Background

United 241 incident

- When: November 1968
- Where: Departure from Detroit
- What: B727

  Started rapid climb at 4700 ft maintaining 1G

  At 6000 ft in 20-deg bank, aircraft encountered an abnormal meteorological condition

  Bank increased to 40 degs and an abnormal climb rate

  Captain applies forward pressure and nose-down trim

  High rate of descent and difficulty recovering

  -1.5G at 8700 ft and 4.7G at 1200 ft

- Why: Trim overcontrol in recovery

China Airlines 006 incident

- When: February 1985
- Where: 300 nmi NW of San Francisco, FL410
- What: 747 SP

  Loss of No. 4 engine

  Roll autopilot counters until it reaches limit…more roll

  Almost 360 deg right roll, pitch down 69 deg

  5.1g's reached during pull-up; exceeded Vmo twice

  Recovered at 9,500 ft

  Two serious injuries

- Why: Preoccupation with malfunction; failure to monitor instruments; likely spatial disorientation

Midwest Express 105

- When: September 1985
- Where: Milwaukee, Wisconsin
- What: DC-9

  Day, VMC

  Uncontained right engine failure on takeoff at 450 ft AGL

  Correct then incorrect pedal, followed by aft column

  Continued climbing to 700 ft, rolled right near 90 degs

  Accelerated stall
- Why: Improper response to engine failure, lack of crew coordination

China Eastern Airlines 583

- When: April 1993
- Where: 950 nmi south Shemya, Alaska
- What: MD-11

  Night, VMC, FL330

  Inadvertent deployment of leading-edge wing slats

  Several violent pitch oscillations in ensuing recovery

  Simultaneous shaker and slat overspeed chime

  +2.1G to -1.2G
- Why: Inadequate design of flap/slat actuation handle. Light control forces and reduced pitch stability made overcontrol easy to do

USAir 427

- When: September 1994
- Where: Approach to Pittsburgh International
- What: 737-300

  At 6,000 ft, wake encounter from a leading 727

  Rolled out to assigned heading, then into 28, and then more than 70 deg roll left…shaker activates

  Roll likely causes by rudder moving to stop arising from a jam

  Full aft column from pitch -30/90 deg roll until impact

Why: Rudder moved to its limit, likely in direction opposite commanded as a result of jam in rudder power control unit

Airborne Express N827AX

- When: December 1996
- Where: Narrows, Virginia
- What: DC-8

  Night, in and out of clouds, 14,000 ft

  Approach-to-stall tests.

  Expecting shaker at 128 kts. Got early buffet at 151

  Set full power, resulting in compressor surges in No. 2
  Maintained 10-14 degs pitch

  Airspeed continued to decrease to full stall

  Eventually applied full rudder

- Why: Inappropriate inputs in response to stall

Formosa Airlines B12255

- When: March 1998
- Where: 7 miles NW HSZ airport, Taiwan
- What: Saab 340B

  Right main bus inop in preflight, but captain proceeds

  Several systems unavailable

  Torque split arises after attempt to equalize temps

  Roll and yaw asymmetry from torque split

  Potential disorientation and fatigue
- Why: Loss of situational awareness; failure to comply with MEL; likely fatigue

Korean Air Cargo 8509

- When: December 1999
- Where: Great Hallingbury, England
- What: 747-200

  Night, scattered clouds 500 ft

  Captain's ADI shows no bank while he increases it

  Comparator alarm sounds. Flight Engineer says "bank"

  Warnings canceled prior to impact at 90 deg bank
- Why: Poor crew resource management

Gulf Air 072

- When: August 2000
- Where: Persian Gulf, Bahrain
- What: A320

  Dark night, VMC

  On second go-around, captain commanded half the pitch req'd, and did not maintain runway heading

  With TOGA and low pitch, aircraft rapidly accelerated

  Flap overspeed warning; commanded flaps up

  Captain deflected stick forward and got -15 deg pitch

  Did not respond to multiple GPWS alerts
- Why: Likely spatial disorientation, incorrect go-around procedure, poor CRM

Icelandair 315 incident

- When: January 2002
- Where: Approach to Oslo airport
- What: B757

  Day, IMC

  Go around after unstable approach (near MCP alt)

  After go-around transient, aircraft tries to level and slow to MCP speed of 150 kts

  Captain put in inputs to prevent stall

  Pitch goes between +40/-49;

  Load factor goes between 3.6 and -0.6g's

  Aircraft had two more flights afterwards w/o inspection
- Why: Loss of situational awareness; mode switching challenges

Flash Airlines 604

- When: January 2004
- Where: Red Sea near Sharm el-Sheikh A/P
- What: 737-300

  Night, VMC

  Left turn to intercept VOR after takeoff

  A/P disconnects. Captain requests heading select.

  Co-pilot warned that bank was increasing

  Captain neutralizes wheel, then increases right bank

  Banks 111 degs and 43 pitch down

  Airplane hits water at 24 degs right bank and 4G's
- Why: Findings inconclusive (disorientation? System failure?)

Pinnacle Airlines 3701

- When: October 2004
- Where: Jefferson City, Missouri
- What: CRJ-200

  Night, VMC

  Reposition flight; Climbed to FL410

  Shaker and pusher activations; Dual engine flameout

  Recovered from upset at FL340

  Started performing double engine failure checklist

  Did not obtain necessary speed for restart (300 kts)

  Moved to APU-assisted start; unable due to core lock
- Why: Unprofessional behavior; lack of airspeed monitoring; improper response to stall; improper engine restart

Provincial Airlines C-GZKH incident

- When: May 2005
- Where: Climbout from St. John's, Newfoundland
- What: de Havilland DHC-8

  Day, IMC

  Inadvertently selected vertical speed mode (1190 fpm)

  At 7000', engine anti-ice selected. Pneumatic not selected.

  Through 8000', gradual speed decrease over 5 mins

  Shaker activates at 14,800' and 104 kts
- Why: Inappropriate mode select; lack of monitoring of speed during climb out; lack of recognition of stall cues

West Caribbean Airways 708

- When: August 2005
- Where: Wreckage in Venezuela
- What: MD-82

  Night, poor weather

  Vertical speed mode climb to FL330…Mach EPR limited

  Engine anti-ice cycled

  Tried to cruise at FL 330, M=0.75. Again Mach EPR lim

  Poor weather. Continuous speed drop.

  Buffeting started. Descent requested.

  Shaker activated in descent at FL320 and remained on

- Why: Lack of knowledge on operating limits, lack of speed monitoring, lack of proper response to stall

Armavia 967

- When: May 2006
- Where: Black Sea near Sochi, Russia
- What: A320

  Night, IMC

  Decided to divert, then decided to land

  ATC instructed go-around after Wx dropped below mins

  Thrust levers placed into climb; flaps and gear extended

  “Speed, speed, speed” alert; Levers moved to TO/GA

  Disengaged A/P, decrease pitch, banked right, used rudder

- Why: Likely spatial disorientation; poor CRM, improper go-around procedure; dual (and opposite) sidestick inputs

Adam Air 574

- When: January 2007
- Where: Makassar Strait off Indonesia
- What: 737-400

  Day, IMC; stormy weather

  FL350; troubleshooting IRS malfunction…A/P disconnect

  Slow right roll began “bank angle” alert

  Bank angle reached 100 degs; pitch 60 degs down

  Pulls 3.5g (prolonged shaker) and 490 Kts
- Why: Preoccupation with troubleshooting INSs; inadvertent A/P disconnect; possible spatial disorientation

Kenya Airways 507

- When: May 2007
- Where: Doula Intl Airport, Cameroon
- What: 737-800

  Night, IMC

  After takeoff, captain gave command to engage A/P

  Command not acknowledged; A/P not engaged

  Several heading changes input into MCP, but no A/P

  Captain engages A/P and increases bank angle

  Bank reaches 115 degs and pitches down at 2900 ft

  Pilots used opposite inputs during attempted recovery

  Bank is 60 degs at impact

- Why: Lack of monitoring, spatial disorientation, lack of crew coordination

Thomsonfly G-THOF incident

- When: September 2007
- Where: Approach to Bournemouth Airport, U.K.
- What: 737-300

  Night ILS approach

  Uncommanded autothrottle disengagement

  Autopilot trims stabilizer up to stay on path

  Go around called after aircraft slows below speed

  Pitch up to 44 degs, speed 82 kts

  Full column forward ineffective, trim not applied

  Thrust reduced to 86%. Recovered.

- Why: Unnoticed autothrottle disconnect, lack of trim awareness and application

Aeroflot 821

- When: September 2008
- Where: Perm, Russia
- What: 737-500

  Night, rainy

  Approach was not stabilized

  Possible western versus eastern attitude display issue

  Significantly below Vref during approach

  After base turn, aircraft roll 360 degs

- Why: Poor crew coordination, fatigue, spatial disorientation, captain alcohol consumption

XL Airways GXL888T

- When: November 2008
- Where: Off coast of Canet-Plage, France
- What: A320

  Day, light rain

  Water penetrated AoA sensors during a rinse

  At FL320, AoA sensors 1 and 2 stopped moving (froze)

  Later on approach, crew checked normal law protections

  Stabilizer trimmed full nose up during decel

  Drop to Direct Law likely unnoticed

  Loss of control and crash into sea

- Why: System failure due to AoA vanes freezing. Lack of trim awareness. Lack of understanding in stall recognition

Empire Airlines 8284

- When: January 2009
- Where: Lubbock, Texas
- What: ATR-42

  Night, IMC

  Flap asymmetry (at F15, one side 0 and other 8-10 deg)

  During troubleshooting, speed 160 to 125 kts in 26 sec

  Ultimately shaker concurrent with TAWS; AoA increases

  Stall; series of pitch, roll, yaw oscillations until impact
- Why: Continued approach after flap anomaly; lack of monitoring to maintain safe speed

Turkish Airlines 1951

- When: February 2009
- Where: Approach to Schiphol Airport, The Netherlands
- What: 737-800

  Nonstandard ATC approach; then unstabilized approach

  Left radio altimeter passed -8 feet to autothrottle

  Autothrottle moved to ‘retard flare’ mode on approach

  Autopilot increased AoA to stay on path during decel

  Speed decay unnoticed until shaker activation at 460 ft
- Why: Unstable approach, lack of monitoring speed, pitch increase, and A/T mode. Stall recovery procedure improperly applied.

Colgan Air 3407

- When: February 2009
- Where: Clarence Center, New York
- What: DHC-8-400

  Night VMC

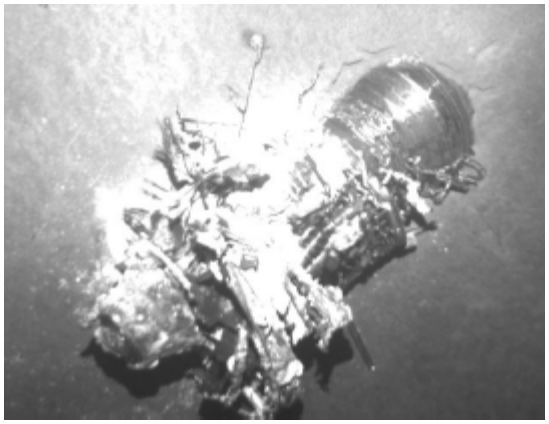
  Briefed Vref of 118 kts, but ref speeds switch “increase”

  Shaker engaged at 131 kts, likely causing surprise

  Captain pulled and resisted shaker

  Tried to control roll during stall until impact
- Why: Lack of airspeed monitoring, unexpected stall warning activation, inappropriate response to stick shaker and pusher

Air France 447



- When: June 2009
- Where: International waters, Atlantic Ocean
- What: A330

  Night IMC

  Unreliable airspeed caused ALT 2B flight control law

  Pilot inputs resulted in a stall

  Stabilizer moved to nose-up limit and remained there

  Tried to control roll during stall until impact
- Why: Unreliable airspeed procedure not applied, lack of stall recognition, recovery inputs disallowed return to safe flight

Afriqiyah Airways 771

- When: May 2010
- Where: Approach to Tripoli Intl Airport
- What: A330

  Night, IMC

  Continued below NDB MDA without ground visual ref

  TAWS activated, then go-around

  Go around pitch not maintained (nor FD commands)

  Dual inputs, but not enough to cause warning

  Captain took control and pushed down (F/O pulled)
- Why: Spatial disorientation, poor CRM, dual inputs, possible fatigue

Air Algerie 5017

- When: July 2014
- Where: 80 km SW of Gossi, Mali
- What: MD-83

  Night

  FL310, several heading changes to fly around cell

  EPR erroneous on both engines (likely icing of sensors)

  A/T then did not apply enough thrust

  A/C slowed from 290 kts to 200 kts in 5.5 mins

  A/P disengaged 20 sec after stall begins (AoA=25 deg)

  Roll 140 degs, pitch down 80 degs
- Why: Crew did not activate engine anti-ice; lack of speed monitoring; lack of proper stall recovery inputs

Air Asia 8501

- When: December 2014
- Where: Karimata Strait, Indonesia
- What: A320

  Dawn? (619 local) VMC

  Repeated Rudder Travel Limit Unit failure at FL320

  Alternate law entered after reset of FAC CBs

  Sideslip from rudder causes roll and rise of FD

  Pilot flying inputs results in stall

  Continuous stall warning during last 3 mins

- Why: Potential ambiguous guidance on clearing failure, lack of upset training on how to recover from a full stall

Commercial Air Safety Team Study

	Lack of External Visual References	Flight Crew Impairment	Training	Airplane Maintenance	Safety Culture	Invalid Source Data	Distraction	Systems Knowledge	Crew Resource Management	Automation Confusion / Awareness	Ineffective Alerting	Inappropriate Control Actions	Total
Formosa Airlines Saab 340	x	x			x		x	x	x		x		7
Korean Air 747-200F	x			x		x	x		x		x		6
Flash Airlines 737-300	x		x		x		x		x	x	x	x	8
Adam Air 737-400	x		x	x			x	x	x	x	x	x	9
Kenya Airways 737-800	x		x				x		x	x	x	x	7
Aeroflot-Nord 737-500	x	x	x	x	x		x	x	x	x	x	x	11
Gulf Air A320	x		x				x		x		x	x	6
Icelandair 757-200 (Oslo)	x						x		x	x	x	x	6
Armavia A320	x	x			x		x		x	x	x	x	8
Icelandiar 757-200 (Baltimore)	x				x	x	x	x	x	x	x	x	9
Midwest Express 717	x				x	x	x		x		x	x	7
Colgan Air DHC-8-Q400	x	x	x		x		x	x	x	x	x	x	10
Provincial Airlines DHC-8	x		x				x			x	x	x	6
Thomsonfly 737-800	x		x	x	x		x			x	x		7
West Caribbean MD-82	x	x			x		x	x	x	x	x	x	9
XL Airways A320		x	x	x	x	x	x	x	x	x	x		10
Turkish Airlines 737-800	x			x	x	x	x		x	x	x		8
Empire Air ATR-42	x	x			x		x		x	x	x		7
Overall	17	7	9	6	12	5	18	7	16	14	18	12	

Upset Accidents and Incidents

Why?

- Lack of attention
- Lack of understanding
- Lack of proper response

Upset Accidents and Incidents

Why?