

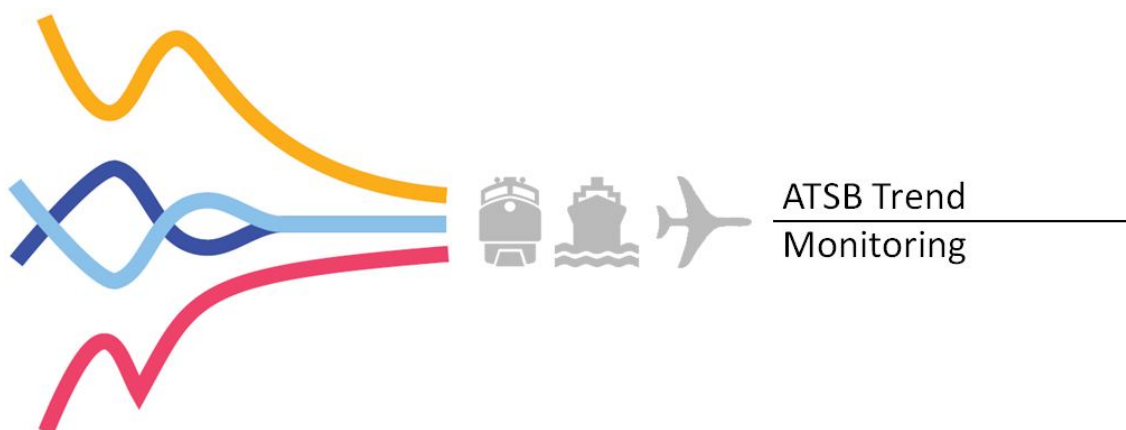


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Australian Transport Safety Bureau

Emerging trends in Australian aviation safety

July – December 2014



ATSB Transport Safety Report

Aviation trend monitoring

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Addendum

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Emerging trends in Australian aviation safety: July–December 2014

Introduction

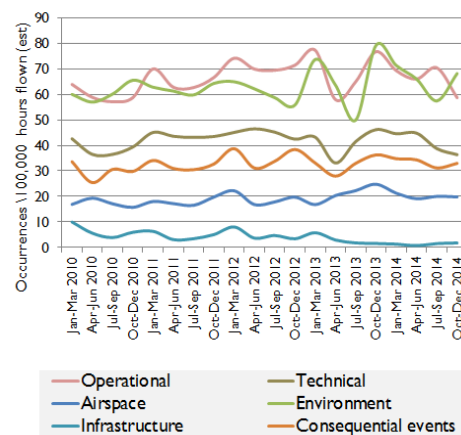
When aviation safety incidents and accidents happen, they are reported to the ATSB. The most serious of these are investigated, but most reports are used to help the ATSB build a picture of how prevalent certain types of occurrences are in different types of aviation operations.

The ATSB uses this data to proactively look for emerging safety trends. By monitoring trends, issues of concern can be communicated and action taken to prevent accidents.

Proactive trend monitoring is a data-driven process, reviewing all occurrences to see if there are subtle changes that may point to a larger issue. Potential issues are then monitored by the ATSB, and shared with industry and other government agencies. Safety actions can then be taken by the most appropriate people to prevent these issues resulting in accidents. These trends can also point to the need for the ATSB to target particular types of occurrences for investigation.

This report summarises significant trends in Australian aviation from July to December 2014, and resultant safety action being taken to address these trends.

Safety occurrence reporting across all types of Australian aviation – last 5 years



Proactive trend monitoring methods

ATSB trend monitoring reviews the rate of reported aviation occurrences (per 100,000 departures or hours flown) biannually, and compares it to the 5-year average. The ATSB performs this assessment independently for every type of occurrence involving high capacity regular public transport (RPT) and charter, low capacity RPT and charter, and general aviation.

Further analysis can show what aircraft models, operators, or locations account for most of the difference, and whether this has been a long term trend or just a spike. When a single operator accounts for most of the difference, the ATSB contacts them for information and comment. Sometimes increases are solely due to a good reporting culture, sometimes because of changes to operations, aircraft, or regulations, and sometimes there is no apparent explanation.

In almost all cases, a significantly different occurrence rate to normal is due to something explainable, and something that does not pose an imminent risk to the safety of aircraft operators, passengers, or the public.

The ATSB continues to monitor all trends for several months to see if they return to normal.

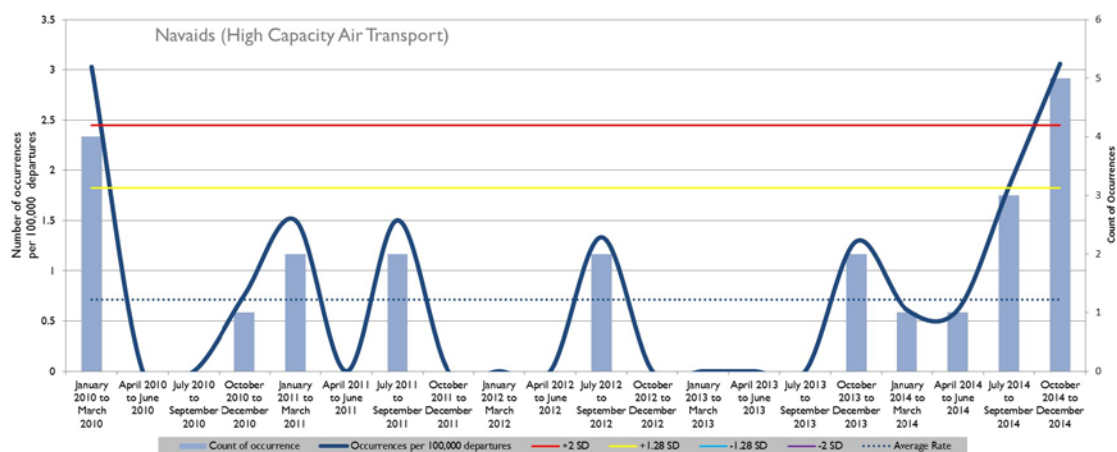
Safety action may be appropriate when a trend has been identified, and can include:

- contacting an operator or industry association for more information
- reporting the trend to the regulator (Civil Aviation Safety Authority) or to the air navigation services provider (Airservices Australia and/or Department of Defence) for further monitoring
- targeting occurrences for new ATSB investigations or research
- having ATSB investigators closely monitor new reports of similar occurrences to gather more information.

Significant trends

Infrastructure / Nav aids – High capacity air transport

The rate of occurrences reported to the ATSB involving *navigation aids* (navaid) that affected high capacity air transport operations has been consistently above average in the last two quarters.



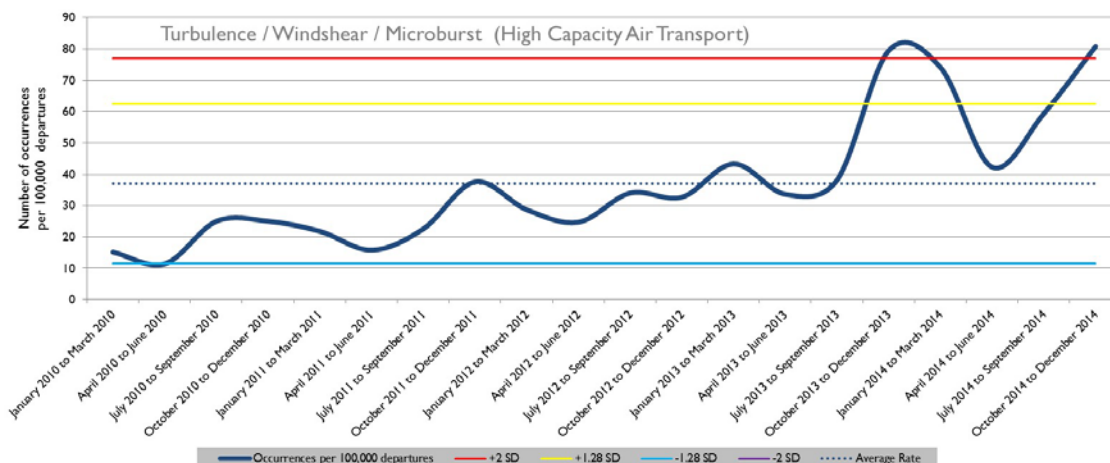
All eight of the *navaid* occurrences in high capacity operations in the last two quarters involved occurrences on approach to Sydney aerodrome. All eight also involved the same operator and aircraft type (Boeing 737). Seven of the eight occurred on approach to runways 16L and 16R, with the other on runway 07. All of the occurrences were during a GNSS Landing System (GLS) approach and describe a loss of GLS guidance on the aircraft. The GLS is an ILS replacement technology currently installed only at Sydney and previously trialled by one operator only but is now available to all GLS equipped operators. At least six of the eight GLS failures occurred in visual meteorological conditions (VMC) – in two occurrences the flight conditions were not reported. In six of the occurrences the failure was detected between 150 feet and 300 feet above ground level (AGL), one occurrence happened quite a bit higher at 1,300 feet, and in one the altitude was not reported. Although two of the occurrences resulted in an autopilot disconnect, none resulted in missed approaches, and all were classified by the ATSB as low risk occurrences with no accident outcome. None of the *navaid* occurrences between Jul- Dec were investigated by the ATSB.

The operator involved in the occurrences described above advised that the GLS system at Sydney has been in operation (Cat 1) since May 2014 and since then the option of using either the legacy (ILS) or new generation (GLS) systems has been at the discretion of the flight crew. The operator reported being aware of the GLS issues and had modified their procedures by restricting the minima to VMC and prohibiting autolands on GLS-equipped aircraft. These operational restrictions have already been communicated to Airservices Australia and other GLS users by that operator.

Airservices Australia have reported that since the commencement of GLS service in 2014 they have been closely monitoring the associated occurrences. In response to the recent upward trend in reported occurrence Airservices undertook an investigation and concluded that the evidence and analysis to date indicates radio frequency interference to the GPS signal to be the most likely cause of the occurrences. Work is also being conducted to establish a monitoring solution and enhance Airservices capability to manage future occurrences. The planned activities are currently schedule for completion by mid-August 2015.

Turbulence / Windshear / Microburst – High capacity air transport

In the second half of 2013 the rate of *turbulence / windshear / microburst* occurrences spiked to a 5-year high. Despite dipping in the first half of 2014 back to near the 5-year average, the rate has spiked again to a similar level as in Oct-Dec 2013.



In the Jul-Dec period there were 229 *turbulence / windshear / microburst* occurrences reported to the ATSB involving high capacity operation. A review of these 229 occurrences shows most involved windshear (57%), clear air turbulence (14%) or wake turbulence (7%), and involve a wide range of operators and aircraft types. A single operator was the major reporter of all *turbulence / windshear / microburst* (42% of all reports). More than half (55%) of all *turbulence / windshear / microburst* occurrences happened on approach. Aircraft overspeed (13%), runway undershoot (11%) and long landing (11%) were the most common effects of *turbulence / windshear / microburst*.

About a fifth of *turbulence / windshear / microburst* occurrences reported to the ATSB in Jul-Dec 2014 were associated with minor cabin injuries (37 in total). All but one of these were injuries to cabin crew, typically rolled ankles, twisted knees or knocks to the head. The one injury to a passenger involved a minor burn from a spilt cup of coffee.

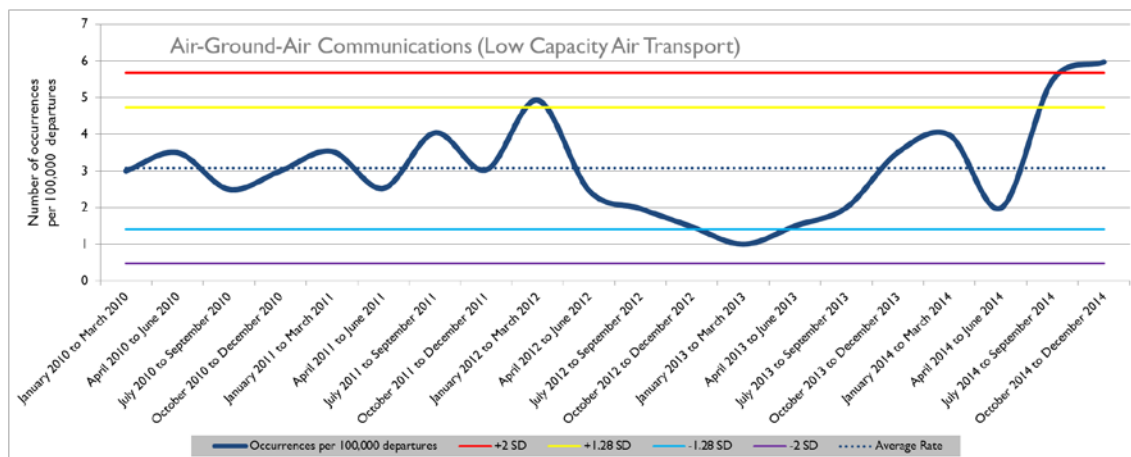
The most common location for *turbulence / windshear / microburst* occurrences in Jul-Dec 2014 continued to be at or near Sydney Airport (67 occurrences – 28% of the total reported), with Melbourne being the next most common location (14%). These occurrences were generally not focused around any particular severe weather events; the largest cluster of events (9) was in the Sydney region on November 23rd.

Analysis of the *turbulence / windshear / microburst* occurrences reported to the ATSB over the entire 5-year period indicates the occurrences at or near Sydney have shown the most significant increase. For the windshear occurrences at Sydney, three quarters were on approach, and nearly half of those were on approach to either runway 16R or 16L. The nine occurrences on 23 November at Sydney involved runways 16R or 16L.

High capacity operators should note the higher tendency for turbulence and windshear occurrences resulting in severe turbulence and/or cabin injuries into Sydney during spring, in particular, on approach to runways 16L and 16R.

Operational / Communications / Air ground Air – Low capacity air transport

While the number of occurrences is relatively small, the rate of *air-ground-air* communications issues involving low capacity air transport aircraft has been above the 5-year quarterly average in both the Jul-Sep 2014 and Oct-Dec 2014 quarters. A majority of the occurrences involved aircraft undertaking charter operations (16), while seven of the occurrences included an aircraft undertaking low capacity RPT operations.



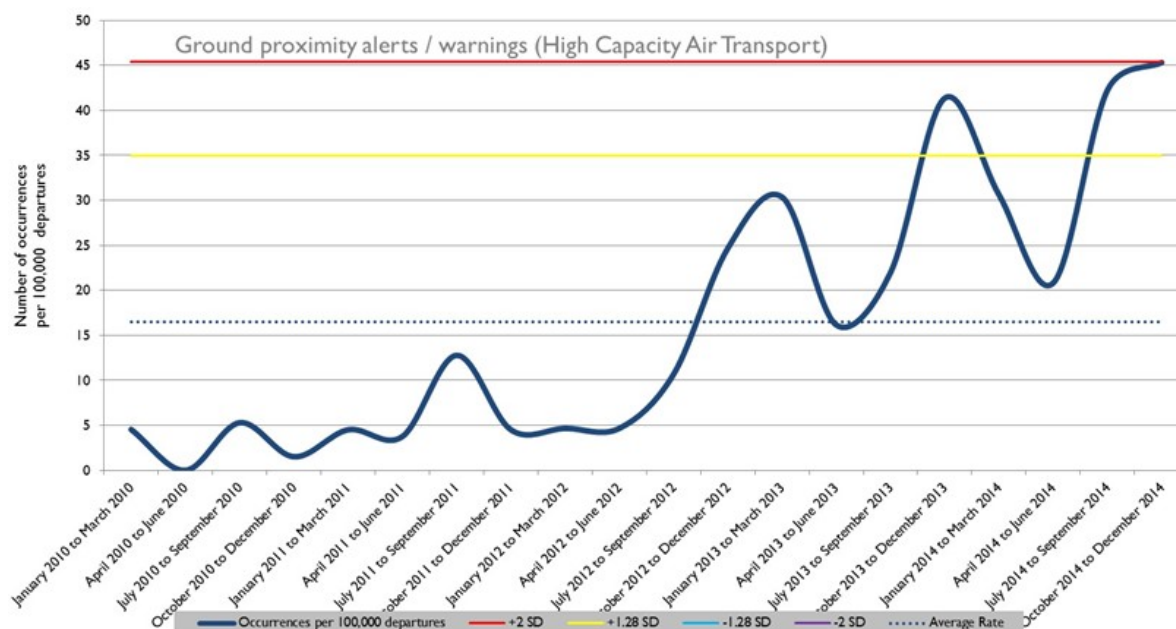
Most of the occurrences (20 out of 23) in the Jul – Dec 2014 period related to aircraft separation issues, either in the air or on the runway. Two of these occurrences related to *Near Collision* occurrences, both of which occurred within CTAF areas. One of these *Near Collision* occurrences was the subject of an ATSB investigation (AO-2014-175).

Most of the occurrences were outside controlled airspace, with only three occurrences occurring within controlled airspace. The majority (16) occurred in CTAF areas and related to pilots either transmitting on the incorrect frequency, or not monitoring/transmitting on the CTAF. Apart from the near collisions above, the other occurrences were low risk in their nature. The main pattern in the data relates to communication issues leading to aircraft separation occurrences in CTAF areas which have been the subject of multiple investigations, safety education activities and research by the ATSB over recent years.

Operations at non-controlled aerodromes is currently on the ATSB Safety Watch list, and the ATSB will start a systematic review of safety occurrences relating to operations at non-controlled aerodromes in late 2016. This trend will be monitored into the next reporting period.

Operational / Ground proximity alerts / warnings – High capacity air transport

Rates of high capacity air transport *ground proximity alerts / warnings* increased significantly in the first reporting quarter (Jul – Sep 2014), and fell very slightly in the second (Oct -Dec 2014), although the occurrence rate remained significantly higher than the 5-year average.



Between Jul – Dec 2014 there were 143 *ground proximity alerts / warnings* (GPWS) in high capacity operations. Forty-three of these occurred at Sydney, with 23 at Melbourne and 15 at Brisbane. The remaining 63 occurrences were spread over a variety of locations. Of the GPWS occurrences at Sydney, 18 occurred on approach or landing with 24 occurring on climb / initial climb. The majority of the alerts at Sydney were bank angle warnings (20), followed by windshear (14), glideslope (6), pitch (1), and landing gear not down (1). Bank angle warnings were also the most common across all locations with 64 of the 143 (45%) being bank angle warnings, with all but 3 being recorded as genuine warnings.

Overall, GPWS occurrences were most often associated with, or attributed to, an environmental factor such as windshear, a microburst, turbulence, or reports of high winds. This was the case for 65 of the 142 GPWS occurrences. Another 22 were associated with a missed approach / go-around. Most (71) were in VMC conditions, with five in IMC and another 67 unknown. Most were low risk, but the ATSB classified 44 of the GPWS occurrences between Jul – Dec 2014 as medium risk occurrences.

A review of the reporting rates by operator for the past 5 years (data not shown) showed that the rate of reporting has been consistently increasing for a number of operators, and that the reporting practices of no one particular operator can account for the recent rise. Looking at the number of GPWS occurrence per year by location, it was found that Sydney has had both the largest number of GPWS occurrences for the last 5 years as well as the highest rate of increase, tripling in the past 3 years.

High capacity aircraft movements at Sydney aerodrome have remained fairly constant of the past 5 years, increasing from slightly below 300,000 movements in 2010 to slightly above 300,000¹ in 2014. With the number of GPWS occurrences increasing and the movements relatively constant, the rate of GPWS occurrences at Sydney has increased markedly in the past 5 years.

¹ Movement data provided by Airservices Australia. High capacity movements are estimated based on the movements by weight category as provided by Airservices.

Looking specifically at the GPWS occurrences at Sydney over the past 5 years, bank angle warnings have been increasing the most significantly, making up 56 per cent (71 of 127) of all the GPWS alerts at Sydney. Three-quarters (74%) of all bank angle – GPWS warnings reported at or near Sydney occurred during the climb phase of flight. Where the departure type was reported, two-thirds of all GPWS bank angle warnings on climb occurred during a Marub Standard Instrument Departure (SID) route.

Although the median bank angle reported by departure routes were quite similar, the highest bank angle reported in the 5 year period of 45° was during a Marub departure. Despite having similar median bank angles, the median altitude at which the bank angle warnings are occurring differ considerably. During the Marub departures, the median alert altitude (where reported) was under 1,000 ft, considerably lower than the median alert altitude for other departure routes. This may be due to the requirements of the Marub departure that requires a 25° minimum right turn with a maximum airspeed of 180 knots to be undertaken at 500 ft with a climb gradient of 4.8 per cent.

The ATSB has communicated these results to Airservices Australia and the ATSB will continue to monitor this trend.

High risk occurrences not investigated

All occurrences reported to the ATSB are risk rated using the Aviation Risk Management Solutions (ARMS) Event Risk Classification (ERC) framework². The ERC methodology determines whether an occurrence could pose a low, medium, high, or very high risk to the safety of people and/or damage to the aircraft and property. The risk that is credibly posed by an occurrence is determined by answering two questions:

- ‘If this event had escalated into an accident, what would have been the most credible accident outcome?’
- ‘What was the effectiveness of the remaining barriers between this event and the most credible accident outcome?’

Most occurrences reported to the ATSB are unlikely to result in any type of accident. Those posing a high risk, even if they did not result in an accident, are usually investigated by the ATSB.

In the June-December 2014 period, the ATSB started 57 investigations into aviation occurrences, covering most high risk occurrences, accidents and serious incidents. In the same 6-month period, there were 41 high risk occurrences reported to the ATSB that were not investigated; one involving high capacity aircraft, one involving low capacity aircraft, 17 involving general aviation aircraft and 22 involving gliders and recreational aircraft.

High capacity air transport

- Loss of separation - Bali International Airport- 06-Aug-2014. Incorrect co-ordination details were passed on a foreign Airbus A330 approaching the FIR boundary. The south-bound A330 was operating at the same level as the north-bound Australian-registered Airbus A380 resulting in a loss of separation. The controller contacted the adjacent controller and instructed them to descend the A330. This occurrence was not investigated by the ATSB as it did not involve Australian air traffic control. (201405843)

Low capacity air transport

- Near collision - El Questro (ALA), 01-Jul-2014. Passing 2,500 feet on descent to El Questro, the crew of the (charter) Cessna 210 observed the second (also charter) Cessna 210 passing opposite direction in close proximity (approximately 100m). The crews of both aircraft reported not hearing any radio calls from each other. (201404991). Due to resource restraints and the limited scope for uncovering systemic safety issues, the ATSB did not investigate this occurrence.

VH-Registered general aviation

- During the cruise at FL310 offshore from Nowra, the crew of the Gates Learjet 35 heard a bang followed by depressurisation of the aircraft. The crew donned oxygen masks and conducted an emergency descent to 9,000ft. The engineering inspection did not reveal the cause of the depressurisation (201405515). The operator reported that there was no structural integrity issues associated with this occurrence and that a service difficulty report (SDR) was forwarded to CASA. As a result of these actions, the ATSB did not investigate this occurrence.
- During flying training operations south west of Tamworth, the crew of the Pacific Aerospace CT/4 observed an aircraft passing in close proximity and took avoiding action. No radio calls had been heard from the second aircraft (201408521). As this matter was being looked into by the Directorate of Defence Aviation and Air Force Safety (DDAAFS), the ATSB did not investigate this occurrence.

² The methodology is from the report The ARMS Methodology for Operational Risk Assessment in Aviation Organisations (version 4.1, March 2010). ARMS is an industry working group set up 2007 in order to develop a new and better methodology for Operational Risk Assessments. It is a non-political, non-profit working group, with a mission to produce a good risk assessment methodology for the industry. The results are freely available to the whole industry and to anyone else interested in the concept.

The ATSB did not investigate the following high risk general aviation occurrences due to resource restraints and the limited scope for uncovering systemic safety issues.

- A Robinson R22 helicopter crossed the runway while a Cessna 150 was conducting a touch-and-go landing at Ballina/Byron Bay. The 150 passed over the R22 in close proximity. The pilot of the R22 reported not hearing any radio calls from the 150. (201404944). During confined area flying training near Bringelly, the Robinson R22 lost lift and collided with terrain before rolling onto its side. The helicopter was substantially damaged (201405575). During the cruise near Inverleigh, the crew of the Bell 412 received a left rotor brake warning and conducted a precautionary landing in a field. The engineering inspection revealed no fault with the rotor system. (201406348).
- During cruise north of Gawler, the crew of the Cessna 172 observed an aircraft on a reciprocal track at the same altitude. The flight instructor took control and manoeuvred to avoid the other aircraft as it passed in close proximity. (201406617).
- During the climb after departing Cairns, the crew of the Cessna 172 manoeuvred to avoid a Robinson R44 passing in close proximity. (201406620). Due to resource restraints and the limited scope for uncovering systemic safety issues, the ATSB did not investigate this occurrence. During initial climb out of Toowoomba, the pilot of the de Havilland DH-82 lost directional control and collided with terrain on aerodrome perimeter. The aircraft was substantially damaged and the pilot received minor injuries. (201407104).
- During cruise, smoke and fumes were detected in the cockpit of the Aeromot AMT-200 and increasing heat was detected from the engine firewall. Due to the increasing heat and smoke the pilot ditched the aircraft into Lake Proserpine. The engineering inspection revealed leaking oil had ignited causing a fire in the engine bay. (201407271).
- During the landing roll at Eudamallah Station, the Pilatus PC-12 struck a bush on the side of the airstrip resulting in minor damage. (201407528).
- During circuit operations at Ballarat, the crew of the Piper PA-44 observed the Cessna 172 pass in close proximity on approach to the crossing runway. The PA-44 took avoiding action and the 172 conducted a missed approach. It was subsequently determined that the 172 was operating on the incorrect frequency. (201407587).
- While conducting search and rescue operations at 200 ft AGL, over water off North Head, Sydney, the crew of the Kawasaki BK117 observed the Piper PA-28 approaching at the same altitude and descended to ensure separation was maintained. The PA-28 passed overhead the BK117 in close proximity. (201407843).
- During a practice missed approach at Gunnedah, the crew of the Piper PA-30 observed the ASH-25M motor-glider passing in close proximity. The PA-30 crew took avoiding action and subsequently contacted the glider pilot who advised that they were operating on the Lake Keepit CTAF, not the Gunnedah CTAF. (201407853).
- The Melbourne approach air traffic controller detected an aircraft operating below the lowest safe altitude for the area at night in the vicinity of Carrum. The aircraft did not respond to numerous broadcasts on the area frequency. The aircraft was subsequently identified as a Robinson R44 when the crew contacted Moorabbin tower for a clearance. (201408520).
- Two Cessna 172s were observed on final approach to the same runway at Ballarat in close proximity. The crew of an aircraft on the ground notified both 172 crews of their close proximity to each other and the 172 that was slightly behind and above conducted a missed approach. (201408708).
- During approach to Kyneton, the engine on the Cessna 180 lost power and the aircraft landed in a paddock short of the runway. The aircraft struck an embankment resulting in substantial damage. (201409089).

- During cruise at 1,500 ft west of Jandakot, the pilot of the Eurocopter EC135 observed a fixed wing aircraft passing in close proximity and manoeuvred to regain separation. No radio calls were heard from the fixed wing aircraft. (201409750)

Gliners, amateur-built aircraft, and (non-VH-registered) recreational aircraft

There were also several high risk occurrences that involved recreational aircraft registered with a recreational aviation administration organisation (RAAO), such as Recreational Aviation Australia (RA-Aus), the Australian Sport Rotorcraft Association (ASRA), or the Hang Gliding Federation of Australia (HGFA). The ATSB is currently not resourced to investigate most (non-VH) recreational aviation accidents and sports aviation accidents involving VH-registered gliders or balloons, but ensures that in every accident the appropriate recreational aviation association is informed if they wish to conduct an independent investigation. The ATSB also uses the information from these reports to undertake trend analysis (such as in this report) and to form the basis of research and other analyses.

Australian Sports Rotorcraft Association (ASRA)

- During take-off at Delissaville airport (approximately 20 km SW of Darwin) the gyrocopter pitched up and rolled left. The pilot was unable to regain control of the gyrocopter before it impacted the runway resulting in substantial damage (201407891).
- During the take-off run at Windsor Station, near Mount Magnet WA, the gyrocopter's left tyre deflated causing the rim to dig into the dirt runway surface. The aircraft rolled left and came to rest on its side. The pilot sustained minor injuries and the gyrocopter was substantially damaged (201408001).

Hang Gliding Federation of Australia (HGFA)

- During the approach at Noosa aerodrome, the pilot of the powered trike became distracted by other traffic in the area and subsequently collided with water abeam the runway resulting in substantial damage (201407431).
- While being tow launched at Wellington aerodrome NSW, the hang glider collided with terrain and the pilot received serious injuries (201408641).
- During approach at Long Reef (just north of Dee Why NSW), the paraglider stalled, resulting in a collision with terrain. The pilot sustained serious injuries (201409601).
- While hang gliding near Bar Beach NSW, the pilot lost control of the glider and crashed into the front of a house. The pilot was fatally injured (201406450).
- While manoeuvring at 1,000 ft AGL near Bangalley Head NSW, the hang glider pilot observed a helicopter approaching at high speed. The hang glider pilot took evasive action the helicopter passed in close proximity (201408148).

Recreational Aviation Australia (RA-Aus)

- Shortly after taking off from Moruya aerodrome the Morgan Aero Works Sierra 100 collided with the water. Both occupants were fatally injured (201404908).
- While conducting sheep spotting and dam inspections on the family station property near Cobar NSW, the pilot of the Tecnam Bravo P2004 became distracted during a turn and the aircraft stalled and subsequently collided with terrain. The aircraft was substantially damaged and the pilot sustained minor injuries. (201405891).
- While conducting mustering operations near Carnarvon WA, the engine of the Jabiru J230 failed and the aircraft collided with thick scrub. The pilot sustained minor injuries and the aircraft was substantially damaged. An inspection revealed that the engine had failed due to fuel starvation (201406119).
- During take-off near Montrose QLD, the Aeroprakt A22LS Foxbat did not climb as expected. The aircraft veered left and struck an earth bank resulting in substantial damage (201407244).
- Approximately 20nm west of Calliope QLD, a Savannah aircraft collided with terrain and was destroyed by the post-impact fire. The pilot was fatally injured (201407428).

- Passing 30 ft on take-off from Goondiwindi Aerodrome, the pilot of Aeroprakt A22LS Foxbat lost directional control and the aircraft collided with the runway resulting in substantial damage (201408021).
- While landing the Aeropro Eurofox at Raywood (ALA), the aircraft bounced and the pilot lost directional control. The aircraft veered off the runway and collided with a fence resulting in substantial damage (201408242).
- During the approach into Broken Hill aerodrome, the pilot of the Aeroprakt A22LS Foxbat was distracted by sun glare and subsequently collided with terrain, resulting in substantial damage (201405427).
- During a missed approach, after a bounced landing at Sunshine Coast Airport, the Evektor SportStar stalled and collided with terrain. The pilot sustained minor injuries and the aircraft was substantially damaged. (201409567).

VH- registered amateur-built aircraft

- An amateur built Van's RV-6 collided with terrain near Mudgee Aerodrome. The two occupants were fatally injured. The investigation is continuing (201406862, AO-2014-149).
- An amateur built Rihn DR-107 One Design collided with terrain near Goolwa (ALA). The pilot was fatally injured. The investigation is continuing (201407539, AO-2014-163).
- An amateur built Van's RV-6 collided with a residential dwelling in Chelsea, Vic. and was destroyed by the post impact fire. The pilot sustained fatal injuries. The ATSB investigation into this accident is continuing (201407632, AO-2014-164).

VH- registered gliders

- During cruise, smoke and fumes were detected in the cockpit of the Aeromot AMT-200 (motorised glider) and increasing heat was detected from the engine firewall. Due to the increasing heat and smoke the pilot ditched the aircraft into Lake Proserpine. The engineering inspection revealed leaking oil had ignited causing a fire in the engine bay (201407271).
- During a practice missed approach at Gunnedah Aerodrome the crew of the Piper PA-30 observed the ASH-25M motor-glider passing in close proximity. The PA-30 crew took avoiding action and subsequently contacted the glider pilot who was operating on the Lake Keepit CTAF (201407853).
- While soaring at 4,500 feet near Caboolture (ALA), the BLANIK L-13 glider encountered sink and the pilot initiated a return to Caboolture. The pilot determined that the glider would not reach the aerodrome and elected to conduct an out landing on a levelled gravel pit. During the landing, the glider struck an embankment resulting in substantial damage (201408212).

About the ATSB

The Australian Transport Safety Bureau (ATSB) is an independent Commonwealth Government statutory agency. The ATSB 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; and 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.

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.

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.