Loss of Control – Is This Really a Big Deal?

Single Pilot Safety Standdown
NBAA Annual Conv., Las Vegas
November 16, 2015

Earl F. Weener, Ph.D.
Member, NTSB
N6529R - B36TC Bonanza
The NTSB is an independent US federal agency charged with determining the probable cause(s) of transportation accidents, making recommendations to prevent their recurrence, conducting special studies and investigations, and coordinating resources to assist victims and their families after an accident.
Topics

• General Aviation Accident Trends
• Most Wanted List – Loss of Control
• Loss of Control – In-Flight Breakup
• Loss of Control – Stall/Spin
All GA Accidents

Number of accidents

- Non-Fatal
- Fatal Accidents

<table>
<thead>
<tr>
<th>Year</th>
<th>Non-Fatal</th>
<th>Fatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1492</td>
<td>345</td>
</tr>
<tr>
<td>2001</td>
<td>1402</td>
<td>325</td>
</tr>
<tr>
<td>2002</td>
<td>1371</td>
<td>345</td>
</tr>
<tr>
<td>2003</td>
<td>1389</td>
<td>352</td>
</tr>
<tr>
<td>2004</td>
<td>1305</td>
<td>314</td>
</tr>
<tr>
<td>2005</td>
<td>1350</td>
<td>321</td>
</tr>
<tr>
<td>2006</td>
<td>1215</td>
<td>308</td>
</tr>
<tr>
<td>2007</td>
<td>1366</td>
<td>288</td>
</tr>
<tr>
<td>2008</td>
<td>1292</td>
<td>277</td>
</tr>
<tr>
<td>2009</td>
<td>1275</td>
<td>275</td>
</tr>
<tr>
<td>2010</td>
<td>1271</td>
<td>271</td>
</tr>
<tr>
<td>2011</td>
<td>1268</td>
<td>268</td>
</tr>
<tr>
<td>2012</td>
<td>1273</td>
<td>273</td>
</tr>
<tr>
<td>2013</td>
<td>1221</td>
<td>221</td>
</tr>
<tr>
<td>2014</td>
<td>1253</td>
<td>253</td>
</tr>
</tbody>
</table>
GA Accident-involved Fatalities

Total Fatalities

GA Accident Rates

Accidents per 100k Flight Hours

Fatal
Total

*The 2011 GA Survey is currently not available. FAA is actively engaged in re-calibration efforts and expect to have validated 2011 data published at a later date.
Accident Rates per 100k Flight Hours

The 2011 GA Survey is currently not available. FAA is actively engaged in re-calibration efforts and expect to have validated 2011 data published at a later date.
Fatal Accident Rates per 100k Flight Hours

*The 2011 GA Survey is currently not available. FAA is actively engaged in re-calibration efforts and expect to have validated 2011 data published at a later date.
## Defining Events – Part 91 Ops

<table>
<thead>
<tr>
<th>Business</th>
<th>Instruction</th>
<th>Personal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Loss of Control</td>
<td>1. Loss of Control</td>
<td>1. Loss of Control</td>
</tr>
<tr>
<td>2. CFIT</td>
<td>2. Midair</td>
<td>2. Powerplant Fail</td>
</tr>
<tr>
<td>4. Component Fail</td>
<td>4. CFIT</td>
<td>4. Other</td>
</tr>
<tr>
<td>5. Powerplant Fail</td>
<td>5. Other</td>
<td>5. Component Fail</td>
</tr>
</tbody>
</table>
2015 MWL – Loss of Control

• *Prevent Loss of Control in Flight in General Aviation*
  
• More than 40% of fatal GA accidents were LOC during 2004 – 2014

• Most deadly flight phases
  – Approach to landing
  – Maneuvering
  – Climb
Business Flying, 2008-2014

Number of Fatal Accidents

- Loss of Control In-Flight: 18
- Controlled Flight Into Terrain: 11
- Fuel Related: 5
- System/Component Failure - Non-powerplant: 4
- System/Component Failure - Powerplant: 4
- Unknown: 2
- Ground Handling: 1
- Turbulence Encounter: 1
- Windshear/Thunderstorm: 1
### Number of Fatal Accidents

<table>
<thead>
<tr>
<th></th>
<th>Number of Accidents</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Control In-Flight</td>
<td>10</td>
</tr>
<tr>
<td>Midair</td>
<td></td>
</tr>
<tr>
<td>System/Component Failure-Powerplant</td>
<td>8</td>
</tr>
<tr>
<td>Controlled Flight Into Terrain</td>
<td>7</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
</tr>
<tr>
<td>Abrupt Maneuver</td>
<td>4</td>
</tr>
<tr>
<td>Low Altitude Operation</td>
<td>4</td>
</tr>
<tr>
<td>Collision on Takeoff or Landing</td>
<td>3</td>
</tr>
<tr>
<td>Unknown</td>
<td>3</td>
</tr>
<tr>
<td>Abnormal Runway Contact</td>
<td>2</td>
</tr>
<tr>
<td>Ground Handling</td>
<td>2</td>
</tr>
<tr>
<td>Loss of control on Ground</td>
<td>2</td>
</tr>
<tr>
<td>Fuel Related</td>
<td>1</td>
</tr>
<tr>
<td>Simulated/training event</td>
<td>1</td>
</tr>
<tr>
<td>Unintended Flight Into IMC</td>
<td>1</td>
</tr>
</tbody>
</table>
Personal Flying, 2008-2014

Number of Fatal Accidents

- Loss of Control In-Flight: 601
- System/Component Failure - Powerplant: 149
- Controlled Flight Into Terrain: 116
- Other: 66
- System/Component Failure - Non-Powerplant: 62
- Unintended Flight Into IMC: 60
- Unknown: 47
- Fuel Related: 39
- Low Altitude Operation: 33
- Midair: 27
- Abrupt Maneuver: 19
- Collision on Takeoff or Landing: 19
- Abnormal Runway Contact: 15
- Loss of Control on Ground: 11
Fatalities by CAST/ICAO Common Taxonomy Team (CICTT) Aviation Occurrence Categories


Note: Principal categories as assigned by CAST.

For a complete description of CICTT Aviation Occurrence Categories, go to: http://www.intiationstandards.org/
### Primary category of accidents

<table>
<thead>
<tr>
<th>Category</th>
<th>LOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal flying</td>
<td>LOC</td>
</tr>
<tr>
<td>Instructional flying</td>
<td>LOC</td>
</tr>
<tr>
<td>Business flying</td>
<td>LOC</td>
</tr>
<tr>
<td>Corporate flying</td>
<td>LOC</td>
</tr>
<tr>
<td>Airline flying</td>
<td>LOC</td>
</tr>
</tbody>
</table>
Fatal Airport LOC 2008-2014

Fixed-Wing Fatal Loss of Control Airport Accidents 2008-2014

- Takeoff - 41
- Initial Climb - 127
- Missed Approach / Go Around - 44
- Crosswind - 4
- Downwind - 15
- Base - 23
- Final - 30

VFR/IFR Approach 55
Accident ID: ERA12FA385

14 CFR Part 91
Approximately 1235 EDT, June 7, 2012
Injuries: 6 Fatal

In-flight breakup
near Lake Wales, FL

Pilatus PC-12/47, N950KA
History of Flight

IFR Flight Plan

Fort Pierce, Florida to Junction City, Kansas

Departure 12:05 EDT
Climbing to FL260
Accident 12:35 EDT
Pilot advised of moderate to heavy precipitation at 12 to 2 o’clock

Deviations north of course approved

Also approved deviations south of course

Weather – no record of briefing

GEOS-13 visible image showed multiple layers of clouds at time of accident
History of Flight

Cleared to FL260

On autopilot throughout climb

Pirep nearby – light rime FL260

At FL247 activated Ice Mode

At FL251 in IMC right turn on autopilot

Four sec into turn at IAS 109 kt and <25 degree bank – autopilot disconnected

Bank angle increased to approx 100 deg and 338 kt airspeed
Right Forward Quarter
Left Rear Quarter
Left Forward Quarter
Right Forward Quarter
Airplane

• Pilatus PC-12/47
  – Type Certificate December 2005
  – Normal category (load factors +3.3/-1.32 g’s)
  – S/N 730, manufactured 2006
  – Max T/O weight 10,450 lbs
  – Maneuvering speed 163 KIAS
  – Vmo 236 KIAS (Mmo .48 Mach)
  – Vd 290 Kias
Pilot

- Age 45
- Private Pilot ASEL, Instrument rating
- Approximately 800 hrs total, 30 hrs instruments
- Prior to purchase
  - No actual instrument time logged in previous 7yr and 4 mo
  - 7.5 hrs dual in PA-46-500TP (Meridian) in 2009 (no endorsement)
- Subsequent to purchase
  - Ground, simulator and extra flight sessions
  - IPC, BFR, High Altitude Flight Endorsement
- 14 hrs PIC in accident airplane
Probable Cause

- The failure of the pilot to maintain control of the airplane while climbing to cruise altitude in instrument meteorological conditions (IMC) following disconnect of the autopilot. The reason for the autopilot disconnect could not be determined during postaccident testing. Contributing to the accident was the pilots lack of experience in high-performance, turbo-propeller airplanes and in IMC.
Accident ID: ERA12FA120

14CFR Part 91
1725 EDT, December 22\textsuperscript{nd}, 2012
One fatality - Pilot

IFR - Long Beach, CA to York Airport, Nashville, PA

Night visual approach
Engine-out Loss of Control

Cessna 441, N48BS
Arrival Flight Path

- Left downwind
- Lost right engine on base leg
- Started turn to final
- Crossed extended runway centerline
- Turned to right
Right Engine Loss of Thrust

Pilot called “base to final”

Turn continued into right engine

Witness – bank increased through vertical to inverted
Impacting in near vertical descent
Radar Plot Position and Altitude

Radar plotting

112 kt downwind

102 kt
beginning
base

75 kt in right turn

Maintained
1,100 to 1,200
ft altitude

Witness – “awfully slow”,
“snap rolling nose down,
tail up”
Frontal View
Aft Section View
Left Side View
Pilot

- Age 38
- Commercial License, SEL, MEL, Instruments
- Approximately 1400 hrs Total Time
  - 950 hrs multi-engine
  - Approximately 500 hrs make and model
- Medical – 3rd Class, November 7, 2011
- No medical or toxicological anomalies noted
- Fatality due to “blunt impact”
Airplane

- Cessna 441, Conquest II
- Honeywell TPE 331, 635 HP TP
- Approximately 5900 Hrs total time
- 514 Hrs since engine overhaul
- Right engine loss-of-power
  - Unknown cause
  - Fuel not an issue
Loss of Thrust – Single Engine

- Minimum Control Speed (Vmca) 91 KIAS
- Normal Procedures: Before Landing
  - 13. Wing Flaps – LAND below 180 knots
  - 14. Approach Speed – 99 KIAS at 9360 pounds
- Emergency Procedures (Amplified Procedures)
  - Engine Failure in Flight (Speed Below Vmca)
    (Memory Items)
  - 1. Power Lever – RETARD as required to stop turn
  - 2. Aileron and Rudder – AS REQUIRED toward operative engine to maintain straight-ahead flight
  - Pitch Attitude – LOWER NOSE to accelerate above 91 knots
Probable Cause

• The pilot’s failure to maintain minimum control airspeed after a loss of power to the right engine, which resulted in an uncontrollable roll into an inadvertent stall/spin. Contributing to the accident was the failure of the airplane’s right engine for reasons that could not be determined because no preexisting mechanical anomalies were found, and the pilot’s subsequent turn toward that inoperative engine while maintaining altitude.
Beech B100, N729MS
Probable Cause

The pilot’s failure to avoid severe weather, and the air traffic controller’s failure to provide adverse weather avoidance assistance, as required by FAA directives, both of which led to the airplane’s encounter with a severe thunderstorm and the subsequent loss of control and inflight breakup of the airplane.
Cessna 421C, N421W
Probable Cause

The pilot’s failure to maintain airplane control during descent while operating in instrument meteorological conditions.
Rockwell Int’l 690B, N13622
• Probable Cause
  – The pilot’s failure to maintain airspeed while banking aggressively in and out of clouds for landing in gusty tailwind conditions, which resulted in an aerodynamic stall and uncontrolled descent.
“Learn all you can from the mistakes of others. You won’t have time to make them all yourself”
Accident Investigations

• NTSB accident files are on-line
• Many recent accident Dockets are on-line
  – Factual reports,
  – Interviews
  – Photographs
• www.ntsb.gov

LOC Forum - Docket

- October 14, 2015 Forum
  - Humans and Hardware: Preventing General Aviation Inflight Loss of Control
- Home>News & Events>Press Releases>NTSB Docket, Video Available for “Humans and Hardware: Preventing General Aviation Inflight Loss of Control”
- Docket - 38 documents and links to video archive & NTSB Youtube Channel
  - Video: Search “NTSB Youtube Loss of Control”
  - Docket: NTSB ID: DCA15SS004
“Human beings, who are almost unique in having ability to learn from the experience of others, are also remarkable for their apparent disinclination to do so.”