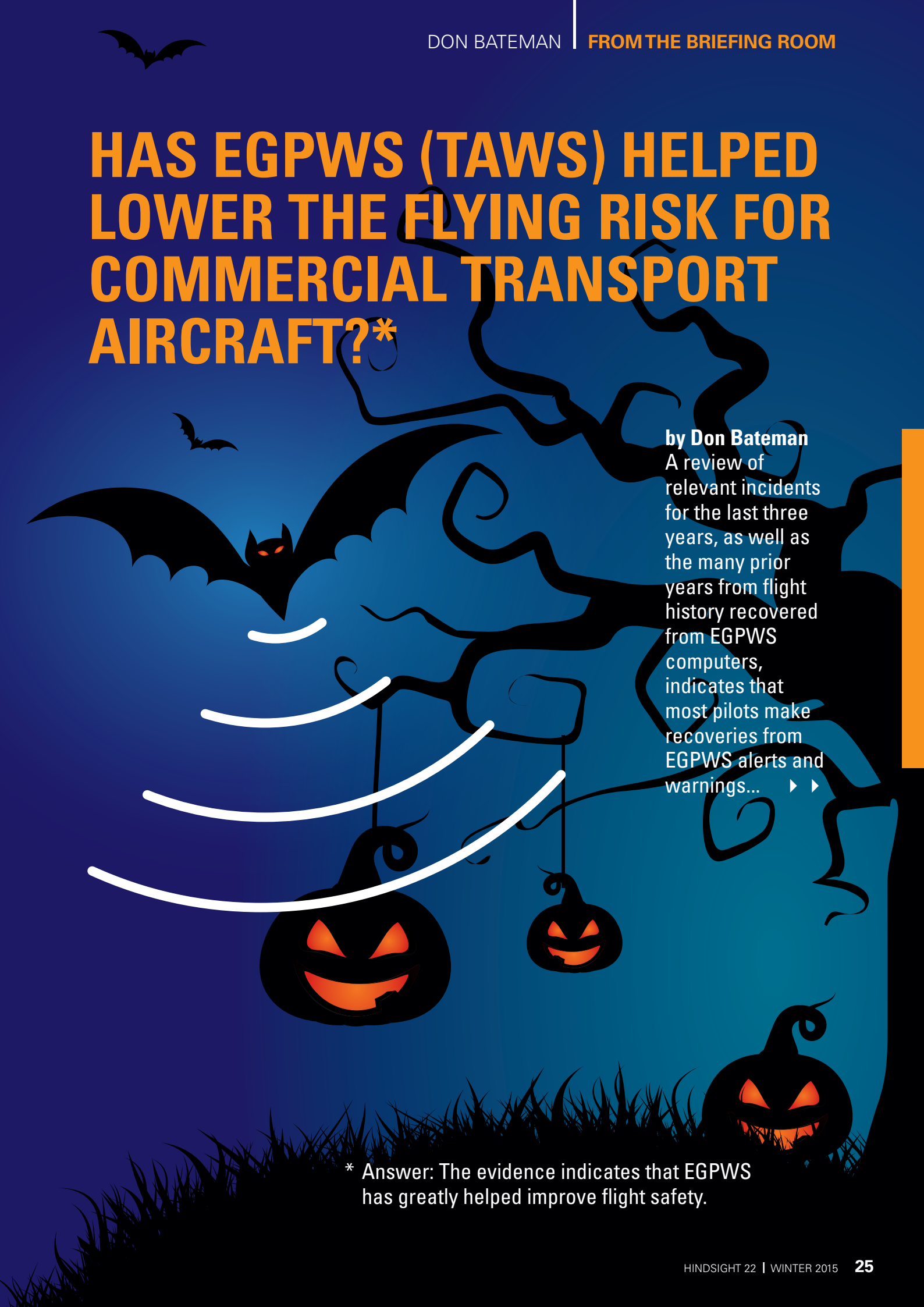
HAS EGPWS (TAWS) HELPED LOWER THE FLYING RISK FOR COMMERCIAL TRANSPORT AIRCRAFT?*



by Don Bateman

A review of relevant incidents for the last three years, as well as the many prior years from flight history recovered from EGPWS computers, indicates that most pilots make recoveries from EGPWS alerts and warnings...

* Answer: The evidence indicates that EGPWS has greatly helped improve flight safety.

Western-built jet transport hull losses have progressively dropped to all time low since the introduction of EGPWS 18 years ago – see Figure 1 which shows the hull loss risk has been reduced by about 2-1/2 times over the last 20 years!

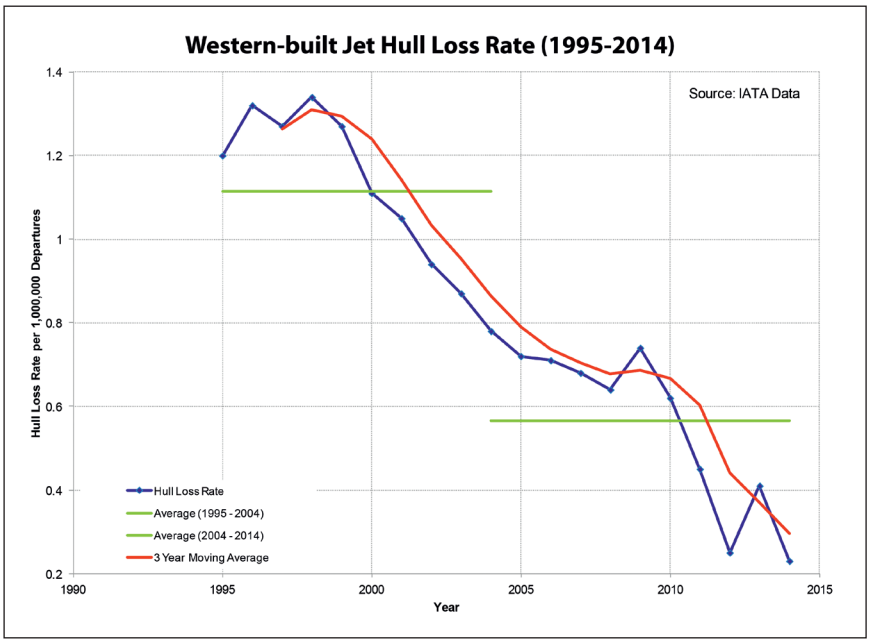


Figure 1 - The declining hull loss rate (IATA Safety Reports 1997-2015)

1. Many examples of positive outcomes have occurred during the years after EGPWS began to be installed in the year 1997. EGPWS is not a panacea for stopping CFIT accidents but it can help interrupt a flight path which is likely to lead to an accident. EGPWS can help provide a "wake up" advisory or a warning.

2. Timely EGPWS activation seems to have helped alert the pilot for flight paths likely to end short of the runway. See Figure 2 which shows that the many EGPWS alerts which occur for Non Precision or Visual Approaches are mostly near Minimum Descent Altitude. Most are unreported when so near to the runway and an EGPWS aural alert seems to result in a very quick recovery response from most pilots.

3. The several software enhancements made starting in 2003 began with a recommendation to use a GPS position feed direct to the EGPWS. IATA recommendations were then made every year to upgrade both the terrain, runway and obstacle databases and software and to support the use of GPS position input. The use of GPS has also helped make EGPWS independent of barometric errors.

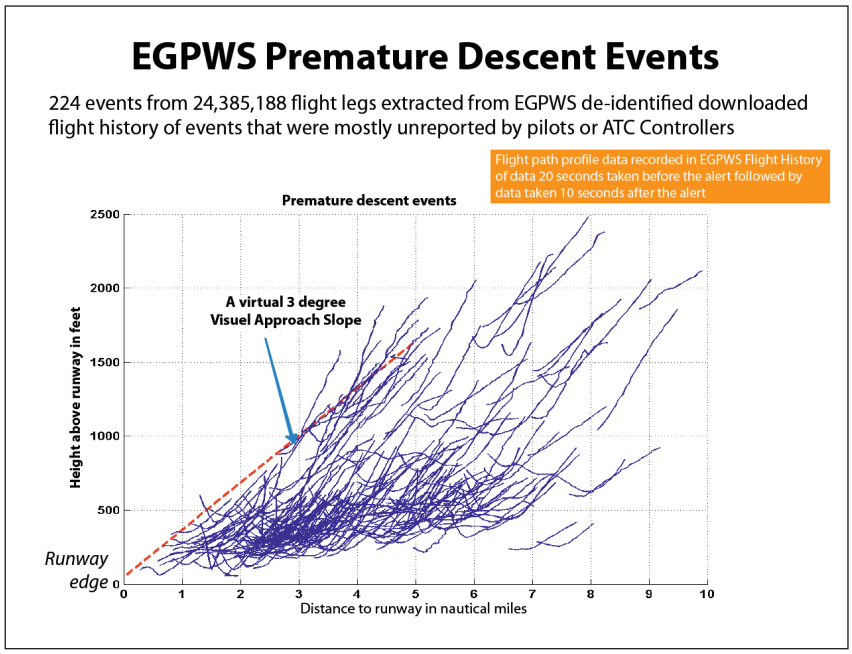


Figure 2 The association of EGWS activations with premature descent [reproduced from Yasuo Ishihara "Continuing trend of landing short/premature descent incidents - ways to reduce risk" presented at the FSF IASS in Abu Dhabi UAE in 2014]

Some official investigation reports of incidents to aircraft fitted with EGPWS during the last three years

To help reduce the risk of Controlled Flight into Terrain (CFIT), EGPWS began to be fitted to aircraft in 1997 (CFIT). 18 years later, a combined total of more than 55,000 Commercial Jet, Turbo-Prop, Business, and Military Transport aircraft are fitted with EGPWS. ICAO Standards require a Class 'A'[1] TAWS should be installed in all turbine-engined aircraft engaged in commercial air transport with an MTOM> 5700kg or more than 9 passenger seats and this requirement also applies to General Aviation aircraft in the same category first registered after 2010.

However, many pilots still hesitate to report a CFIT-risk incident unless a Controller or a passenger or the pilot's airline reports or complains of the incident even though many such incidents are reported in accordance with regulatory requirements.

Honeywell engineers often help airlines investigate some incidents.

1- An important difference between a Class A and Class B TAWS is the requirement for a terrain mapping facility and more effective terrain risk detection and annunciation in the former.

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This work is always considered Confidential to the Airline and will not be shared with others. Honeywell will also assist an official accident/incident investigation if requested and if Honeywell equipment is involved.
Here are a few CFIT risk events from the last three years for which Official Reports on independent investigations have been published:

1. On May 15, 2013, the pilots of an ATR 72 on approach to Moranbah, Australia were trying to avoid cloud while descending visually when, the aircraft inadvertently entered into a high rate of descent near the ground which generated multiple EGPWS warnings. A safe recovery was made with no injuries[2].

2. On December 15, 2014 the crew of a SAAB 2000 near Sumburgh, UK lost control of the aircraft after failing to recognise that the autopilot was still engaged after a lightning strike but recovered from a high rate of descent towards the sea surface after EGPWS warnings occurred.[3]

3. On March 31, 2014 the crew of an A320 making an approach to runway 14 at Coolangata, Australia incorrectly set their altimeters during a visual reference approach and continued in VMC until an EGPWS Alert prompted a go around from 159 feet agl.[4]

4. On March 8, 2013 an A330-200 descended to within 600 feet of the terrain at 9 nm from the runway and off the extended centreline of runway 16 at Melbourne, Australia during a visual reference approach. EGPWS Terrain alerts were followed almost immediately by a Pull Up Warning and this was actioned.[5]

5. On April 11, 2012 an A320 descended to 950 feet agl at 11 nm from the runway during a night ILS approach to runway 36 at Lyons Saint- Exupéry Airport, France with no external visual references. An EGPWS Pull Up Warning occurred and eventually, the approach was discontinued.[6]

6. On March 24, 2012 an A-319 descended at high speed towards runway 19 at Tunis in VMC from above the ILS glideslope and after capturing it less than 3 nm from the runway at 220 knots, EGPWS Pull Up and Too Low Terrain Warnings prompted the crew to get clearance for and carry out a 400 feet agl orbit on short final.[7]

Loading CityMaps in EGPWS is a great idea! Now I think it's safe to take a shortcut on approach.....

2- see: http://www.skybrary.aero/index.php/AT76,_vicinity_Moranbah_Queensland_Australia,_2013_(CFIT_HF)
3- see: http://www.skybrary.aero/index.php/SB20,_vicinity_Sumburgh,_UK_2014_(LOC_HF_WX)
4- see: http://www.atsb.gov.au/media/4905339/ao-2014-065_final.pdf
5- see: http://www.skybrary.aero/index.php/A332,_vicinity_Melbourne_Australia,_2013_(CFIT_HF)
6- see: http://www.skybrary.aero/index.php/A320,_vicinity_Lyons_Saint-Exup%C3%A9ry_France,_2012_(CFIT_HF_AGC)
7- see: http://www.skybrary.aero/index.php/A319,_vicinity_Tunis_Tunisia,_2012_(LOC_HF)

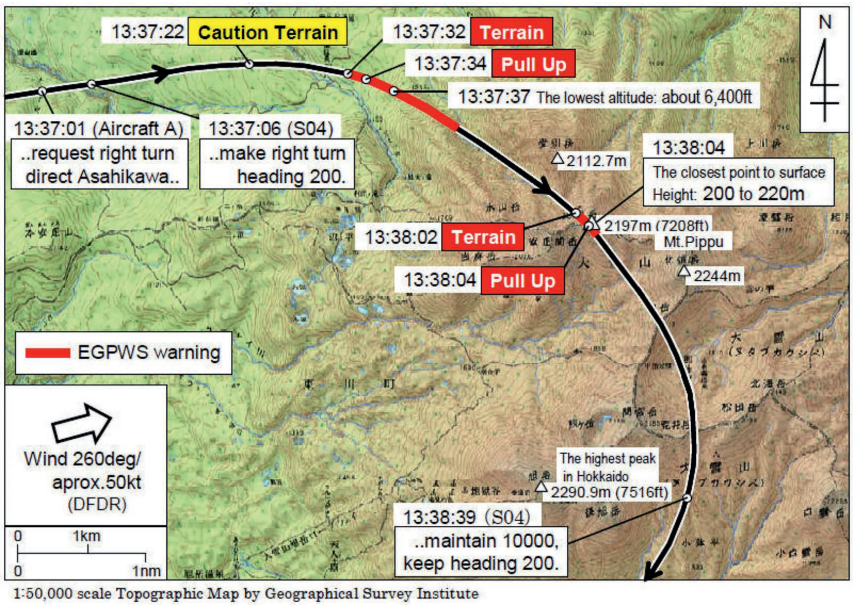
There are many other Official Investigation Reports about incidents before 2012 which also had positive outcomes because of EGPWS. One notable example was on October 26, 2010 when the crew of a B737-800 lost positional awareness in relation to terrain during an initial descent to Asahikawa, Japan.[8] The aircraft was following ATC radar vectors and was below MVA and approaching mountainous terrain approximately 16 nm east of the airport during daylight, but in IMC. Two EGPWS Pull Up Warnings were received and acted on and the aircraft passed within 655 feet of a 7208ft high summit - see Figure 3 which is from the Official investigation Report.

Despite these successes, however, negative outcomes still occur to aircraft fitted with EGPWS:

1. On 14 August, 2013, an A300-600 cargo aircraft on a LOC approach to runway 18 at Birmingham, Alabama, USA, descended into terrain short of the runway in IMC at night. The pilots received EGPWS Alerts just before impact but the aircraft was not fitted with the latest recommended software enhancements which would have led to slightly earlier EGPWS activation.

2. On May 9, 2012, a brand new Su95 was on a demonstration flight when it flew into a mountain near Jakarta, Indonesia after the pilot, unaware of the local terrain, ignored 38 seconds of EGPWS Alerts and Warnings in IMC and switched the equipment off, believing that there was a database error. The terrain mapping feature had been demonstrated earlier in the flight but then switched off.

3. On July 28, 2010, an A321 flew into terrain whilst descending at 3000 fpm after loosing visual contact with the aerodrome on the downwind leg of a circling approach to runway 12 at Islamabad, Pakistan. Impact was preceded by EGPWS Cautions and Warnings lasting over a minute on which no action was taken.



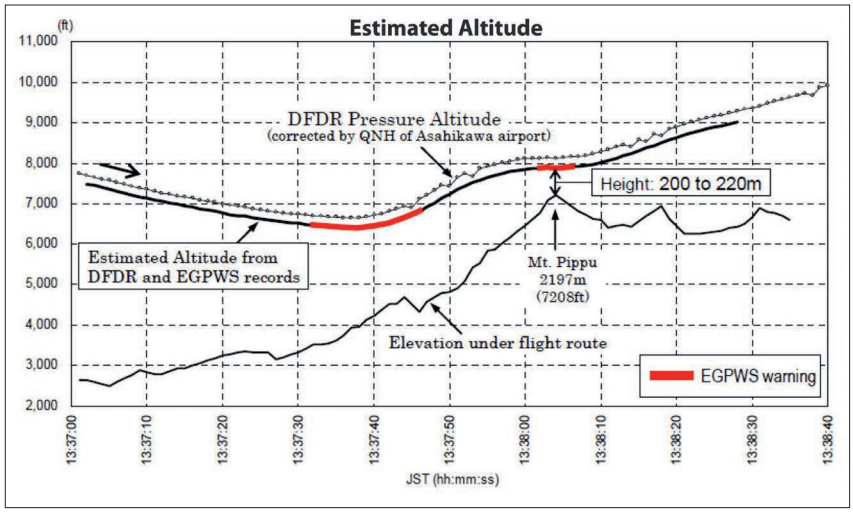


Figure 3 - The Boeing 737-800 Incident Asahikawa, Japan [reproduced from the Official Investigation Report]

4. On 10 April, 2010, a Tu-154 continued descent below the applicable non-precision approach minima at Smolensk, Russia in thick fog and crashed short of the runway and off the extended centreline after the crew ignored 18 seconds of EGPWS warnings culminating in 12 seconds of continuous Pull Up Warnings.

In all these accidents, the crew either significantly violated standard operating procedures before EGPWS Pull Up Warnings began and/or ignored them when they did occur. In three out of the four cases, had the crew responded to the warnings as trained when they began, these accidents would not have occurred.

Reference

Yasuo Ishihara "Reviewing worldwide EGPWS alert statistics -further reducing the risk of a CFIT" presented at the FSF IASS 2012 in Santiago, Chile

8- see: http://www.skybrary.aero/index.php/B738,_En_route,_east_of_Asahikawa_Japan,_2010_(CFIT_HF)
9- see: http://www.skybrary.aero/index.php/A306,_vicinity_Birmingham_AL_USA,_2013_(CFIT_HF_FIRE)
10- see: http://www.skybrary.aero/index.php/SU95,_manoeuvring_near_Jakarta_Indonesia,_2012_(CFIT_HF_FIRE)
11- see: http://www.skybrary.aero/index.php/A321,_vicinity_Islamabad_Pakistan,_2010_(CFIT_HF_FIRE)
12- see: http://www.skybrary.aero/index.php/T154,_vicinity_Smolensk_Russian_Federation,_2010_(CFIT_HF_WX_FIRE)