



## Watchlist

# Technologies to track and to locate

### What is the problem?

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The operators of aircraft, ships and boats, and rail vehicles underuse currently available tracking and locating technologies.

Such technologies can reduce the risk of things going wrong, improve survival chances after an accident occurs, help ensure a lost vehicle and its occupants are found, and help us to learn what went wrong in order to improve safety.

### What is the solution?

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New Zealand's transport sector regulators could do more to encourage and, where reasonable, require the operators of air, rail, and marine vehicles to use available tracking and location technologies.

Across the air, rail, and maritime transport modes, tracking and locating technologies offer ways to improve people's chances of avoiding or surviving an accident or incident and ensuring they can be found. Transport Accident Investigation Commission inquiries in all three modes have suggested opportunities exist for New Zealanders to get greater benefit from the life-saving technologies available to them. We encourage transport regulators to educate operators of the significant safety advantages of using the most technologically advanced tracking and locating devices that are reasonable and affordable, and to regulate for this in some circumstances.

# Background

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Many technologies exist to track, monitor, and locate aircraft, ships and boats, and rail vehicles. Operators of fleets of all kinds can use information from such technologies for various purposes, including the efficient management of their fleet and providing better customer service. However, the information can also play a significant role in enhancing transport safety.

## Aviation

The aviation industry's use of tracking technologies gained international public attention with the disappearance of Malaysia Airlines flight MH370 in 2014. Since the incident, the International Civil Aviation Organisation (ICAO) has issued new standard recommended practices for the normal tracking of international commercial aircraft; it has also adopted further standards and recommendations relating to the transmission of location information from larger aeroplanes in distress.<sup>1</sup>

The Civil Aviation Authority, as New Zealand's representative on ICAO, should continue to support the international effort to improve standards and requirements for tracking and location of aircraft.



In February 2014, the Commission released the report of our inquiry into a 2011 helicopter accident in which two people died.<sup>2</sup> The helicopter was fitted with a Flight Tracking Device. Generally these devices do not alert anyone that a crash has occurred, but do provide a useful record of where an aircraft has been and its general location after an occurrence. In this instance, when the helicopter was reported overdue, search aircraft were able to be directed immediately to the general area where

the helicopter had crashed. Similarly, searches for helicopters in three other helicopter crashes the Commission has investigated were assisted by the aircraft's tracking system.<sup>3</sup>

Had there been survivors in these accidents, the information provided by the Flight Tracking Device could have proved life-saving. As a result of the inquiry into the 2011 accident, we recommended to the Civil Aviation Authority that it encourage the use of Flight Tracking Devices, especially for use in aircraft operating in remote areas around New Zealand.

Even where an aircraft is required to carry a satellite locator beacon, these do not always work following an accident.<sup>4</sup> In the helicopter accident described in the February 2014 report, the aircraft was also fitted with an Emergency Locator Transmitter. These devices are manually or automatically activated in an emergency. A second recommendation to the Civil Aviation Authority resulting from the helicopter accident was to continue to support the international work underway to improve the crash survivability of Emergency Locator Transmitters and to include GPS information in the data transmitted by such devices. A proposed change to civil aviation rules introducing "Performance Based Navigation"<sup>#</sup> will aid emergency location of some aircraft. This approach allows a flexible framework for adopting a wider range of emergency location technologies where specified objectives can be met. This is a positive step.

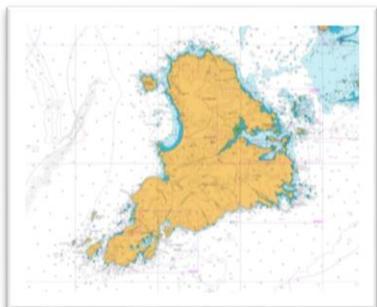
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<sup>#</sup> Performance Based Navigation is an internationally adopted term for procedures using satellite based systems. See the New Southern Sky website: <http://www.nss.govt.nz/>

Cockpit video recorders are now available, and the Commission has recommended that these be fitted to Robinson helicopters to help explain how mast bump accidents occur.<sup>5</sup>

### Maritime

Tracking and locating technologies are used in the maritime environment to assist in alerting authorities to accidents at sea. Examples are Automatic Identification Systems and Emergency Position Indicating Radio Beacons (EPIRBs). In two investigations of accidents involving fishing vessels in Foveaux Strait, we discussed how equipment to indicate the position of a vessel could improve the chances of people being noticed and rescued in the event of an emergency. In one of these accidents, in which six people died<sup>6</sup>, we found that if the boat had been equipped with locating equipment, authorities may have been able to start the search for survivors earlier. As it was, by the time search and rescue units were able to respond to the alarm, night had fallen making the search difficult and time-consuming.



In the other accident we investigated eight people died<sup>7</sup>. In our report, we commented on monitoring and tracking equipment and the cost of various options, to highlight what is available and its potential use.

These accidents illustrate the benefits technologies can offer at relatively small cost to operators. In 2013, the Government of Western Australia introduced laws requiring all skippers navigating more than two nautical miles from a coast to have an EPIRB.<sup>8</sup> The law has been introduced in response to new technology combined with the reduced cost of the devices.

### Rail

Rail operators monitor and control trains in several ways to avoid collisions and enforce speed restrictions. A 'positive train control' system integrates these various methods of control, including GPS technology to monitor the location and movement of a train, and on-board equipment to access relevant information and to stop the train if necessary.

In the United States, trains providing passenger services (and freight services involving some hazardous materials) are required by law to implement positive train control by 2018. The issue remains one of the (United States) National Transportation Safety Board's advocacy priorities.<sup>9</sup>

Implementing full positive train control requires significant investment, and may not be justified or feasible for all areas on the New Zealand rail network. Nevertheless, opportunities exist to enhance safety by using technologies that improve the visibility of rail vehicles to train controllers used together with technologies that can stop or slow vehicles without driver intervention.

In 2009, as the result of an inquiry into a track warrant overrun, the Commission recommended to the New Zealand Transport Agency that it ensures progress towards achieving positive train control.<sup>10</sup>



In 2013, we investigated an incident involving the near head-on collision between a freight train and another rail vehicle. We recommended to KiwiRail that it take all appropriate steps to ensure all rail vehicles travelling on the controlled rail network are electronically visible to train control.<sup>11</sup>

The Commission has since closed these two recommendations because, in December 2014, KiwiRail introduced a software application called 'Watchdog'. 'Watchdog' monitors the GPS

positions of trains to ensure they remain inside valid track authority limits, and alerts train control when it detects a train outside these limits. The system requires cellular coverage, which currently covers 80% of the network operating under track warrant control.

GPS tracking should ultimately cover all rail vehicles (contracted or otherwise), including ancillary and high-rail vehicles; and the New Zealand Transport Agency and KiwiRail should continue to work to integrate this improved vehicle visibility with technologies that stop vehicles or reduce their speed where necessary to avoid collisions, derailments, and other safety occurrences.

## References

<sup>1</sup> Further information can be found here:

<http://www.icao.int/safety/globaltracking/Documents/Update%20on%20GADSS%20Global%20Aircraft%20Tracking%20Initiatives.pdf>

<sup>2</sup> Transport Accident Investigation Commission *Report 11-003 In-flight break-up ZK-HMU, Robinson R22, near Mount Aspiring, 27 April 2011*

[http://www.taic.org.nz/ReportsandSafetyRecs/AviationReports/tabid/78/ctl/Detail/mid/482/InvNumber/2011-003/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicAviation%2Fskin\\_aviation](http://www.taic.org.nz/ReportsandSafetyRecs/AviationReports/tabid/78/ctl/Detail/mid/482/InvNumber/2011-003/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicAviation%2Fskin_aviation)

Open safety recommendations: 005/14 and 006/14

<sup>3</sup> Transport Accident Investigation Commission reports:

*13-003: Robinson R66, ZK-IHU Mast bump and in-flight break-up, Kaweka Range, 9 March 2013*

[http://www.taic.org.nz/ReportsandSafetyRecs/AviationReports/tabid/78/ctl/Detail/mid/482/InvNumber/2013-003/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicAviation%2Fskin\\_aviation](http://www.taic.org.nz/ReportsandSafetyRecs/AviationReports/tabid/78/ctl/Detail/mid/482/InvNumber/2013-003/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicAviation%2Fskin_aviation)

A news article about this accident can be found here:

<http://www.stuff.co.nz/national/10606147/Miracle-helps-find-crash-site>

*15-002: Mast bump and in-flight break-up, Robinson R44, ZK-IPY Lochy River, near Queenstown, 19 February 2015*

[http://www.taic.org.nz/ReportsandSafetyRecs/AviationReports/tabid/78/ctl/Detail/mid/482/InvNumber/2015-002/Page/0/language/en-NZ/Default.aspx?SkinSrc=\[G\]skins%2ftaicAviation%2fskin\\_aviation](http://www.taic.org.nz/ReportsandSafetyRecs/AviationReports/tabid/78/ctl/Detail/mid/482/InvNumber/2015-002/Page/0/language/en-NZ/Default.aspx?SkinSrc=[G]skins%2ftaicAviation%2fskin_aviation)

Transport Accident Investigation Commission open inquiry into a helicopter crash in Kahurangi National Park in October 2014 (inquiry number 14-006).

<sup>4</sup> A review by the Australian Transport Safety Board (ATSB) found that 'emergency locator beacons function as intended in about 40 to 60 percent of accidents in which their activation was expected'. For the full review, see the ATSB's website: <https://www.atsb.gov.au/publications/2012/ar-2012-128/>

<sup>5</sup> Transport Accident Investigation Commission *Report 2015-002: Mast bump and in-flight break-up, Robinson R44, ZK-IPY, Lochy River, near Queenstown, 19 February 2015*

[http://www.taic.org.nz/ReportsandSafetyRecs/AviationReports/tabid/78/ctl/Detail/mid/482/InvNumber/2015-002/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicAviation%2Fskin\\_aviation](http://www.taic.org.nz/ReportsandSafetyRecs/AviationReports/tabid/78/ctl/Detail/mid/482/InvNumber/2015-002/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicAviation%2Fskin_aviation)

Open safety recommendation 014/16

<sup>6</sup> Transport Accident Investigation Commission *Report 06-204: Fishing vessel "Kotuku", capsized, Foveaux Strait, 13 May 2006*

[http://www.taic.org.nz/ReportsandSafetyRecs/MarineReports/tabid/87/ctl/Detail/mid/484/InvNumber/2006-204/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicMarine%2Fskin\\_marine](http://www.taic.org.nz/ReportsandSafetyRecs/MarineReports/tabid/87/ctl/Detail/mid/484/InvNumber/2006-204/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicMarine%2Fskin_marine)

<sup>7</sup> Transport Accident Investigation Commission *Report 12-201: Fishing vessel "Easy Rider", capsize and foundering, Foveaux Strait, 15 March 2012*

[http://www.taic.org.nz/ReportsandSafetyRecs/MarineReports/tabid/87/ctl/Detail/mid/484/InvNumber/2012-201/Page/0/language/en-NZ/Default.aspx?SkinSrc=\[G\]skins%2ftaicMarine%2fskin\\_marine](http://www.taic.org.nz/ReportsandSafetyRecs/MarineReports/tabid/87/ctl/Detail/mid/484/InvNumber/2012-201/Page/0/language/en-NZ/Default.aspx?SkinSrc=[G]skins%2ftaicMarine%2fskin_marine)

<sup>8</sup> Information on Western Australia's introduction of laws relating to Emergency Position Indicating Radio Beacons is here on the Department of Transport website:

[http://www.transport.wa.gov.au/mediaFiles/about-us/MAR\\_P\\_2013\\_09\\_23\\_EPIRB\\_exempt\\_zone\\_revoked\\_ms.pdf](http://www.transport.wa.gov.au/mediaFiles/about-us/MAR_P_2013_09_23_EPIRB_exempt_zone_revoked_ms.pdf)

<sup>9</sup> The National Transportation Safety Board's advocacy for positive train control can be found here on its website:

<http://www.nts.gov/safety/mwl/Pages/mwl7-2016.aspx>

<sup>10</sup> Transport Accident Investigation Commission Report 07-108: Express freight Train 720, track warrant overrun at Seddon, Main North Line, 12 May 2007  
[http://www.taic.org.nz/ReportsandSafetyRecs/RailReports/tabid/85/ctl/Detail/mid/483/InvNumber/2007-108/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicRail%2Fskin\\_rail](http://www.taic.org.nz/ReportsandSafetyRecs/RailReports/tabid/85/ctl/Detail/mid/483/InvNumber/2007-108/language/en-US/Default.aspx?SkinSrc=%5BG%5Dskins%2FtaicRail%2Fskin_rail)  
Closed safety recommendation 005/09

<sup>11</sup> Transport Accident Investigation Commission Report 11-102: Track occupation irregularity leading to near head-on collision, Staircase-Craigieburn, 13 April 2011  
<http://www.taic.org.nz/LinkClick.aspx?fileticket=evczSOCjaGA%3D&tabid=36&mid=613&language=en-US>  
Closed safety recommendation 016/13

## Version history

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This Watchlist item was first published January 2015 and then updated in October 2016.

Updated content: new ICAO standards and recommendations for tracking and location of aircraft; proposed CAA rule changes referenced; date for implementation of positive train control in the US extended from 2015 to 2018; new aviation inquiries referenced; ATSB research report referenced; rail safety recommendations closed.

Update consulted with: Ministry of Transport, New Zealand Civil Aviation Authority, New Zealand Transport Agency, Maritime New Zealand.

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*Te Komihana Tirotiro Aitua Waka*  
**Transport Accident Investigation Commission**  
[www.taic.org.nz](http://www.taic.org.nz)



The Transport Accident Investigation Commission is an independent Crown entity established to determine the circumstances and causes of accidents and incidents with a view to avoiding similar occurrences in the future.