety action number</b>	AO-2009-065-NSA-064
<b>Risk category</b>	Minor
<b>Safety issue description</b>	When revising or maintaining its A320 endorsement training program, the third party training provider did not use or have access to current versions of the aircraft manufacturer's recommended training program.
<b>Action taken by</b>	Jetstar Airways
<b>Safety action outcomes</b>	The operator (Jetstar) advised that it was conducting regular training gap analysis of third-party training programs versus aircraft manufacturer recommendations. The operator and the training provider also reported that they were examining options to enable the training provider to directly access the aircraft manufacturer's recommended training program.  The ATSB is satisfied that that the action taken to date, and action proposed to be taken, by the various organisations will, when completed, adequately address this safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>AO-2009-068</b> <b>Operational event - 132 km west of Horn Island Aerodrome, Queensland - 9 November 2009 - VH-EMZ - Bell Helicopter Company 412</b>
<b>Safety action number</b>	AO-2009-068-NSA-050
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The operator's winching procedure did not include the requirement to confirm adequate hover reference existed overhead an intended winch area prior to deploying personnel on the winch.
<b>Action taken by</b>	Australian Helicopters Pty Ltd
<b>Safety action outcomes</b>	<p>Shortly after this occurrence, the operator issued a flying staff instruction reemphasising the hazards and risks associated with winching operations. The instruction detailed the importance of adequate power margins and hover reference and that, where practical, they should be assessed over the intended winch area at the intended hover height. The instruction also stated that where it was expected that the hover reference may be inadequate, the reference was to be assessed overhead the intended winch location prior to lowering personnel below the level of any obstructions or recovering personnel. The operator also conducted a review of the section of the operations manual concerning winching operations.</p> <p>An initial review, conducted shortly after the occurrence, concluded that the content was appropriate and contained sufficient guidance. Subsequently a more detailed review of the operations manual, taking into account a number of established best practice procedures within the industry, was initiated. This ongoing review, including the development of an appendix detailing winching to ships, will include emphasis on the need to ensure that adequate hover reference exists during the conduct of winching operations.</p> <p>The ATSB is satisfied that the action by the helicopter operator will, once in place, adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	21 Jan 2011

<b>Investigation:</b>	<b>AO-2009-068</b> <b>Operational event - 132 km west of Horn Island Aerodrome, Queensland - 9 November 2009 - VH-EMZ - Bell Helicopter Company 412</b>
<b>Safety action number</b>	AO-2009-068-NSA-051
<b>Risk category</b>	Minor
<b>Safety issue description</b>	There was no formal risk assessment process in use at the operator's Horn Island base.
<b>Action taken by</b>	Australian Helicopters Pty Ltd

<b>Safety action outcomes</b>	<p>Following this occurrence, the operator revised the existing task risk analysis (TRA) related to winching operations. Once completed, the revised TRA will be disseminated to all of the operator's search and rescue/emergency medical service bases as part of the initiation of formal aviation risk management training covering all aspects of company operations to be introduced in early 2011.</p> <p>The ATSB is satisfied that the action by the helicopter operator will, once in place, adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	21 Jan 2011
<b>Investigation:</b>	<b>AO-2009-070</b> <b>Collision with terrain - VH-ZRR, 21 km SE of Kojonup, Western Australia - 17-November-2009</b>
<b>Safety action number</b>	AO-2009-070-NSA-043
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The lack of guidance material for the supervision of a pilot with an Agriculture Pilot (Aeroplane) Rating Grade 2 increases the risk of inadequate supervision of such a pilot.
<b>Action taken by</b>	Civil Aviation Safety Authority (CASA)
<b>Safety action outcomes</b>	<p>In its response to this safety issue, CASA advised that:</p> <p><i>CASA will development [sic] an Advisory Circular that provides guidance to industry as to how supervision of Ag 2 pilots may be conducted. CASA will also address the issue of differences in the aeroplane along with the helicopter flight training syllabi.</i></p> <p>The ATSB is satisfied that the proposed action to be taken by CASA adequately addresses the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	26 Nov 2010
<b>Investigation:</b>	<b>AO-2009-070</b> <b>Collision with terrain - VH-ZRR, 21 km SE of Kojonup, Western Australia - 17-November-2009</b>
<b>Safety action number</b>	AO-2009-070-NSA-045
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Confusion within the aerial application industry concerning the correct authorisation for a supervisor of a pilot with an Agriculture Pilot (Aeroplane) Rating Grade 2 (Ag 2) increases

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the risk of an inappropriately qualified person supervising such a pilot.

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**Action taken by** Civil Aviation Safety Authority (CASA)

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**Safety action outcomes**

In its response to this safety issue, CASA advised that:

*CASA agrees there is evidence of confusion regarding the qualifications required to supervise an Ag2 rated pilot. Civil Aviation Safety Regulation (CASR) 137 and Civil Aviation Order (CAO) 40.6 are not directly related or interactive legislative components and must therefore be dealt with and considered separately. The following explains:*

*CASR 137 - is applicable to a person applying for or who holds an Air Operator Certificate (AOC) authorising "aerial application operations - other than rotorcraft". This means aeroplanes only. In other words, it is the how to do business and flying operations regulations for aeroplane aerial application operators. There is no relevant CAO for aeroplane aerial application AOC holders as CASR 137 has already superseded CAO 20.21 is this regard for aeroplanes.*

*CAO 20.21 - is applicable to "aircraft engaged in agricultural operations" not aircraft engaged in "aerial application operations" (refer CASR 137). However, CAO 20.21 is still applicable to helicopters as CASR 137 does not refer to helicopter aerial application operations as yet. In other words, it is the how to do business and flying operations directions for helicopter agricultural operators and therefore CAO 20.21 cannot be repealed until CASR 137 includes rotorcraft.*

*CAO 40.6 - is a set of directions issued under sub regulation 5.14(1), regulations 5.16 and 5.18 of Civil Aviation Regulations (CAR) 1988 for the purposes of describing the flight tests that must be passed, other requirements that must be satisfied, the authority given by and the limitations of that authority for people who wish to train persons for the issue of and obtain an agricultural rating in either aeroplanes or helicopters. In other words, it is a set of ground and flying training, flight testing and limiting directions empowered by CAR 1988 Part 5. Therefore, it is the how to do business and flying operations regulations for ALL providers of "agricultural flying training" and not directly linked to CASR 137, other than 137 requiring an operator to ensure their pilots are correctly qualified.*

*The supervision requirements in CAO 40.6 are risk mitigators for new AG rating holding pilots, added for the same reasons new flying instructor rating holding pilots require supervision as outlined in CAO 40.1.7 (instructor ratings aeroplanes) and CAO 40.3.7 (instructor ratings helicopters). CASA intends to promulgate information and provide education to industry to clarify the requirements in CASR Part 137 and CAO 40.6.*

The ATSB is satisfied that the proposed action to be taken by CASA will, when complete, adequately address the safety issue.

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**Safety action status** Closed

**Investigation completion date** 26 Nov 2010

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<b>Investigation:</b>	<b>AO-2009-077</b> <b>Visual flight into instrument meteorological conditions - Dorrigo, New South Wales, 9 Dec 2009, VH-MJO, Bell Helicopter Company 206L-1 LongRanger</b>
<b>Safety action number</b>	AO-2009-077-NSA-046
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The helicopter landing area was occasionally subjected to rapidly-moving fog or low cloud that increased the risk of flights under the visual flight rules encountering instrument meteorological conditions.
<b>Action taken by</b>	National Parks and Wildlife Service (NSW)
<b>Safety action outcomes</b>	National Parks and Wildlife Service closed the landing area adjacent to the Dorrigo National Parks and Rainforest Centre.  The ATSB is satisfied that the proposed action to be taken by the National Parks and Wildlife Service adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	11 May 2011

<b>Investigation:</b>	<b>AO-2009-080</b> <b>Loss of separation assurance - 222 km NW of Tennant Creek, Northern Territory - 22 December 2009</b>
<b>Safety action number</b>	AO-2009-080-NSA-066
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Ambiguity existed between the Manual of Air Traffic Services and the Aeronautical Information Publication in relation to the assignment of non-standard cruising levels and the definition of an 'operational requirement'.
<b>Action taken by</b>	Airservices Australia
<b>Safety action outcomes</b>	In response to this safety issue, Airservices advised the ATSB that:  <i>Since the release of this report in 2003, Airservices has been investigating the issue of non standard routes and non standard levels in respect of recommendations R20030056 and R20030057. As the ATSB would be aware, flight planning errors of this type are routinely and reliably tracked through the ESIR [electronic safety incident report] application. Airservices analysed this data and ascertained that non standard routes are not normally a significant contributory factor to Breakdown of Separation. Nonetheless, over the past several years we have invested significantly in examining technical solutions that would detect flight planning errors and highlight them to the controller. Our investigations determined that it was not feasible to use either NAIPS (Airservices' flight planning system) or to develop a separate database to process flight plans prior to entering the Eurocat system. Further, we determined that the cost of implementation in Eurocat for a warning system is high, and as Airservices has now commenced work on its future ATS [air traffic services] system the lead time and cost does not support further work in this</i>

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area.

*We discussed the use of non standard levels with CASA [Civil Aviation Safety Authority] a number of years ago and it was determined that the number of changes of level that would be incurred if standard levels were required to be utilised in all cases would introduce an increased level of risk into the system. In addition, since this incident a number of changes have been introduced to improve instruction to both pilots and air traffic controllers on the use of non standard levels.*

*The Aeronautical Information Publication (AIP) was updated on 18 November 2010 and now specifically states that a pilot must only request a non conforming level when it is determined by the pilot in command to be essential to the safety of the flight and its occupants. [In such circumstances, the phrase 'DUE OPERATIONAL REQUIREMENTS' must be included in the level change request.]*

The ATSB notes the action by Airservices related to ATSB Safety Recommendations R20030056 and R20030057 and in response to the issues identified in this investigation. The ATSB is satisfied that, the combined action in response to these ATSB Safety Recommendations and that recommended by the Airservices investigation will, when implemented, adequately address the identified safety issues.

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<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	24 Jun 2011
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<b>Investigation:</b>	<b>AO-2009-080 Loss of separation assurance - 222 km NW of Tennant Creek, Northern Territory - 22 December 2009</b>
<b>Safety action number</b>	AO-2009-080-NSA-067
<b>Risk category</b>	Significant
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<b>Safety issue description</b>	The controller had not received training in compromised separation recovery techniques.
<b>Action taken by</b>	Airservices Australia
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<b>Safety action outcomes</b>	Airservices has indicated that it plans to implement a Compromised Separation Recovery training module for the en route air traffic control groups, with the intention that all group controllers will undertake that training in the 2010/11 financial year. In addition, a dedicated Compromised Separation Recovery training module is now delivered at the Airservices Learning Academy.  The ATSB notes the action by Airservices related to ATSB Safety Recommendations R20030056 and R20030057 and in response to the issues identified in this investigation. The ATSB is satisfied that, the combined action in response to these ATSB Safety Recommendations and that recommended by the Airservices investigation will, when implemented, adequately address the identified safety issues.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	24 Jun 2011

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<b>Investigation:</b>	<b>AO-2010-008</b> <b>Turbulence event - Canberra Aerodrome, Australian Capital Territory - 31 Jan 2010</b> <b>- VH-ERP, Grumman Traveller</b>
<b>Safety action number</b>	AO-2010-008-NSA-007
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The limited consideration of the potential wind impact of the two buildings to the north of runway 12 during northerly wind conditions has resulted in continued operations to that runway in those conditions without any alert to affected pilots about the associated risk.
<b>Action taken by</b>	Canberra Airport Pty Ltd; Airservices Australia
<b>Safety action outcomes</b>	<p>In response to this safety issues, Canberra Airport Pty Ltd has proposed the following:</p> <ul style="list-style-type: none"> <li>• <i>the continued commissioning of wind impact studies for future developments; and</i></li> <li>• <i>that Canberra Airport will discuss with operators at the Airport the use of runway 12, whether there have been any other turbulent events, and assess their views on what action should be taken, if any, to maintain safety in the use of the runway.</i></li> </ul> <p>In response to this safety issue, Airservices Australia advised the following:</p> <p><i>Current procedures state, upon receipt of a pilot report and/or a forecast of moderate, strong or sever wind shear, alert all arriving and departing aircraft by ATIS broadcast, and directed transmission where the aircraft is not in receipt of the ATIS information. When aware of the presence of significant wind shear, nominate a more favourable runway, if available, and provide the appropriate flight information. Given that no previous reports had been received, before the occurrence, Airservices was unable to provide this consideration and implement the alerting system. Finally, as no standards exist for assessing the potential wind impact of aerodrome building developments in conjunction with the actual wind direction and speed, Airservices is not in a position to accurately predict where and when mechanical turbulence will be experienced on approach to Runway 12.</i></p> <p>The ATSB acknowledges the action taken by Canberra Airport to addresses these safety issues. However, there is the potential for the inclusion of an entry in the En Route Supplement Australia, similar to that affecting aircraft operations to runway 35 at Canberra during strong westerly winds, to alert pilots of the possibility of turbulence during operations on runway 12 in north easterly winds.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	5 Apr 2011

<b>Investigation:</b>	<b>AO-2010-008</b> <b>Turbulence event - Canberra Aerodrome, Australian Capital Territory - 31 Jan 2010</b> <b>- VH-ERP, Grumman Traveller</b>
<b>Safety action number</b>	AO-2010-008-NSA-008
<b>Risk category</b>	Significant
<b>Safety issue description</b>	There were no criteria for assessing the potential wind impact of aerodrome building developments on aircraft operations.
<b>Action taken by</b>	Department of Infrastructure and Transport
<b>Safety action outcomes</b>	<p>In response to the Australian Government's decision to safeguard airports and communities around them from inappropriate off-airport development, the Department of infrastructure and Transport has established the National Airports Safety Advisory Group (NASAG). NASAG is made up of senior officials from the Planning Departments of States and Territories, the Australian Local Government Association, senior officials from some Transport Departments, Airservices Australia, CASA and DoIT. NASAG was established to provide advice to Governments on the establishment of a national safeguarding framework.</p> <p>Following agreement by NASAG, the Department, in close consultation with CASA, has engaged an independent firm with expertise in wind engineering to develop guidance material for airports and off-airport planning authorities on the potential windshear and mechanical turbulence effects of new constructions near runways. This work will include:</p> <ul style="list-style-type: none"> <li>(a) a review of relevant ICAO guidance material and existing research and approaches to assess world's leading practice;</li> <li>(b) the establishment of criterion/ criteria which would trigger a detailed assessment of the potential for building-generated turbulence and windshear to affect the safety of operations at airports;</li> <li>(c) guidance on the design and positioning of structures in relation to runways to minimise effects on aircraft operations; and</li> <li>(d) guidance on other options to mitigate building generated turbulence and windshear for existing structures where safety risks are identified. This work is expected to be completed by the first quarter of 2011.</li> </ul> <p>The ATSB is satisfied that the action taken by the Department of Infrastructure and Transport adequately addresses this safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	5 Apr 2011

<b>Investigation:</b>	<b>AO-2010-008</b> <b>Turbulence event - Canberra Aerodrome, Australian Capital Territory - 31 Jan 2010</b> <b>- VH-ERP, Grumman Traveller</b>
<b>Safety action number</b>	AO-2010-008-NSA-020
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Two buildings were constructed north of the runway 12 threshold at a height and position that could generate turbulence affecting the approach, threshold and touchdown areas of the runway under some wind conditions.
<b>Action taken by</b>	Operator of Canberra Airport (Canberra Airport Pty Ltd)
<b>Safety action outcomes</b>	<p>In response to this safety issues, Canberra Airport Pty Ltd has proposed the following:</p> <ul style="list-style-type: none"> <li>• <i>the continued commissioning of wind impact studies for future developments; and</i></li> <li>• <i>that Canberra Airport will discuss with operators at the Airport the use of runway 12, whether there have been any other turbulent events, and assess their views on what action should be taken, if any, to maintain safety in the use of the runway.</i></li> </ul> <p>The ATSB acknowledges the action taken by Canberra Airport to addresses these safety issues. However, there is the potential for the inclusion of an entry in the En Route Supplement Australia, similar to that affecting aircraft operations to runway 35 at Canberra during strong westerly winds, to alert pilots of the possibility of turbulence during operations on runway 12 in north easterly winds.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	5 Apr 2011

<b>Investigation:</b>	<b>AO-2010-012</b> <b>ATC information error, VH-BCQ, PA-31, Proserpine / Whitsunday Coast</b> <b>Aerodrome, Queensland, 25-Feb-10</b>
<b>Safety action number</b>	AO-2010-012-NSA-001
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Practices used within the ATS Group did not ensure that NOTAMs were effectively reviewed and communicated.
<b>Action taken by</b>	Airservices Australia
<b>Safety action outcomes</b>	<p>Airservices Australia has reviewed the procedures for the review and communication of notices to airmen and considers that if correctly applied, the procedures are sound. However, as a result of this incident, Airservices will conduct an education program to highlight the effect on safety, when information pertaining to a controller's area of responsibility is not considered appropriately or reviewed prior to that information being provided to pilots.</p> <p>The ATSB is satisfied that the action taken by Airservices Australia has adequately addressed the safety issue.</p>

<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	30 Nov 2010
<b>Investigation:</b>	<b>AO-2010-012</b> <b>ATC information error, VH-BCQ, PA-31, Proserpine / Whitsunday Coast Aerodrome, Queensland, 25-Feb-10</b>
<b>Safety action number</b>	AO-2010-012-NSA-011
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The Out of Hours telephone numbers for Proserpine Airport, listed in the Jeppesen Airways Manual, were incorrect.
<b>Action taken by</b>	Jeppesen
<b>Safety action outcomes</b>	Following advice of this safety issue, Jeppesen revised their data for Proserpine/Whitsunday Coast Aerodrome, including the telephone numbers, and published it in their next amendment cycle.  The ATSB is satisfied that the action taken by Jeppesen has adequately addressed the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	30 Nov 2010
<b>Investigation:</b>	<b>AO-2010-025</b> <b>Total power loss - VH-MTC, Victa Ltd Airtourer 115/A1 - Hobart, Tas - 04-Apr-10</b>
<b>Safety action number</b>	AO-2010-025-NSA-002
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Information contained in the approved flight manual and pilot's operating handbook was not applicable to the engine that was fitted to the aircraft.
<b>Action taken by</b>	Aircraft owners' associations (Airtourer Association; Airtourer Co-Operative)
<b>Safety action outcomes</b>	The aircraft owner's association has updated a previously-written article on this risk and the article on Flight Manual Supplements has been placed on the Airtourer Association website. The article was also published in the association's November Newsletter. The association has also drafted an Operations Bulletin advising certificate of registration holders and pilots of the possibility of AFM data being amended by a supplement. That document is currently undergoing the association's document review process. The association also intends to hold an 'AFM [Approved Flight Manual] Workshop' at one of their upcoming aircraft 'fly-ins' to provide registered owners with the knowledge to allow them to assess their own aircraft's AFMs for all required supplements.  The ATSB is satisfied that the action being taken by the aircraft owner's association will,

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when complete, adequately address the safety issue.

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**Safety action status** Closed

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**Investigation completion date** 14 Dec 2010

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**Investigation:** **AO-2010-025**  
**Total power loss - VH-MTC, Victa Ltd Airtourer 115/A1 - Hobart, Tas - 04-Apr-10**

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**Safety action number** AO-2010-025-NSA-004

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**Risk category** Minor

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**Safety issue description** The Registered Operator's maintenance control practices did not ensure compliance with all Airworthiness Directives.

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**Action taken by** Royal Aero Club of Southern Tasmania (the aircraft operator)

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**Safety action outcomes** The aircraft operator has created an ongoing list of the required airworthiness directives affecting each aircraft to facilitate compliance monitoring.  
The ATSB is satisfied that the safety action taken by the Royal Aero Club of Southern Tasmania adequately addresses the safety issue.

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**Safety action status** Closed

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**Investigation completion date** 14 Dec 2010

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**Investigation:** **AO-2010-025**  
**Total power loss - VH-MTC, Victa Ltd Airtourer 115/A1 - Hobart, Tas - 04-Apr-10**

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**Safety action number** AO-2010-025-NSA-005

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**Risk category** Minor

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**Safety issue description** There was the potential for the incorrect use of the dipstick to result in the over-reading of the fuel quantity.

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**Action taken by** Aircraft owners' associations (Airtourer Association; Airtourer Co-Operative)

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**Safety action outcomes** The aircraft owner's association has produced an article for their newsletter highlighting the correct method of fuel dipstick use to aircraft owners. That article can be accessed through the association's webpage.  
The ATSB is satisfied that the action taken by the aircraft owner's association adequately addresses the safety issue.

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**Safety action status** Closed

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<b>Investigation completion date</b>	14 Dec 2010
<b>Investigation:</b>	<b>AO-2010-025</b> <b>Total power loss - VH-MTC, Victa Ltd Airtourer 115/A1 - Hobart, Tas - 04-Apr-10</b>
<b>Safety action number</b>	AO-2010-025-NSA-006
<b>Risk category</b>	Minor
<b>Safety issue description</b>	There was the potential for the incorrect use of the dipstick to result in the over-reading of the fuel quantity.
<b>Action taken by</b>	Current aircraft type certificate holder (Airtourer Association)
<b>Safety action outcomes</b>	The aircraft's type certificate holder has devised an Operations Bulletin for issue to owners of the aircraft type that will detail the correct method for the use of the dipstick. As of final ATSB report release this document is currently undergoing type certificate holder document review.  The ATSB is satisfied that the action being taken by the aircraft type certificate holder will, when complete, adequately address the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	14 Dec 2010
<b>Investigation:</b>	<b>AO-2010-089</b> <b>In-flight uncontained engine failure - overhead Batam Island, Indonesia - 04 November 2010 - VH-OQA - Airbus A380-842</b>
<b>Safety action number</b>	AO-2010-089-NSA-013
<b>Risk category</b>	Critical
<b>Safety issue description</b>	Misaligned stub pipe counter-boring is understood to be related to the manufacturing process. This condition could lead to an elevated risk of fatigue crack initiation and growth, oil leakage and potential catastrophic engine failure from a resulting oil fire.
<b>Action taken by</b>	Civil Aviation Safety Authority (CASA)
<b>Safety action outcomes</b>	In response to this safety issue, CASA has advised the ATSB that: On 1 December 2010, the Civil Aviation Safety Authority (CASA) issued a maintenance direction to Qantas under Regulation 38 of the Civil Aviation Regulations 1988. That direction required that Qantas:  (a) Comply with Rolls-Royce plc Service bulletin number 72-G595 [see subsequent Other party safety action – Rolls-Royce plc] and any amendment or revision of it, within two cycles from the issue of this direction; (b) In the event abnormal or eccentric counter-boring of the tubes described in the service bulletin is identified, this must be recorded as a major defect of the engine; (c) Upon completion of compliance with the service bulletin an entry shall be made in the

	<p>aircraft's maintenance records stating what actions were taken to comply with the service bulletin and this direction;</p> <p>(d) Upon completion of compliance with the service bulletin a written report shall be furnished to [CASA] stating how the service bulletin and this direction were complied with and the outcome of compliance with the service bulletin.</p> <p>The ATSB is satisfied that the action taken by CASA adequately addresses the immediate safety of flight concerns in respect of Qantas operation of A380 aircraft equipped with Trent 900 series engines.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	N/A – The ATSB investigation into this occurrence is still underway at the time of writing.

<b>Investigation:</b>	<b>AO-2010-089</b> <b>In-flight uncontained engine failure - overhead Batam Island, Indonesia - 04 November 2010 - VH-OQA - Airbus A380-842</b>
<b>Safety action number</b>	AO-2010-089-NSA-014
<b>Risk category</b>	Critical
<b>Safety issue description</b>	Misaligned stub pipe counter-boring is understood to be related to the manufacturing process. This condition could lead to an elevated risk of fatigue crack initiation and growth, oil leakage and potential catastrophic engine failure from a resulting oil fire.
<b>Action taken by</b>	Qantas Airways

<b>Safety action outcomes</b>	<p>In response to this safety issue, Qantas has advised the ATSB that:</p> <p><i>In response to Service Bulletin RB211-72-G595, and in line with ATSB Safety Recommendation AO-2010-089-SR-012, Qantas will conduct a focused borescope measurement inspection of the HP/IP Turbine bearing support structure oil feed tube for concentricity of the counter-bore and inspection of the related components on its RB211 Trent 900 series engines. The inspection results will be sent to Rolls Royce for evaluation. Rolls Royce will then provide Qantas with formal confirmation as to the serviceability of the engine. These inspections will take place within the next 24hrs on engines in place on A380 aircraft currently in service, and before further flight on engines on aircraft not yet returned to service.</i></p> <p>The ATSB is satisfied that the action taken by Qantas adequately addresses the immediate safety of flight concerns in respect of the operation of its A380 aircraft equipped with Trent 900 series engines.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	N/A – The ATSB investigation into this occurrence is still underway at the time of writing.

## Marine

<b>Investigation:</b>	<b>MO-2008-013</b> Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker <i>Karratha Spirit</i> off Dampier, Western Australia on 24 December 2008.
<b>Safety action number</b>	MO-2008-013-NSA-061
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The ship's procedures for connecting and disconnecting from the CALM buoy did not provide explicit, succinct and unambiguous guidance and there were differences between the procedures and the actual shipboard practices that increased the level of risk associated with those operations.
<b>Action taken by</b>	Teekay Shipping Australia
<b>Safety action outcomes</b>	Teekay Shipping Australia has rewritten the procedures for connecting and disconnecting the import hose and for mooring at and disconnecting from the CALM buoy, including appropriate photographs and diagrams.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	28 Sep 2010

<b>Investigation:</b>	<b>MO-2008-013</b> Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker <i>Karratha Spirit</i> off Dampier, Western Australia on 24 December 2008.
<b>Safety action number</b>	MO-2008-013-NSA-062
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The procedures for connecting and disconnecting the import hose and disconnecting from the CALM buoy in place on board <i>Karratha Spirit</i> were signed off as being satisfactory and reflecting shipboard practice, but they had not been effectively reviewed on board the ship. Consequently, the ambiguities in the procedures and the discrepancies between the procedures and the ship's practices were not identified during any shipboard review or audit and were not made known to the ship's managers through any review process.
<b>Action taken by</b>	Teekay Shipping Australia
<b>Safety action outcomes</b>	The ATSB has been advised that the following safety actions have been taken by Teekay Shipping as a result of the accident: Inadequate Supervision and Adherence to Procedures • The importance of Risk Assessment and strictly adhering to documented procedures to be emphasized through a concentrated training campaign for the entire staff on both FSOs. • Develop an induction package that highlights high risk operational tasks to be viewed by unfamiliar facility personnel prior to task being undertaken. Trainer to ascertain facility personnel's understanding. Familiarisation to be recorded in current competency matrix. Drills to be undertaken on irregular high risk tasks (i.e. disconnection drill prior to cyclone season). • The Management of Change process and parameters to

	<p>be highlighted onboard the FSOs during an extraordinary HSEQ safety meeting. • Conduct an operational audit of all FSO specific practices to ensure validity, compliance and alignment of procedures Loss of situational awareness • The FSOs are to develop documented procedures that persons off watch may be called at any time for priority operations. • Shore management to develop a means of ensuring facility personnel are effectively familiarised by experienced personnel prior to identified high risk tasks being undertaken. • Such familiarisation is to be recorded in a manner that the Master (or designate) can identify the amount of experience the FSO has onboard, at any one time, for any one high risk task. • Shore management in consultation with Master is to review competency matrix and identify task experience shortfalls, as per FSO training matrix and competency/induction matrix. • Interview the Master, highlighting failures. Provide relevant training. • Raise awareness regarding safe mooring practices and the dangers of being present within snap back zones. • Communicate this incident as an extraordinary safety meeting to both FSOs to extract learning from the incident. • Use the lessons learnt from incident to raise awareness during seafarer conferences, and ship visits.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	28 Sep 2010
<b>Investigation:</b>	<b>MO-2008-013 Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker <i>Karratha Spirit</i> off Dampier, Western Australia on 24 December 2008.</b>
<b>Safety action number</b>	MO-2008-013-NSA-063
<b>Risk category</b>	Significant
<b>Safety issue description</b>	In this instance, the consensus of the regulatory authorities is that <i>Karratha Spirit</i> was not in a navigable form at the time of the accident and was therefore under NOPSA's jurisdiction according to the OPGGSA. However, the point at which <i>Karratha Spirit</i> became 'navigable' is not clearly defined in the OPGGSA and is open to interpretation. Furthermore, had the accident occurred on board <i>Karratha Spirit</i> after it had departed the CALM buoy and while it was steaming off the coast to avoid a cyclone, without entering any ports, then it is possible that the ship would not come under the jurisdiction of any Australian safety regulatory regime.
<b>Action taken by</b>	Australian Maritime Safety Authority (AMSA)
<b>Safety action outcomes</b>	The ATSB has been advised that the Australian Maritime Safety Authority is currently undertaking a review of the Navigation Act 1912.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	28 Sep 2010

<b>Investigation:</b>	<b>MO-2008-013</b> <b>Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker <i>Karratha Spirit</i> off Dampier, Western Australia on 24 December 2008.</b>
<b>Safety action number</b>	MO-2008-013-NSA-064
<b>Risk category</b>	Minor
<b>Safety issue description</b>	NOPSA does not undertake the audits necessary for maritime compliance and AMSA is only able to do so, while the facility is on station, with NOPSA's cooperation. NOPSA had carried out annual occupational health and safety inspections on board the ship and AMSA had carried out the necessary third party audits of the system to meet its certification requirements. However, none of these audits or inspections had identified the discrepancy between the mooring hawser procedures and actual shipboard practices or that the ship's internal review processes had not identified the discrepancy.
<b>Action taken by</b>	National Offshore Petroleum Safety Authority (NOPSA)
<b>Safety action outcomes</b>	The Safety Authority has sought ongoing support from AMSA in the provision of marine surveyors to assist the Safety Authority in its inspection of facilities (that can become vessels upon exiting the offshore petroleum regime). AMSA have confirmed its ongoing willingness to assist. The Authority has reviewed and is using its 'sail-away preparedness' and 'cyclone response preparedness' checklists in inspections of selected facilities. The Authority has increased its target frequency for inspections of normally occupied facilities (including FPSOs and FSOs) from once a year to twice a year, and is actively addressing the consequential requirement for additional OHS Inspectors.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	28 Sep 2010

<b>Investigation:</b>	<b>MO-2008-013</b> <b>Independent investigation into the fatality on board the Australian registered floating storage and offloading tanker <i>Karratha Spirit</i> off Dampier, Western Australia on 24 December 2008.</b>
<b>Safety action number</b>	MO-2008-013-NSA-065
<b>Risk category</b>	Significant
<b>Safety issue description</b>	In this instance, the consensus of the regulatory authorities is that <i>Karratha Spirit</i> was not in a navigable form at the time of the accident and was therefore under NOPSA's jurisdiction according to the OPGGSA. However, the point at which <i>Karratha Spirit</i> became 'navigable' is not clearly defined in the OPGGSA and is open to interpretation. Furthermore, had the accident occurred on board <i>Karratha Spirit</i> after it had departed the CALM buoy and while it was steaming off the coast to avoid a cyclone, without entering any ports, then it is possible that the ship would not come under the jurisdiction of any Australian safety regulatory regime.
<b>Action taken by</b>	National Offshore Petroleum Safety Authority (NOPSA)
<b>Safety action outcomes</b>	The ATSB is no doubt also aware of the reports prepared for the Australian Government by Kym Bills and David Agostini in June 2009 concerning Offshore Petroleum Safety Regulation: Better practice and the effectiveness of the National Offshore Petroleum

	<p>Safety Authority and Marine Issues. The Department of Resources Energy and Tourism has drafted a Response for Consultation, addressing the two reports and including a response to the June 2008 Review of NOPSA Operational Activities. The Government has already acted on some of the recommendations from the reports. Details and links to all the documents are available from the Department's website. The Safety Authority is actively engaged with the Department on the development of these responses, including several which have some bearing on the Significant Safety Issue raised in the ATSB report. For instance, consideration is being given to amending the Offshore Petroleum and Greenhouse Gas Storage Act 2006 to extend the offshore OHS regime boundary 500m from the point of departure and to provide OHS Inspectors with powers appropriate to investigation of OHS incidents that occur on a facility that then becomes a vessel. A previous amendment to the Act has created a warrant that may be issued by a Magistrate and executed by an OHS Inspector to gain entry to, and seize evidential material from, such a vessel. The OHS laws for vessels that exit the OHS regime are being considered by the Government as part of a complete review of the Navigation Act. The Safety Authority will provide operational relevant input to this review as required.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	28 Sep 2010
<b>Investigation:</b>	<b>MO-2009-001</b> <b>Independent investigation into the grounding of the Hong Kong registered products tanker <i>Atlantic Blue</i> at Kirkcaldie Reef, Torres Strait on 7 February 2009.</b>
<b>Safety action number</b>	MO-2009-001-NSA-017
<b>Risk category</b>	Significant
<b>Safety issue description</b>	<i>Atlantic Blue's</i> safety management system procedures did not require specific off-track limits to be included in the passage plan or otherwise ensure that limits for effective track monitoring were always defined.
<b>Action taken by</b>	Fleet Management Limited, Hong Kong
<b>Safety action outcomes</b>	<p>Fleet Management has advised the ATSB that as a result of the incident a number of corrective measures have been, or will be, implemented on board ships managed by the company. These measures comprise action to directly address the safety issue and other action to support these direct measures and to avoid similar incidents. The company has decided to revise its shipboard safety management system (SMS) procedures to include off-track limits. The passage plan will specify these limits for each leg of the passage. Procedures will require the officer of the watch (OOW) to call the master to the bridge if the OOW is unable to keep the ship within those defined limits.</p> <p>Fleet Management has circulated a safety alert to managed ships highlighting <i>Atlantic Blue's</i> grounding to emphasise the importance of bridge team management and measures to avoid a similar incident. The measures include a mandatory risk assessment before the master leaves the ship's bridge during a passage. The master-pilot information exchange checklist in the company's SMS has been revised. For a pilotage passage of long duration, the checklist includes identifying critical areas, marking master and pilot call points on charts and briefing the OOW for critical areas and required actions during the passage.</p> <p>Training to support the measures above has been extended to include a process whereby masters and mates undertake a mandatory, 2 day 'navigational safety course'</p>

	<p>before they join a Fleet Management managed ship. In addition, the company has implemented 'SAFER+', a behaviour based safety training tool, for its staff. Atlantic Blue's second mate at the time of the grounding is to undertake another bridge team management course at the next opportunity.</p> <p>The ATSB is satisfied that the action taken by Fleet Management will adequately address the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	16 Dec 2010

<b>Investigation:</b>	<b>MO-2009-001</b> <b>Independent investigation into the grounding of the Hong Kong registered products tanker <i>Atlantic Blue</i> at Kirkcaldie Reef, Torres Strait on 7 February 2009.</b>
<b>Safety action number</b>	MO-2009-001-NSA-025
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The pilotage system used by <i>Atlantic Blue</i> 's pilot did not define off-track limits or make effective use of recognised bridge resource management tools in accordance with the Queensland Coastal Pilotage Safety Management Code and regular assessments of his procedures and practices under the code's check pilot regime conducted over a number of years had not resolved these inconsistencies.
<b>Action taken by</b>	Australian Maritime Safety Authority (AMSA)
<b>Safety action outcomes</b>	<p>The Australian Maritime Safety Authority (AMSA) has advised the ATSB that a review of the coastal pilotage marine orders is being finalised.</p> <p>Changes will include an upgrade of check pilot procedures to promote more rigour and independence within the check pilot system. It is also intended to enhance pilot training and licence renewal requirements through the use of bridge simulators and additional testing and training requirements for trainee pilot licences. This training will focus on bridge team management, human factors and piloting to a passage plan. The marine orders will require standard passage plans to be employed and a consultative process to develop plans which are acceptable to all pilots is being progressed. The review into Coastal Pilotage Services in the Torres Strait and Great Barrier Reef by AMSA and the Department of Infrastructure, Transport, Regional Development and Local Government, commenced in July 2008, is being progressed. An independent, full review of the fatigue management plan is also to be completed.</p> <p>In its response, AMSA also advised that it has concerns that there may be systemic issues that could impact upon the safe operation of coastal pilots and the ability to fully develop a 'safety culture'. These concerns are based upon reports from pilots raising various issues about safety and certain aspects of pilotage operations.</p> <p>The ATSB is not satisfied that the action proposed by the Australian Maritime Safety Authority will, by itself, adequately address the safety issue because specific information obtained from AMSA in relation to its concerns about the operations of coastal pilots indicates that wider, significant safety issues may exist. Therefore, the ATSB will undertake a systemic, safety issue investigation into coastal pilotage which it aims to complete by the end of 2011.</p>
<b>Safety action status</b>	Closed

<b>Safety issue addressed</b>	Safety issue partially addressed
<b>Investigation completion date</b>	16 Dec 2010
<b>Investigation:</b>	<b>MO-2009-001</b> <b>Independent investigation into the grounding of the Hong Kong registered products tanker <i>Atlantic Blue</i> at Kirkcaldie Reef, Torres Strait on 7 February 2009.</b>
<b>Safety action number</b>	MO-2009-001-NSA-026
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The 'shallow water alert' generated by the Great Barrier Reef and Torres Strait Vessel Traffic Service's (REEFVTS) monitoring system did not provide adequate warning of <i>Atlantic Blue</i> entering shallow water because the boundary of the defined shallow water alert area was too close to dangers off Kirkcaldie Reef.
<b>Action taken by</b>	REEFVTS
<b>Safety action outcomes</b>	<p>The Australian Maritime Safety Authority (AMSA), joint competent authority of REEFVTS, has advised the ATSB that a review of shallow water areas had already been started in late 2008. The review was conducted by REEFVTS staff from AMSA and Maritime Safety Queensland (MSQ).</p> <p>The joint review resulted in a decision to extend shallow water areas so that their boundaries are at least 2.5 miles, where possible, from the nearest shallow water or danger adjacent to a shipping track. These changes were implemented in March 2009, following <i>Atlantic Blue</i>'s grounding, and included enlarging the shallow water area off Kirkcaldie Reef. A process to annually review shallow water areas was introduced after the grounding.</p> <p>The ATSB is satisfied that the action taken by REEFVTS adequately addresses the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	16 Dec 2010
<b>Investigation:</b>	<b>MO-2009-001</b> <b>Independent investigation into the grounding of the Hong Kong registered products tanker <i>Atlantic Blue</i> at Kirkcaldie Reef, Torres Strait on 7 February 2009.</b>
<b>Safety action number</b>	MO-2009-001-NSA-027
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The REEFVTS monitoring system did not provide an 'exiting corridor alarm' when <i>Atlantic Blue</i> exited the two-way route that it was transiting because the route had not been defined as a navigational corridor.

<b>Action taken by</b>	REEFVTS
<b>Safety action outcomes</b>	<p>The Australian Maritime Safety Authority (AMSA), joint competent authority of REEFVTS, has advised the ATSB that following <i>Atlantic Blue's</i> grounding a process to annually review electronic corridors was introduced. Reviews are to be conducted by REEFVTS staff from AMSA and Maritime Safety Queensland (MSQ).</p> <p>The joint reviews completed have taken into account REEFVTS records of past tracks and positions of ships to define electronic corridors that closely follow two-way routes. Two-way routes in the Torres Strait, including the route between Twin Island and Kirkcaldie Reef, have been defined as electronic corridors.</p> <p>The ATSB is satisfied that the action taken by REEFVTS adequately addresses the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	16 Dec 2010
<b>Investigation:</b>	<b>MO-2009-002</b> <b>Independent investigation into the loss of containers from the Hong Kong registered container ship <i>Pacific Adventurer</i> off Cape Moreton, Queensland, on 11 March 2009.</b>
<b>Safety action number</b>	MO-2009-002-NSA-028
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The poor condition of much of the ship's container lashing equipment indicates that the inspection and maintenance regime applied to this critical equipment had been inadequate.
<b>Action taken by</b>	Swire Navigation/CNCO
<b>Safety action outcomes</b>	<p>Swire Navigation has advised the ATSB that: At the time of the incident, the company (and ship) had in place a comprehensive inspection and maintenance regime which included regular inspection and maintenance and/or replacement of the vessel's container lashing equipment. The upkeep and replacement of relevant cargo securing equipment by the crew was progressing at the time of the incident. Following the incident, Swire Navigation has reviewed the inspection and maintenance process for the container fitting system in use on the ship at the time of the incident and, although Class approved, has decided to replace the entire system with an alternative Class approved system for all eight ships of this class that the company believes will be even more robust.</p> <p>The ATSB is satisfied that the action taken by Swire Navigation adequately addresses this safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>MO-2009-002</b> <b>Independent investigation into the loss of containers from the Hong Kong registered container ship <i>Pacific Adventurer</i> off Cape Moreton, Queensland, on 11 March 2009.</b>
<b>Safety action number</b>	MO-2009-002-NSA-030
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The ammonium nitrate prills were not packaged in the containers in accordance with the requirements of the IMDG Code. The containers were packed in a way which allowed the prills to move within the container in a way that may have contributed to the failure of the containers and/or the lashing system.
<b>Action taken by</b>	Orica
<b>Safety action outcomes</b>	Orica has advised the ATSB that: The company has taken two main actions relating to packing of ammonium nitrate for sea transport following the incident. Orica has worked with AMSA to agree on a revised packing procedure for ammonium nitrate prills. The new approved procedure differs from the previous method in three respects: the plastic liner inside the shipping container is now closed with a zip, rather than tape; the wooden bulkhead has been replaced with a steel bulkhead, in order to reduce the presence of combustible material inside the container, but not, as Orica understands, due to concerns about structural integrity in using a wooden bulkhead; and the containers are now packed with 18.5 tonnes of ammonium nitrate, rather than 19.5 tonnes. Orica has also developed a training program with respect to IMDG compliance which has been rolled out to all Orica personnel and contractors involved in packing and loading of shipments of ammonium nitrate. This program was developed in consultation with AMSA, and has been approved by AMSA. The ATSB is satisfied that the action taken by Orica Australia adequately addresses this safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>MO-2009-002</b> <b>Independent investigation into the loss of containers from the Hong Kong registered container ship <i>Pacific Adventurer</i> off Cape Moreton, Queensland, on 11 March 2009.</b>
<b>Safety action number</b>	MO-2009-002-NSA-031
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Before the incident, Orica Australia had advised the Australian Maritime Safety Authority (AMSA) that their packaging method for the prills was fully compliant with the IMDG Code's provisions. However, AMSA's IMDG Code compliance audit regime had not detected that the method was not compliant.
<b>Action taken by</b>	Australian Maritime Safety Authority (AMSA)

<b>Safety action outcomes</b>	<p>The Australian Maritime Safety Authority (AMSA) has advised the ATSB that: Work has been undertaken with Orica and other ammonium nitrate shippers to ensure that the IMDG Code packaging requirements are understood. To further assist with this education campaign, AMSA published an information sheet in June 2009 covering all the relevant issues of shipping ammonium nitrate. In the case of Orica, AMSA have specific approvals covering their loading of ammonium nitrate prills into containers to ensure that the end-wall strength requirements of the IMDG Code are complied with. AMSA have also conducted inspections of Orica's loading arrangements to ensure that the approvals are complied with. In accordance with chapter 3.1 of the IMDG Code (2008 edition), AMSA has, through Marine Orders Part 41, implemented the requirements for training of shore-based personnel involved in all aspects of IMDG Code compliance. This has involved AMSA formally accepting training providers and courses for certain levels of training, and it includes an additional audit function. AMSA has also published a dangerous, hazardous and harmful cargo handbook for use by industry.</p> <p>The ATSB is satisfied that the action taken by the Australian Maritime Safety Authority adequately addresses this safety issue.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	27 Jan 2011
<b>Investigation:</b>	<b>MO-2009-002</b> <b>Independent investigation into the loss of containers from the Hong Kong registered container ship <i>Pacific Adventurer</i> off Cape Moreton, Queensland, on 11 March 2009.</b>
<b>Safety action number</b>	MO-2009-002-NSA-032
<b>Risk category</b>	Significant
<b>Safety issue description</b>	At the time of the incident, there was no requirement for any third party to inspect or survey the fixed and loose lashing equipment on a ship. Had this been done, the maintenance and replacement regime of such equipment on board <i>Pacific Adventurer</i> might have been more effective.
<b>Action taken by</b>	Australian Maritime Safety Authority (AMSA)
<b>Safety action outcomes</b>	<p>The Australian Maritime Safety Authority (AMSA) has advised the ATSB that: While Port State Control procedures cover the Cargo Securing Manual and the verification of its use on board, AMSA also implemented its own specific cargo securing inspection regime. Since March 2009, AMSA has conducted in excess of 300 cargo securing inspections. In addition to the above, AMSA conducted a focused inspection campaign on cargo securing arrangements from February to May 2010. Finally, AMSA continues to provide their marine surveyors with specialised dangerous goods and IMDG Code training and has extended surveyor training to cover the issue of cargo securing.</p> <p>The ATSB is satisfied that the action taken by the Australian Maritime Safety Authority adequately addresses this safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	27 Jan 2011

<b>Investigation:</b>	<b>MO-2009-005</b> <b>Serious injury on board <i>United Treasure</i> off Port Kembla, New South Wales on 7 July 2009</b>
<b>Safety action number</b>	MO-2009-005-NSA-023
<b>Risk category</b>	Significant
<b>Safety issue description</b>	<i>United Treasure's</i> permit to work aloft system had not been effectively implemented on board the ship. In addition, the standard form for the permit did not ensure that the officer in charge of the work and its authoriser were not the same person and that a risk assessment was formally undertaken by at least two responsible officers.
<b>Action taken by</b>	United Ocean Ship Management, Singapore
<b>Safety action outcomes</b>	United Ocean Ship Management has advised the ATSB that it has implemented the following measures to address the issue. The permit to work aloft system has been revised. The amended permit form lists more detailed safety precautions including not working aloft if rolling exceeds 2°, a maximum scaffolding height to width ratio of 2:1, a pre-work inspection to verify that scaffolding cannot topple or collapse and a pre-work job safety meeting. In addition, a risk assessment is to be carried out by the officer in charge and the work permit's authoriser, who must be a senior officer and cannot be the same person as the officer in charge. A new 'Risk Management Manual' which provides guidance for the identification of specific hazards when working aloft or outboard and the management of those risks.  The ATSB is satisfied that the safety action taken by United Ocean Ship Management adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	17 Nov 2010

<b>Investigation:</b>	<b>MO-2009-009</b> <b>Independent investigation into the fire on board the Marshall Islands registered anchor handling tug supply vessel <i>Petra Frontier</i> at sea on 28 September 2009.</b>
<b>Safety action number</b>	MO-2009-009-NSA-019
<b>Risk category</b>	Minor
<b>Safety issue description</b>	<i>Petra Frontier's</i> safety management system contained procedures outlining how fire and abandon ship drills should be carried out in accordance with SOLAS and Marshall Islands requirements. However, it also contained a drill schedule that provided some contradictory information.
<b>Action taken by</b>	Petra Marine Australia
<b>Safety action outcomes</b>	Petra Marine Australia recognises that the drill schedule may have lead to some confusion and that this document will be amended accordingly.

	The ATSB is satisfied that the action taken proposed by Petra Marine Australia will adequately address the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	14 Dec 2010
<b>Investigation:</b>	<b>MO-2009-009</b> <b>Independent investigation into the fire on board the Marshall Islands registered anchor handling tug supply vessel <i>Petra Frontier</i> at sea on 28 September 2009.</b>
<b>Safety action number</b>	MO-2009-009-NSA-020
<b>Risk category</b>	Minor
<b>Safety issue description</b>	While <i>Petra Frontier</i> had undergone an initial flag State inspection on 4 May 2009 and routine class surveys, the most recent being a class survey completed on 12 August 2009, neither authority was aware that the ship was unseaworthy in relation to critical safety equipment when it departed Singapore.
<b>Action taken by</b>	American Bureau of Shipping (ABS)
<b>Safety action outcomes</b>	<p>The American Bureau of Shipping advised the ATSB that: The class surveys of the PETRA FRONTIER in Singapore from 7 to 12 August 2009 were annual surveys which generally call for visual examination of machinery and equipment. Even if there had been more detailed surveys, similar to the renewal surveys, they would not have identified many of the deficiencies, some of them caused by subsequent work on the vessel. Furthermore, the American Bureau of Shipping stated that: Under ABS Rules, any damage, failure or deterioration of the hull, machinery or equipment of an ABS-classed vessel which affects or may affect classification is to be reported to ABS by the vessel owner at first opportunity. ABS received no notification of malfunctions of the vessel's fuel oil purifier, oily water separator or steering gear until advised of the 16 September 2009 PSC detention of the vessel. Nor was ABS advised of the early September attempted repairs to machinery items and the steering system, as also required by ABS Rules.</p> <p>The Australian Transport Safety Bureau advises that the American Bureau of Shipping should consider the safety implications of this safety issue and take further action where considered appropriate.</p>
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	14 Dec 2010

<b>Investigation:</b>	<b>MO-2009-009</b> <b>Independent investigation into the fire on board the Marshall Islands registered anchor handling tug supply vessel <i>Petra Frontier</i> at sea on 28 September 2009.</b>
<b>Safety action number</b>	MO-2009-009-NSA-022
<b>Risk category</b>	Minor
<b>Safety issue description</b>	While <i>Petra Frontier</i> had undergone an initial flag State inspection on 4 May 2009 and routine class surveys, the most recent being a class survey completed on 12 August 2009, neither authority was aware that the ship was unseaworthy in relation to critical safety equipment when it departed Singapore.
<b>Action taken by</b>	Marshall Islands International Registries
<b>Safety action outcomes</b>	Marshall Islands International Registries has advised the ATSB that: The Marshall Islands Registry has reviewed the initial flag State inspection carried out by its contracted surveyor on board <i>Petra Frontier</i> on 4 May 2009. As a result of this review, it has been decided that the contractor will not be engaged to carry out inspections in the future. <i>Petra Frontier</i> and its owners remain under close scrutiny by the Marshall Islands Registry. A flag State representative inspected the ship in Darwin on 3 October 2009 and follow up visits were carried out in Singapore between 24 and 30 October. Further visits were also carried out up until the time the ship departed Singapore. The ship has since been inspected on 10 March 2010 and 25 September; and the next inspection is planned for April/May 2011. The ATSB is satisfied that the action taken by the Marshall Islands Registry will adequately address the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	14 Dec 2010

<b>Investigation:</b>	<b>MO-2009-010</b> <b>Fatality on board the chemical tanker <i>Bow De Jin</i> at sea off New South Wales on 24 November 2009.</b>
<b>Safety action number</b>	MO-2009-010-NSA-018
<b>Risk category</b>	Significant
<b>Safety issue description</b>	While enclosed space entry checklists were being filled out by the crew members on board <i>Bow De Jin</i> , the checklist system was not being used as a proactive means to ensure that the necessary safety requirements were being met prior to tank entries.
<b>Action taken by</b>	Fleet Management Limited, Hong Kong
<b>Safety action outcomes</b>	Fleet Management has advised the ATSB that the company has reviewed its SMS procedures with regard to enclosed space entry and found them to be adequate. However, the company also recognises that a serious failure occurred on board <i>Bow De Jin</i> as a result of non-compliance with company procedures. Consequently, in order to ensure compliance with procedures and to heighten awareness of the enclosed space entry requirements fleet-wide, Fleet Management has initiated a number of short and long term preventative measures.

<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	10 Nov 2010

**Investigation:** **MO-2010-001**  
**Independent investigation into the engine room fire on board the Australian registered bulk carrier *River Embley* off Gladstone, Queensland, on 16 February 2010**

<b>Safety action number</b>	MO-2010-001-NSA-001
<b>Risk category</b>	Minor
<b>Safety issue description</b>	<i>River Embley's</i> planned maintenance system did not require routine testing of the compressor high temperature alarm/shutdown.
<b>Action taken by</b>	ASP Ship Management
<b>Safety action outcomes</b>	On 17 February, the day after the fire, ASP Ship Management advised all chief engineers in the fleet of the incident on board <i>River Embley</i> and instructed them to check the operation of each screw air compressor and to test all associated safety devices. Subsequently, the planned maintenance schedules on board all ships in the fleet have been updated to include routine testing of compressor shutdown devices.  The ATSB is satisfied that the action taken by ASP Ship Management adequately addresses this safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	25 Jan 2011

**Investigation:** **MO-2010-001**  
**Independent investigation into the engine room fire on board the Australian registered bulk carrier *River Embley* off Gladstone, Queensland, on 16 February 2010**

<b>Safety action number</b>	MO-2010-001-NSA-002
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The manufacturer's maintenance manual did not include a requirement for the routine testing of the compressor high temperature alarm/shutdown.
<b>Action taken by</b>	Champion Compressors
<b>Safety action outcomes</b>	In response to this safety issue, Champion Compressors advised that ATSB that: Champion Compressors acknowledges that a ship's engineer is suitably qualified to carry out the various tasks involved in testing the shutdown systems on these types of

compressors. However, the testing of this type of equipment has its challenges because of the varying skill levels of operators across our customer base. Therefore, Champion Compressors have worked to design fail-safe protective systems. The new type temperature probe is a 4 - 20 Ma transducer which is continually monitored by the compressor control system. The control system will immediately shut down the compressor if the probe fails. Today's compressors are also fitted with a secondary temperature probe. This acts as a further protection if the temperature rises above the set point of the primary shut down device. This probe is situated in the minimum pressure valve on top of the separator and it will shut the machine down when an increase in separator temperature occurs or there is a flash fire in the separator. Today's Champion Compressor manuals also state that compressor protective systems should be checked every 6000 hours. The compressor fitted on board River Embley as a replacement for the Sullair compressor that was damaged in the fire and is fitted with all the protection systems described above.

The ATSB is satisfied that the response from Champion Compressors adequately addresses this safety issue.

<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	25 Jan 2011
<b>Investigation:</b>	<b>MO-2010-003 Independent investigation into the grounding of the Chinese registered bulk carrier <i>Shen Neng 1</i> on Douglas Shoal, QLD on 3 April 2010.</b>
<b>Safety action number</b>	MO-2010-003-NSA-007
<b>Risk category</b>	Significant
<b>Safety issue description</b>	In the 30 minutes leading up to the grounding, there were no visual cues to warn either the chief mate or the seaman on lookout duty, as to the underwater dangers directly ahead of the ship.
<b>Action taken by</b>	Australian Maritime Safety Authority (AMSA)
<b>Safety action outcomes</b>	The Australian Maritime Safety Authority has advised the ATSB that, as part of a package to improve safe navigation in the Great Barrier Reef, the Authority will be enhancing navigational aids, leveraging off current and anticipated technology, to assist navigation by both pilots and masters and to increase situational awareness in real time. This includes consideration of deploying navigational buoys at Douglas Shoal and Rock Cod Shoal on the route taken by the vessels transiting to and from Gladstone from the north.  The ATSB is satisfied that the proposed action taken by the Australian Maritime Safety Authority adequately addresses this safety issue.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	14 Apr 2011

<b>Investigation:</b>	<b>MO-2010-003</b> <b>Independent investigation into the grounding of the Chinese registered bulk carrier <i>Shen Neng 1</i> on Douglas Shoal, QLD on 3 April 2010.</b>
<b>Safety action number</b>	MO-2010-003-NSA-008
<b>Risk category</b>	Significant
<b>Safety issue description</b>	At the time of the grounding, the protections afforded by some of the measures currently employed in the more northern sections of the Great Barrier Reef were not in place in the sea area off Gladstone.
<b>Action taken by</b>	Australian Maritime Safety Authority (AMSA)
<b>Safety action outcomes</b>	The Australian Maritime Safety Authority has advised the ATSB that, following a review of the protection arrangements within the Great Barrier Reef, the coverage of REEFVTS will be extended to the southern boundary of the Particularly Sensitive Sea Area. This will include the sea area off Gladstone and implementation will be effective from 1 July 2011.  The ATSB is satisfied that the proposed action taken by the Australian Maritime Safety Authority adequately addresses this safety issue.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	14 Apr 2011

<b>Investigation:</b>	<b>MO-2010-005</b> <b>Independent investigation into crew member fatality on board the Liberian registered general cargo ship <i>Cape Darnley</i> at sea on 8 July 2010</b>
<b>Safety action number</b>	MO-2010-005-NSA-003
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The oiler's actions indicate that he was not aware of the dangers associated with the use of an angle grinder to remove the top of the drum.
<b>Action taken by</b>	NSC Schiffahrtsgesellschaft, Germany
<b>Safety action outcomes</b>	The ATSB has been advised by NSC Schiffahrtsgesellschaft that instructions for hot work have been reviewed and precaution measures against possible fire and explosion of empty drums has been added. It is now strictly forbidden to use an angle grinder while working with empty and potentially dangerous used drums unless properly cleaned and well ventilated. All crew members have been informed about the prohibition.  The ATSB is satisfied that the action taken by NSC Schiffahrtsgesellschaft adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed

<b>Investigation completion date</b>	17 Feb 2011
<b>Investigation:</b>	<b>MO-2010-005</b> <b>Independent investigation into crew member fatality on board the Liberian registered general cargo ship <i>Cape Darnley</i> at sea on 8 July 2010</b>
<b>Safety action number</b>	MO-2010-005-NSA-004
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The oiler's actions indicate that he was likely not aware of the ship's safety management system hot work permit requirements.
<b>Action taken by</b>	NSC Schiffahrtsgesellschaft, Germany
<b>Safety action outcomes</b>	The ATSB has been advised by NSC Schiffahrtsgesellschaft that safety drill/training plans have been reviewed with a special focus on Hot Work and Risk & Hazard Assessment. The Training Checklists have been improved and amended accordingly, so that new crew members will be familiar with the safety management system, including hot work. The frequency of Training of Safe working practice, including Hot Work, has been increased from three month to a monthly schedule.  The ATSB is satisfied that the action taken by NSC Schiffahrtsgesellschaft adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	17 Feb 2011
<b>Investigation:</b>	<b>MO-2010-009</b> <b>Independent investigation into the grounding of the Liberian registered container ship <i>MSC Basel</i> in Moreton Bay, Queensland on 1 November 2010</b>
<b>Safety action number</b>	MO-2010-009-NSA-009
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Preliminary inspections and tests of <i>MSC Basel</i> steering system did not identify any faults. However, more thorough examinations of the entire steering systems may identify any intermittent defects.
<b>Action taken by</b>	Laeisz Reederei
<b>Safety action outcomes</b>	Laeisz Reederei has advised the ATSB that the spherical bearing and pin which were found seized during the investigation were replaced by the manufacturer in Singapore on 15 November 2010 with genuine spare parts. Following the repairs, the steering gear was tested and found to operate satisfactorily.  The ATSB believes that further action is needed by Laeisz Reederei to adequately

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address this safety issue.

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**Safety action  
status**            Closed

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**Investigation  
completion date**    4 May 2011

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## Rail

<b>Investigation:</b>	<b>RO-2009-009</b> <b>Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7 on 12 November 2009</b>
<b>Safety action number</b>	RO-2009-009-NSA-010
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The South Improvement Alliance engineers did not effectively identify and record that the interface between CA74C and CA74D was the fouling point between the Up Main line and No.1 Platform Road and thus did not recognise that the rear of a train sitting on the Up Main line at this location would foul No.1 Platform Road. The design deficiency was caused by a long standing practice of not explicitly recording the clearance point on the Signal Arrangement Plan, Track Insulation Plan or in the Control Tables.
<b>Action taken by</b>	Australian Rail Track Corporation (ARTC)
<b>Safety action outcomes</b>	<p>The Australian Rail Track Corporation has advised that the following actions were taken with respect to future signal design work:</p> <p><i>Update the Track Standards to adequately identify the process for determining the fouling point. Provide consistent references in the Signals Standards to the Track Standard for the fouling point.</i></p> <p><i>Rollingstock Standards and approvals to include control measures for cases where the overhang exceeds 3.0 metres.</i></p> <p><i>The Track Design Engineer is nominated as the responsible authority for the design, calculation and identification of the location of the fouling point. Where the track design is not changed, then an appropriately competent track design engineer shall perform the task based on the as-installed infrastructure. This information to be recorded and configuration managed.</i></p> <p><i>The use of a plate to permanently identify the location of the fouling point be considered.</i></p> <p><i>The Track Maintenance Standards, Examination Standards and Work Schedules be amended to include verification of the clearance after specific maintenance activities or events.</i></p> <p><i>Clearance Points to be explicitly identified on the Signal Arrangement Plan, Track Insulation Plan.</i></p> <p><i>A table be included in the Control Tables to identify Clearance Points and their associated requirements.</i></p> <p><i>Signal Design Standards to be updated for the above. Ensure Compliance with the Signals Standard for Track Insulation Plans to be scale drawings in the longitudinal and lateral axes.</i></p> <p>The Australian Transport Safety Bureau is satisfied that the action taken by the Australian Rail Track Corporation adequately addresses the safety issue.</p>
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	20 Jan 2011

<b>Investigation:</b>	<b>RO-2009-009</b> <b>Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7 on 12 November 2009</b>
<b>Safety action number</b>	RO-2009-009-NSA-025
<b>Risk category</b>	Significant
<b>Safety issue description</b>	The documentation and quality control processes used by the South Improvement Alliance for the Cootamundra re-signalling project were not sufficiently robust, in particular, the closing out of identified design issues was inadequate.
<b>Action taken by</b>	Australian Rail Track Corporation (ARTC)
<b>Safety action outcomes</b>	The Australian Rail Track Corporation has advised that the following actions will be taken with respect to future signal design work: <i>A standard process to be nominated for raising recording and resolving all issues that arise during the design process. The record to form part of the Design Verification. Include in the Signal Design Process a record of signal design staff against activity against version.</i> The Australian Transport Safety Bureau is satisfied that the action taken by the Australian Rail Track Corporation adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Safety issue addressed</b>	Safety issue adequately addressed
<b>Investigation completion date</b>	20 Jan 2011

<b>Investigation:</b>	<b>RO-2009-009</b> <b>Reported signal irregularity at Cootamundra NSW involving trains ST22 and 4MB7 on 12 November 2009</b>
<b>Safety action number</b>	RO-2009-009-NSA-029
<b>Risk category</b>	Minor
<b>Safety issue description</b>	Where a signalling design has implicit safety requirements that need to be validated onsite, field testers should be provided with comprehensive check notes and/or clearly annotated information that ensures specific testing requirements are not omitted.
<b>Action taken by</b>	Australian Rail Track Corporation (ARTC)
<b>Safety action outcomes</b>	The Australian Rail Track Corporation has advised that the following actions will be taken with respect to future signal design work: Checking of Clearance Points between Design and field, by Checking Engineers to be formalized. This to be included in the Principles Test verification. The Track Insulation Plan to be verified as part of the Principles Test. The Commissioning work Instruction and ITF 13/5 to be amended to explicitly indicate when a Clearance Point commissioning test is required. The use of a plate to permanently identify the location of the fouling point be considered. The Track Maintenance Standards, Examination Standards and Work Schedules be

	amended to include verification of the clearance at appropriate time intervals or after specific maintenance activities or events. The Australian Transport Safety Bureau is satisfied that the action taken by the Australian Rail Track Corporation adequately addresses the safety issue.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	20 Jan 2011
<b>Investigation:</b>	<b>RO-2010-002 Safeworking breach at Manildra NSW 10 February 2010</b>
<b>Safety action number</b>	RO-2010-002-NSA-003
<b>Risk category</b>	Minor
<b>Safety issue description</b>	The Manildra Mill shunt locomotive did not have a CountryNet communication system installed as required by the New South Wales Rail Safety (General) Regulation 2008.
<b>Action taken by</b>	Manildra Group
<b>Safety action outcomes</b>	A CountryNet communication system has been installed into the Manildra Mill shunt locomotive. The radio system installed into the Manildra Mill shunt locomotive now complies with the requirements of the New South Wales Rail Safety (General) Regulation 2008.
<b>Safety action status</b>	Closed
<b>Investigation completion date</b>	18 May 2011

Safety issues and safety actions identified through ATSB transport safety investigations: 2010-2011 financial year