



“Terrain, Terrain Pull-up!”

Air Carrier Controlled Flight Toward Terrain Incidents Reported to the NASA ASRS

InfoShare – Flight Operations

Seattle, WA

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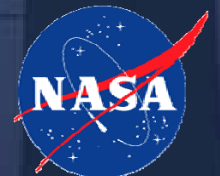
Linda Conner

Program Director, NASA ASRS

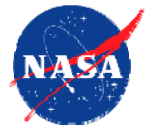
March 2014

Seattle, WA

**AVIATION SAFETY
REPORTING SYSTEM**



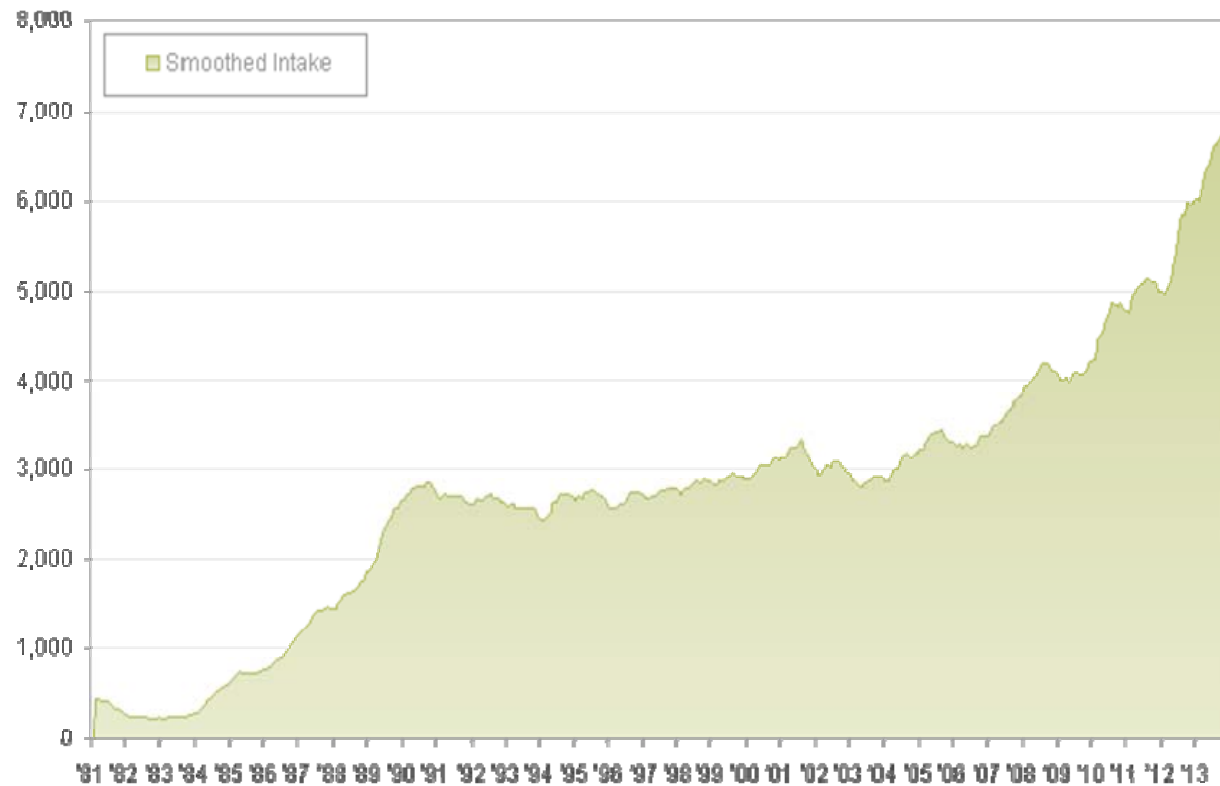
ASRS Reporting



ASRS Report Volume Profile

- 37 years of confidential safety reporting
- Over 1,150,000 reports received
- Over 5,800 alert messages issued
- Over 6,700 reports per month, or 323 per working day
- Total intake for 2013 was 80,840 reports
- Current estimate for 2014 is over 90,000

Monthly Intake
January 1981 – December 2013



ASAP Reporting to ASRS

- **Overall ASAP Intake**

- 181 Total Programs
- 76 Air Carriers

- **Reporting Groups**

- 74 Pilot
- 44 Mechanic
- 39 Dispatch
- 19 Flight Attendant
- 5 Ground Crew

- **Secure Electronic Data connection protocols between airline and ASRS**

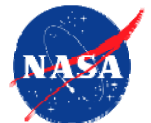
- 179 Programs
- 75 Airlines

ASRS Electronic Transmission Methodology compatible with numerous software platforms

More airline programs being added continuously



26% of all reports are matched to unique events in 2013

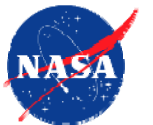


ASRS continues to receive reports describing autoflight issues resulting in a Low Altitude condition, often accompanied by a GPWS warning or ATC alert



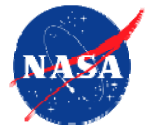
Examples of Reports

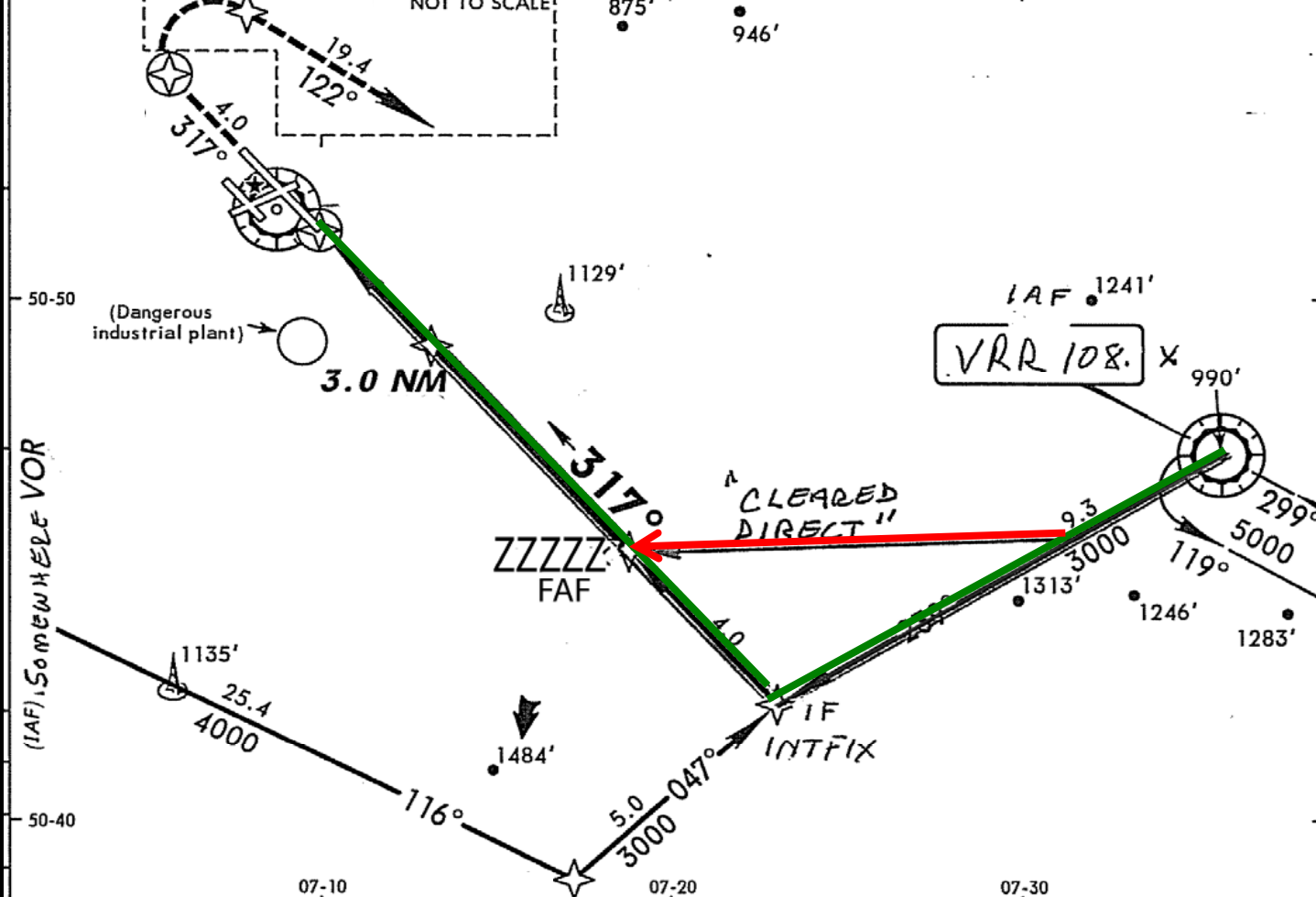
- Line Selectable Modification Issues
- Company Approach Procedures
- Automation and Controlled Flight Toward Terrain (CFTT)



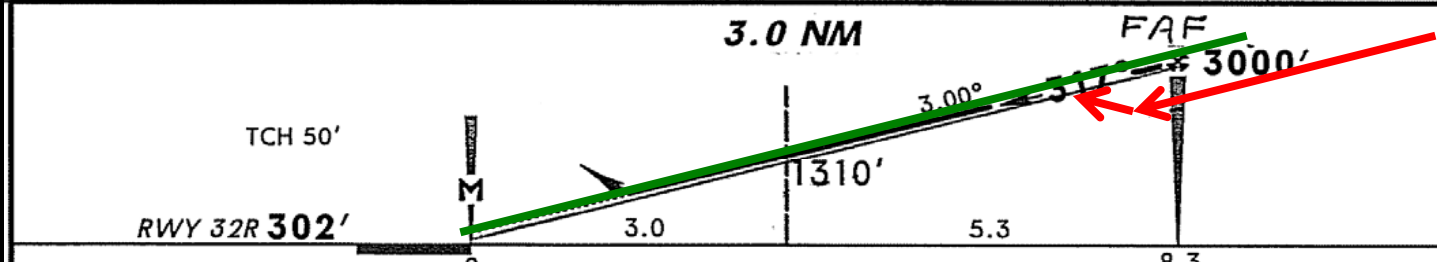
Line Selectable Modification

- An MD-11 flight crew, cleared to fly an RNAV approach, modified the line selectable procedure when cleared direct from their transition route to the FAF
- The crossing restriction at the FAF was thereby deleted and the aircraft descended directly toward the set DA per SOP
- Tower transmitted a low altitude alert and the flight returned to the published approach





	07-10	07-20	07-30				
DIST to RW32R	2.0	3.0	4.0	5.0	6.0	7.0	8.0
ALTITUDE	990'	1310'	1630'	1950'	2270'	2590'	2900'



Gnd speed-Kts	70	90	100	120	140	160		
Descent Angle	3.00°	372	478	531	637	743	849	
MAP at RW32R								

Standard **LNNAV/VNAV** STRAIGHT-IN LANDING RWY **LNNAV**

DA(H) 780' (478') **DA(H) 780' (478')**

This graphic is for illustrative purposes only and not to be used for any other purpose

ALS out

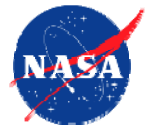
Company Approach Procedures

Lateral, Altitude, Vertical, Speed Intervention

- An air carrier crew was cleared for approach at or above 6,100 FT. Passing the IAF, they set field elevation in the altitude window as called for in the LAV procedure
- In VNAV Path mode, approaching the FAF, the Pilot Monitoring (PM) pointed out towers and told the Pilot Flying (PF) that they need to climb
- Shortly thereafter, they received a GPWS call for “Obstacle” and the PF initiated a more aggressive climb



(ACN 1107021)



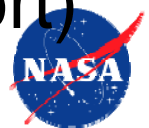
Company Approach Procedures

Lateral, Altitude, Vertical, Speed Intervention

- B737NG crew, descending in Level Change, accomplished a LAVS procedure. VNAV would not engage since they were below the G/S intercept altitude. Crew descended to 400 FT AGL outside of the FAF before a low altitude alert was issued by ATC
 - “Approaching the FAF something didn't feel right and I started re-checking/cross-checking the MCP when the ‘Low Altitude’ alert was issued by ATC.” (Flight Crew Report)
 - “By my estimate, this aircraft was 4 radar hits (22 seconds) from hitting the ground.” (ATC Report)



(ACN 1110487)

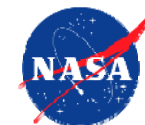


Automation and Controlled Flight Toward Terrain

- A B737NG crew, distracted by wind speed concerns, identified the loss of VNAV mode inside the FAF
- At the DA, seeing only trees, the Captain called for a Missed Approach, but the aircraft continued to sink as power was applied
- “I thought we were critically close to the trees and within seconds of contacting them.... Passengers were commenting on how close the trees were.”



(ACN 1109907)

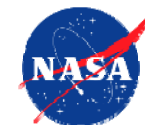


Automation and Controlled Flight Toward Terrain

- A B747-400 was vectored inside a RNAV initial approach waypoint which the PM put on top of the final approach waypoint; thus removing the waypoint from the approach
- Inside of initial waypoint at 2,200 FT in VNAV, the crew set minimums 1,100 FT in MCP panel
- “VPI started to come down; aircraft followed VPI. We saw it was going below the VASI about the same time the Tower gave us a low altitude alert.”



(ACN 1053959)



Automation and Controlled Flight Toward Terrain

- Cleared for the ILS while descending through 3,500 FT with the MCP set at 3,000 FT, PM reset the MCP altitude to 800 FT
- “We were well below the G/S with it coming down to us, but the problem was [we were] still in LVL CHG and following the FD down to 800 FT.”
- “Later, we discussed the pitfall of following the FD in LVL CHG right into the ground.”



(ACN 1119793)

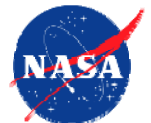


Automation and Controlled Flight Toward Terrain

- While at 5,000 FT on vectors to intercept the final approach course
 - “...the PF performed the LAVS procedure; but instead of pressing the VNAV button after selecting the MDA of 2,100 FT on the MCP, he accidentally pressed the FLCH button.”
- As a result, the airplane started an immediate descent before the final approach fix.”



(ACN 1118712)

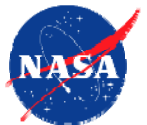


Automation and Controlled Flight Toward Terrain

- PF and PM confirmed that the 4,100 foot restriction was in the MCDU, so the PF switched to FLCH to expedite descent
- When cleared for the ILS, PF put 2,500 in the MCP
- Just prior to FAF, they noticed the aircraft descending through 4,100



(ACN 1130621)



Contributing Factors

- Workload, confusion, situational awareness, distractions and fatigue are some factors found in many of these reports and may have contributed to autoflight related issues
- Company SOPs have also been cited in several reports

Automation and Controlled Flight Toward Terrain

- CFTTT Data set information
 - <http://asrs.arc.nasa.gov/search/reportsets.html>

ASRS Report Sets - Aviation Safety Reporting System - Windows Internet Explorer

http://asrs.arc.nasa.gov/search/reportsets.html

ASRS DATABASE REPORT SETS

Following are thirty (30) ASRS Database Report Sets on topics of interest to the aviation community. Within each Report Set is the date the document was updated. Each file (Report Set) is in Adobe's Portable Document Format (PDF), version 5.0.

Each Report Set consists of fifty (50) ASRS Database records, preceded by a note of introduction and caveats on use of ASRS data. All Report Sets have been pre-screened to assure their relevance to the pre-selected topic description. New topics will be added and outdated topics removed in response to input from the ASRS user community and analysis of web site usage.

Click on the Report Sets link to download or view the high quality PDF

Comments?

Your comments on the usefulness of the ASRS Database Report Sets appreciated, and may be submitted using the contact form on the [Contact Us](#) page. Please select "ASRS Database Report Sets" as your topic.

Quick Links

- ASRS Database Online
- ASRS Database Report Sets
- Requesting ASRS Data

Controlled Flight Toward Terrain
A sampling of reports referencing inadvertent controlled flight towards terrain.

Commuter and Corporate Flight Crew Fatigue Reports
A sampling of reports referencing Commuter and Corporate flight crew fatigue issues and duty periods.

Commuter and GA Icing Incidents
A sampling of aircraft icing encounter reports from GA and Commuter flight crews.

CRM Issues
Crew Resource Management (CRM) inflight situations

Air Carrier (FAR 121) Flight Crew Fatigue Reports
A sampling of reports involving air carrier (FAR 121) flight crew fatigue.

Altitude Deviations
A sampling of altitude deviation reports.

Air Traffic Controller Reports
A variety of reports from ATC Controllers.

Bird or Animal Strike Reports
A sampling of reports referencing a bird or animal strike incident.

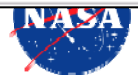
Cabin Smoke, Fire, Fumes, or Odor Incidents
A sampling of air carrier reports concerning cabin smoke, fire, fumes or odor related events.

Checklist Incidents
A sampling of reports from all aviation arenas referencing checklist issues (design, procedures, distraction, etc.).

Commuter and Corporate Flight Crew Fatigue Reports
A sampling of reports referencing Commuter and Corporate flight crew fatigue issues and duty periods.

Commuter and GA Icing Incidents
A sampling of aircraft icing encounter reports from GA and Commuter flight crews.

CRM Issues
Crew Resource Management (CRM) inflight situations



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