

Aviation Mishap Investigation

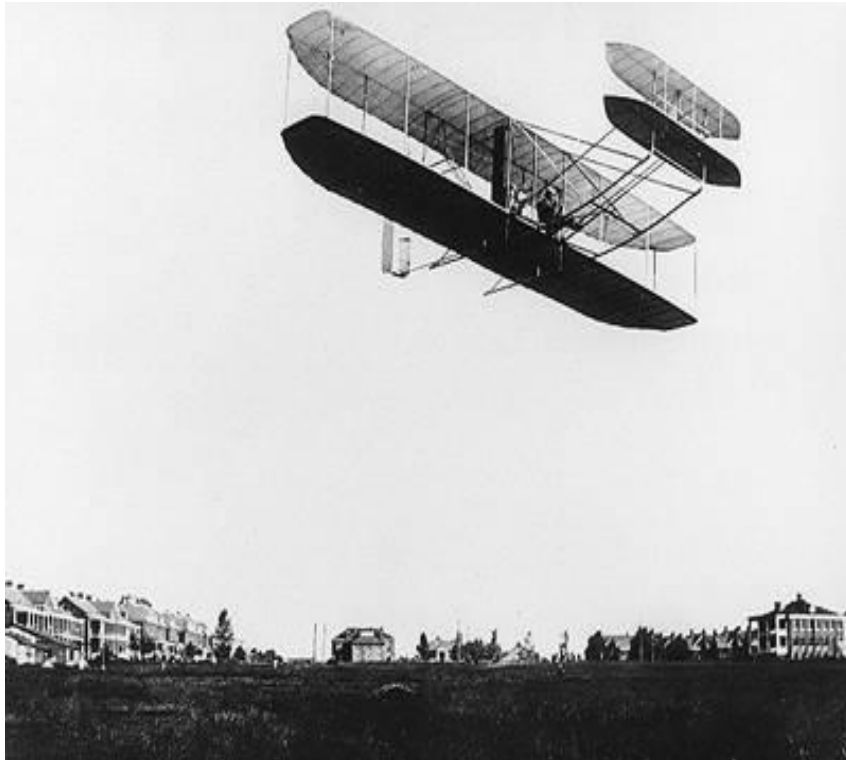


Aviation in itself is not inherently dangerous.

But to an even greater degree than the sea, it is terribly unforgiving of any carelessness, incapacity or neglect.

Author Unknown

Fort Myer, Virginia

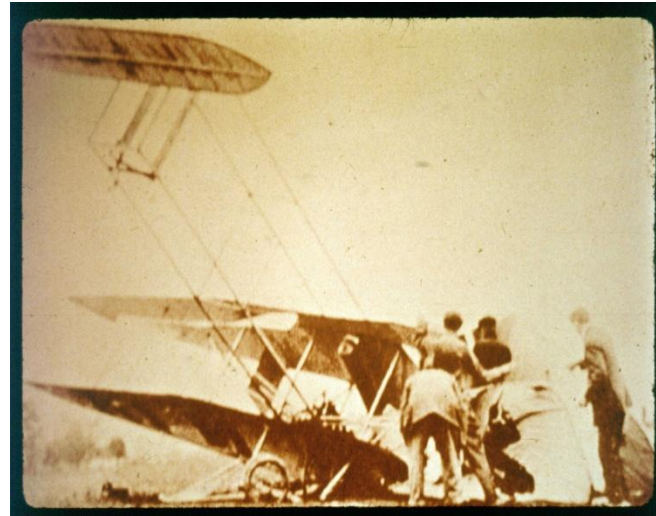


17 September 2008

- Orville Wright arrives to demonstrate the newest model airplane
- Cash incentive of \$1.00 per every mile per hour over a baseline of 35 MPH
- Wilbur and Orville made the propeller extra long for additional thrust for additional speed
- West Point grad, Lt Thomas Selfridge, sweet talks his way into a getting a ride
- Orville is 70 feet AGL and in a slow, gentle turn above Ft Myer...



First Ever Airplane Crash Produces Injury and Fatality



Almost 60 Years Later a C-141B Starlifter Diverts

(12 Jan 1987)



- Iwakuni, Japan
 - 600 Miles SW of Tokyo
 - 120,000 Population
 - Hanshu Island (oceanic tip)
 - Airfield originally built in 1938 for Japanese Navy flight training
- U.S. Marine Corps Air Station (following operation by RAAF)
- Night IMC prevailed
 - Rain
 - Wind
- Fast approach speed and touchdown
 - Hydroplaning

Hydroplaning Conditions, Context and History

- Post Korea conflict research develops 2 fix categories for hydroplaning
 - Runway and airfield development
 - Grooves in pavement
 - Crowning
 - Perimeter drainage augmentation
 - Tire pressurization
 - Mathematical formula: Hydroplane Speed = $9\sqrt{\text{Tire Pressure}}$
 - Tires designed to have higher pressures for approach speeds
 - 121 psi to 144 psi
 - Elevates hydroplaning speed to
 - » $9\sqrt{121} = 9*11 = 99$ knots
 - » $9\sqrt{144} = 9*12 = 108$ knots
 - » Speeds in tune with most planned touchdown speeds
 - Aircrew training “forgot” these valuable hydroplaning lessons

Hydroplaning Lessons for Personal Vehicles

Originating from Aeronautical Science

- Just as seat belts originated with open cockpit airplanes and migrated to automobiles and trucks, so can hydroplaning critical entry speeds
 - Lets apply the formula: Hydroplaning Speed = $9\sqrt{\text{Tire Pressure}}$ to various tire pressures found in personal vehicles
 - 25 psi – 45 mph
 - 28 – 47.6
 - 30 – 49.3
 - 32 – 50.9
 - 34 – 52.5
 - 36 – 54
 - Take proactive steps to make tires have correct maximum pressure and slow down to below calculated hydroplane speed for safe vehicle operations on wet roadways

General Hap Arnold Implements a Proactive Approach to Understanding and Mitigating Aviation Mishaps

- Establishes the “Flight Safety Directorate for Investigations and Trend Analysis” to examine every aircraft mishap
- Points out that more aircraft were destroyed in 1942 training and transport than in all the air war of the same time period in both the European and Pacific Theaters!
- Causes:
 - 85% Logistics
 - 15% Aircrew
- Establishes the precedent of data-driven decision-making that originates with observations, measurable data collection and analysis
- Leverages his considerable liaisons with industry for expert help and partnership from the airplane design stage through its operation and maintenance support



General Arnold's Forensic Anatomy of a Mishap

- When
- Where
- What
- Who
- Damage\$
- Narrative / Investigation / Analysis
- Findings / Causes
- Recommendations

Define

Measure

Analyze

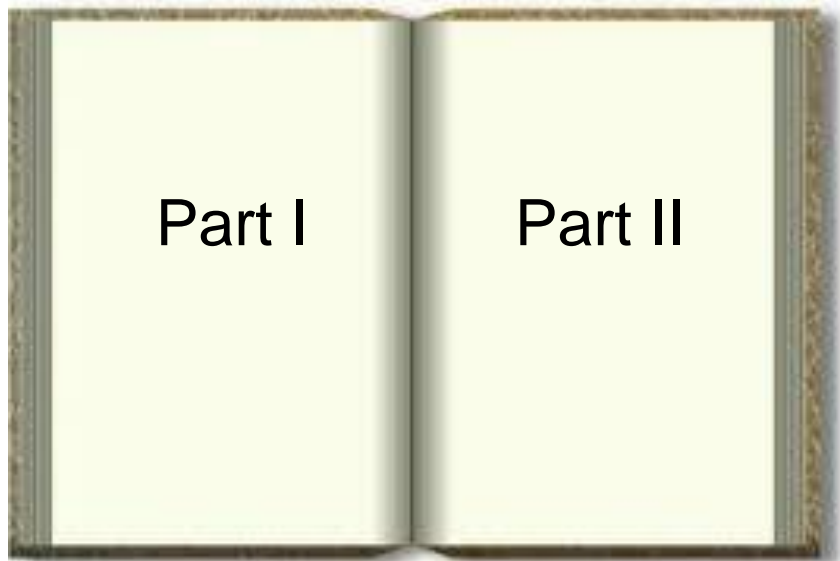
Improve / Control
Lean Principles

...and how its common sense aligns with **DMAIC** & **Lean**

U.S. Air Force Mishap Classifications

- **Class A:** Total destruction of an aircraft, damage of \$1 million or more, or a fatality or permanent total disability.
- **Class B:** Total cost of \$200,000 or more but less than \$1 million, or a permanent partial disability, or inpatient hospitalization of three or more personnel.
- **Class C:** Total cost of \$10,000 or more but less than \$200,000, or an injury or occupational illness resulting in a loss of 8 hours or more.
- **High Accident Potential (HAP):** Events where there is a potential significant hazard to the crew or aircraft if a similar event were to occur.

The Actual Mishap Report – Mechanics



- Part I
 - Releasable
 - Material facts
 - Define
 - Measure
- Part II
 - Non-Releasable
 - Secures cooperation from manufacturers
 - Interpretations
 - Analyze
 - Improve
 - Control

Safety Investigation Board (SIB)

- Purpose
 - Determine cause or causes
 - Provide basis for corrective actions
 - No disciplinary or punitive actions
 - Eliminate mishap potential and prevent future mishaps
- All testimony before SIB has immunity
 - Want assistance in eliciting all facts

SIB Primary Members

- President
 - Rated Colonel or General
 - Appointed by MAJCOM
 - Not from mishap unit
- Pilot Member
 - Current & qualified in mishap aircraft
 - Wide experience
- Maintenance Member
 - Fully qualified with 2 years experience
- Investigator
 - Rated officer with 4 years flying experience
 - Graduate of Flight Safety Officer course
 - Appointed by MAJCOM
- Recorder
 - Non-voting member
 - All administrative affairs and coordination

SIB Additional Members

- Flight Surgeon
- Public Affairs Officer
- Air Traffic Control Officer
- Weather Officer
- Weapons Officer
- Additional Crew Members
- Tech Reps from depot ^{and/}_{or} industry
- Pathologists
- Federal Agencies
 - FAA
 - FBI
 - NASA
 - NTSB
 - USAF Office of Special Investigations (OSI)

SIB Guidelines

- 30 Days start-to-finish
- SIB Report protected by “Executive Privilege”
- Accident Investigation Board (AIB) is separate investigation
 - Legal investigation (Judge Advocate)
 - Convened by Wing Commander up to MAJCOM Commander
 - Concurrent with SIB
 - Shows “credibility” to taxpayer and is fully releasable
 - The “Hammer” to military ^{and/or} civilian members
 - Receives “Part I” of SIB report and “Witness list”
- USAF deliberately segregates the two boards and limits their interactions
 - Major General exercised the “early” retirement option as a result of selectively using SIB information to make punitive examples of aircrew members involved in incidents

Investigation Synopsis

- Impound and Close All Records
 - Aircraft maintenance
 - Aircrew
 - Air traffic
 - Medical
 - Weather
- Crash Site Actions
 - Photographs
 - Diagram wreckage
 - Identify parts
 - Gather statements
- Flight Profile Determination
 - Aircrew
 - Witnesses
 - Flight plan
 - Pre-flight activities
 - Wreckage pattern

Heart of the Investigation

- Gather and interpret evidence
 - Determine sequence of events
 - Use data collected to determine mishap causes
 - Draw upon all information sources
 - Aircraft design through maintenance
 - Human capital training through operational execution
 - Management and supervision
 - Environment of the mission
 - Validate findings
 - Publish
 - Report is coordinated and staffed up through the MAJCOM
 - Many edits from Wing, Air Division and Numbered Air Force
 - Report goes to the Flight Safety Center
 - Safety Center reviews and often goes back to original Flight Safety Officer report
 - Flight Safety Center has the ultimate “final word”

Mishap Cause Factors

- Human – aircrew, maintenance, support
- Supervisory – instructors, “boss”, procedures, directives, manuals
- Logistics – acquisition, material, maintenance
- Environmental – weather, temperature, light, flora and fauna
- Support – infrastructure (meals, sleeping, lounge); services
- Undetermined – often never identified

High Accident Potential (HAP) Criteria

1. Loss of thrust
2. Engine case penetration
3. Engine case rupture, burn through, fire, massive fuel leak
4. Emergency landing of single-engine aircraft
5. Unselected propeller / thrust reversal
6. Flight control malfunction (Attitude, Heading, Altitude)
7. Spillage or Leakage
8. In-flight pitot-static or gyroscopic instrument loss
9. Runway departure
10. All in-flight fires
11. Any other FSO option event (example will be discussed later)

Determine Flight Profile

- Aircrew
- Witness statements
- Mission flight plan
- Aircrew pre-flight briefing record
- Wreckage pattern

Crash Site Actions

- Photographs
- Diagram wreckage
- Identify parts
- Gather statements

Brigadier General Robin Olds Establishes the Flight Safety Center (1971) with a Focus on Data-Driven Analysis and Enhances Arnold's Original Vision



- America's 1st and only "Triple Ace"
- Grew up around Billy Mitchell, Hap Arnold, Carl Spaatz, and other early air power advocates
- All-American as football "Tackle"
- Charismatic maverick
- Set in motion the "Thunderbirds" ground work
- "There are pilots and there are pilots; with the good ones, it is inborn. You can't teach it. If you are a fighter pilot, you have to be willing to take risks."
- Transformed Flight Safety from "bean counting" to being part of making air combat operations more effective
- 14 July 1922 – 14 June 2007



Flight Safety: Post Robin Olds

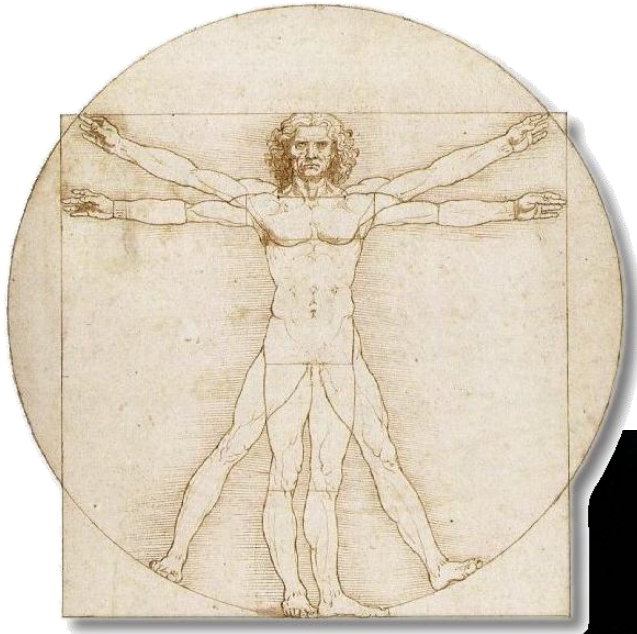
- Flight safety facilitates mission effectiveness by qualitative and quantitative use of resources
- In military aviation, “flight safety is NOT paramount”... contrary to many a mission briefing
 - Mission objectives are primary
 - Safety supports mission objectives by making resources available
- Mishap Causes – Reversed from Arnold’s days:
 - 15% Logistics
 - 85% Aircrew
- John “Forty Second” Boyd built upon General Olds maverick approach
 - Father of “energy maneuvering” for light-weight, high-tech fighters
 - Developed the OODA Loop
 - Observe – Orient – Decide – Act
 - OODA is the foundation for AFSO21
 - Air Force Smart Operations 21st Century
 - Lean Six Sigma, CPI and other proactive implementations

Human Factors and CRM Play Key Role in Mishap Analysis & Mishap Prevention

- Frank Dully, Captain, USN (MD – Flight Surgeon) “Father of Human Factors”
- HF fall into 3 broad categories:
 - Aeromedical
 - Aeronautical adaptation (psychological and physical)
 - Illness, disease, injury
 - Physical factors – fatigue, rest, physical activity, mental workload, environmental
 - Aviation physiology – water/land survival, hypobaric exposure, ejection/egress training, G-tolerance, visual illusions, task management, etc
 - Personal / Social
 - Emotional stress – family/marriage, financial, personality, etc.
 - Performance
 - Flight
 - Ground
- Dully’s “Sex and the Naval Aviator” lecture series
 - Air Force politically correct name “Aircrew Compartmentalization”

Representative Mishaps

- Human factors often work against the Man-Machine interface
 - Consider the 4 mph “man” (with internal systems) and 600 mph “machine” (with internal systems) ... opportunities for disconnects



T-37 Solo: Stall-Spin Following VMC into IMC



Vance AFB Auxiliary Airfield Instructor Beer Bet



- Auxiliary airfields are non-towered and use 2 IPs as Supervisor of Flying (SOF) for solo student pilots practicing touch-and-go landings
- Because the IPs were running early, they challenged each other to precision landings: Land as close as possible to the approach-end of the runway with ONLY one throttle thrust setting
- The approach-end of the concrete runway protruded above the surrounding grass field
- This protruding concrete edge guillotined the Tweet's landing gear
- First student solo arrived and was unable to make radio contact. He returned to main base and reported an airplane collapsed on the runway with a small fire on the right leading edge wing root

~ The Unanticipated ~

Bar tab for the ultimate "Beer Bet of Honor"

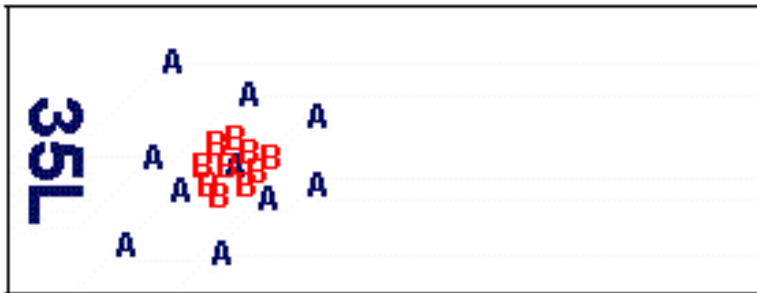
\$0.35 Officer Club Draft Beer

\$250/Hr T-37 Operating Cost

\$850,000 T-37 Acquisition Cost

Lesson-Learned Outcome Led to “Consistent, Precision Landings” in Training and Checkrides

Which Pilot Would You Rather Fly With?



Main landing gear touchdown point at a predetermined point on the runway is

- Repeatable
- Reproducible
- Scientifically substantiated
- Universally applicable
- Reasonable expectation
- Meets or exceeds Six Sigma accuracy

Airline operations provided baseline to Air Force (and airliners were baselined against US Navy carrier landings)

FAA implemented “precision landings” – accuracy within 200 ft – for private pilot applicants (and above) in 1986 (Six Sigma accuracy)

C-141 Weekly Sortie to Pan American Capitals

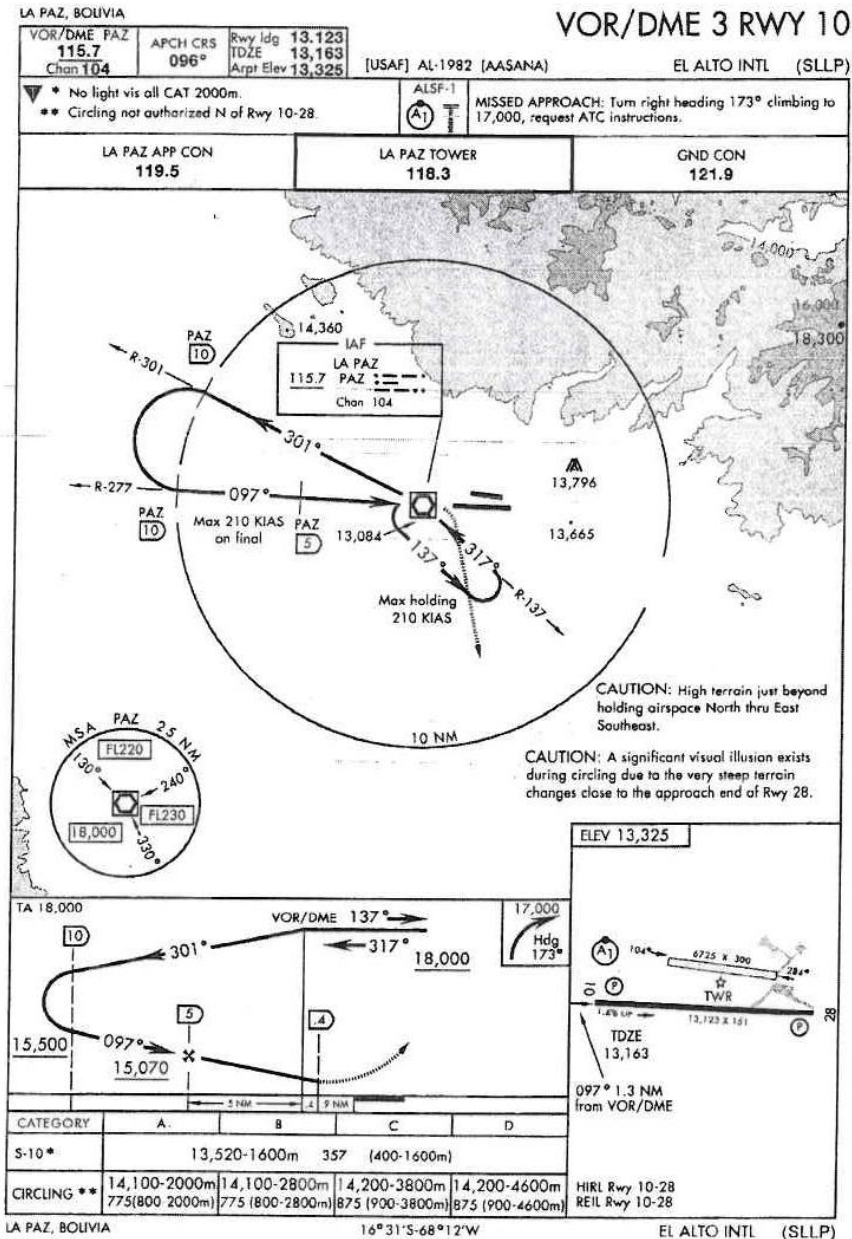
Huayna Potosi near La Paz, Bolivia



18 August 1974

- Departed Howard AB, Panama for 1,800 NM flight over uninhabited jungle with limited nav aids
- Cleared for enroute descent in IMC, in non-radar environment, from FL240 to FL180 for landing in La Paz (highest elevation airport) with ceilings at 700 AGL
- Impacted Mt Potosi (20,000 ft) at the 18,700 ft level. Crew of 7 fatally injured at impact.
- Waited 3 months for winter to pass before attempting body recovery and mishap investigation
 - Helicopters not capable at these altitudes

La Paz VOR Approach



- La Paz is world's highest elevation airport at 13,325 Ft mean sea level
- It is ringed by high Andes Mountains often cloud covered
- High mountains embedded within clouds are referred to as "Cumulo-Granite"
- Must reference descent on VOR and stay close to VOR inside the mountain basin that is rimmed by rocks
- No margin for error!
- Mishap crew started descent from FL240 and did not stay within the rock-free basin

YB-49: The Original Northrop Flying Wing



5 June 1948

- Major Dan Forbes and Captain Glenn Edwards are at the controls
- While in a nose high stall, the airplane entered a tail slide, followed by a high-speed tail down spin that led to in-flight structural break-up.
- Engines were not powerful enough to recover the airplane.
 - Underpowered for speed
- Flying wing was viewed as a “slow” medium-range bomber, with limited bomb capacity at best
- Air Force was not interested in its “stealth” qualities until early 1980s
- Jack Northrop “vindicated” when B-2 Stealth Bomber proves his advanced design fully capable

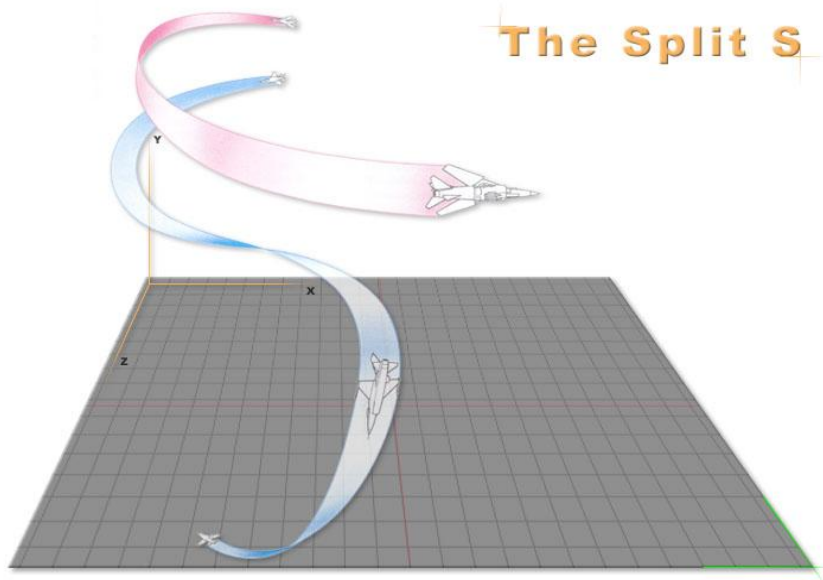
Muroc Field renamed “Edwards AFB”

Topeka Field (KS) renamed “Forbes Field”

Student Pilot Performs Split-S Maneuver



- Vertical turn-around (reverse direction) maneuver from level flight to lower altitude and opposite direction
- T-38 requires 10,000 ft altitude to execute the maneuver
- Student pilot misread altimeter and was not at 18,800 ft but at 8,800 ft
- Airplane impacted the ground at Mach 0.92 (552 knots) indicated with an ensuing fatality and destroyed airplane



Results of Split-S with Inadequate Altitude



- Mishap debris relocated to hanger for reconstruction and analysis
- No ejection attempted

Engineering Change Modifications



Original Altimeter



Re-engineered Altimeter
Applied Human Factors
Considerations

T-38 Attempted Barrel Roll with Runaway Trim



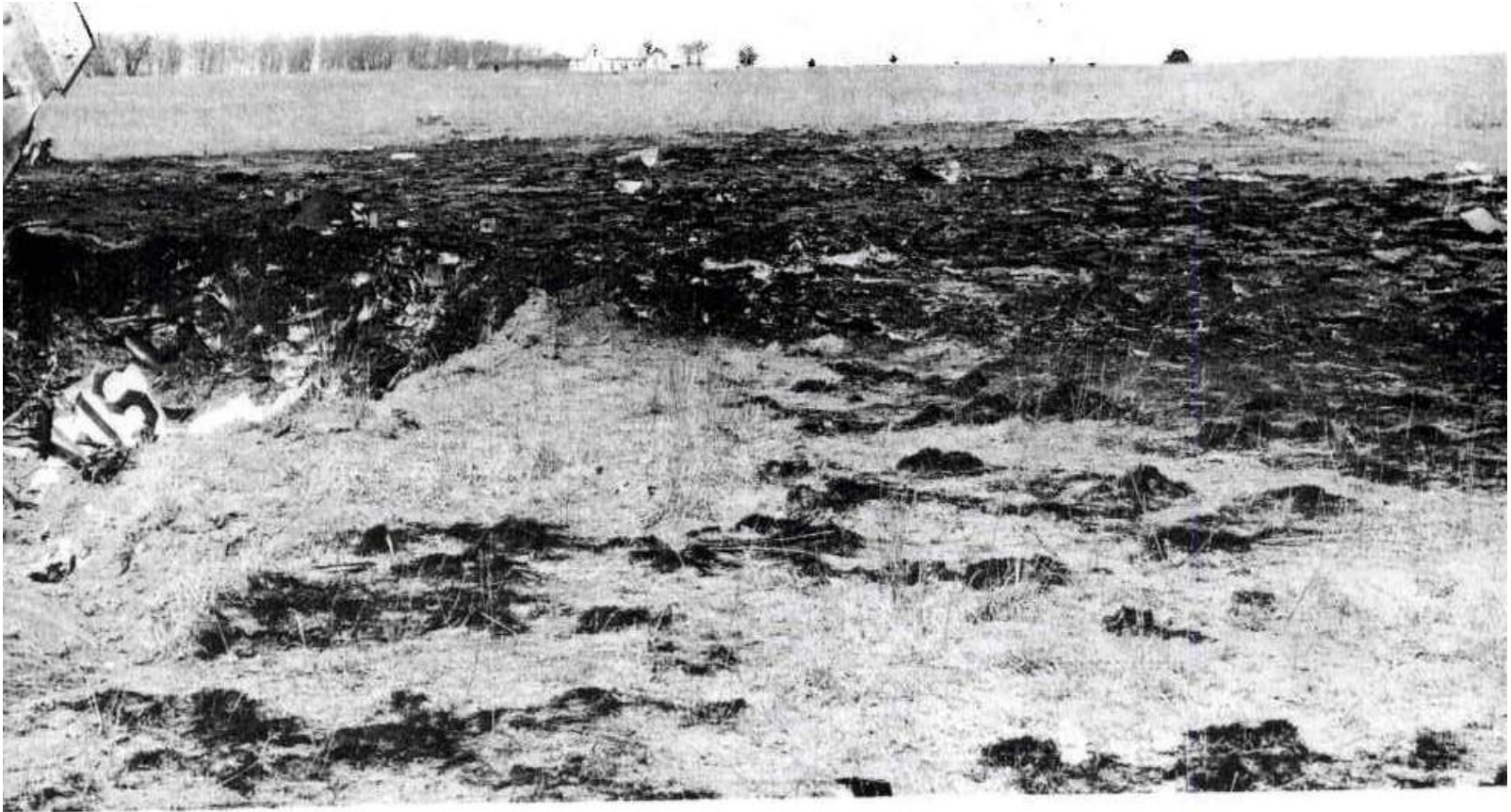
Procedures Count!

Technique Is Important!

- Student Pilot (SP) developed habit of using 2-hands for barrel rolls and loops
- Left hand was on top the 'Aileron-Elevator Trim Button'
- On mishap day, SP activated (unintentionally and unaware) worse case for elevator trim and lost control
- Aircraft destroyed and SP fatal
- FAA 3-dimensional radar plots helped understand aircraft behavior



Results of a High-Speed, High-Impact-Angle



Flight Path Angle of RF-4C Flying Below the “Hard Deck”



Crew discovered that surface-to-air pine trees are just as hazardous and dangerous as surface-to-air missiles

Bird Strikes Are Serious Matters!



$$KE = \frac{1}{2} (mV^2)$$

Although Bird Size Is a Factor, 'Velocity Squared' Is the Significant Component

F-16



KC-135



F-111



A-10



C-130 Hercules Birdstrike Detail

Thunderbirds: T-38 Formation Loop and Crash at Indian Springs Auxiliary Field



18 January 1982

- ‘Diamond’ aircraft 2–1–3–4 were in a line-abreast fingertip formation loop
- Thunderbird-1 receiving faulty G-meter instrument readings
- Insufficient altitude and insufficient G-force on backside of loop for an intended wings level recovery at 100 feet AGL
- All 4 aircraft impacted the ground in a precise, tight formation
- 1982 Show season cancelled (U.S. Congress Resolution 248)
- Thunderbirds (alternative name for “Phoenix”) transitioned to F-16 Falcon

Maintenance Functional Check Flight



- Pilot dual qualified in F-4 Phantom and F-16 Falcon for checking either aircraft after maintenance and before return to regular flight operations
- Ideal job conditions for weekly, daytime flying and home life with his wife who was a maintenance squadron commander
- Although not a TPS graduate or member of Edwards AFB test flight community, pilot acted with bravado of one, even though he performed routine status check flights
- 28 January 1986 while the Challenger Space Shuttle was taking-off from Cape Canaveral, pilot was taking-off from Tampa (MacDill AFB) in an F-16
- At FL200, the Falcon went out of control...

Same Day and Opposite Coast from the Challenger



- The F-16 began to tumble
- The titanium Pratt & Whitney F-100 engine developed an internal supersonic “air buzz saw”
- Temperatures got so high that the F-100 began to melt (Titanium melts at 1,668° C)
- The melting engine exited the right aft section of the airplane
- Pilot ejected at 5,000 feet while airplane was supersonic: 847 knots TAS from a chip recovered from the ejection seat
- Pilot’s arms and legs experienced “auto flail” and he received numerous fractures in each appendage bone segment
- Automated features of parachute deployment, safety raft, and survival kit worked perfectly
- Rescue HC-130 on a routine sortie reached pilot in under 20 minutes and a “PJ” jumped from cargo ramp of the Hercules into the Gulf of Mexico

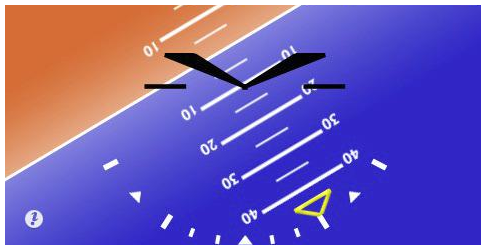
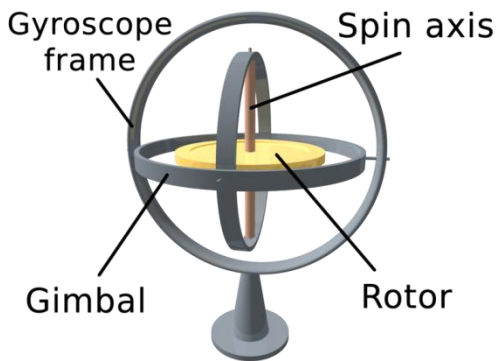
Gyroscopic Guidance: You Bet Your Flight Pay

10 November 1986

30 NM Northwest of Prince George, BC



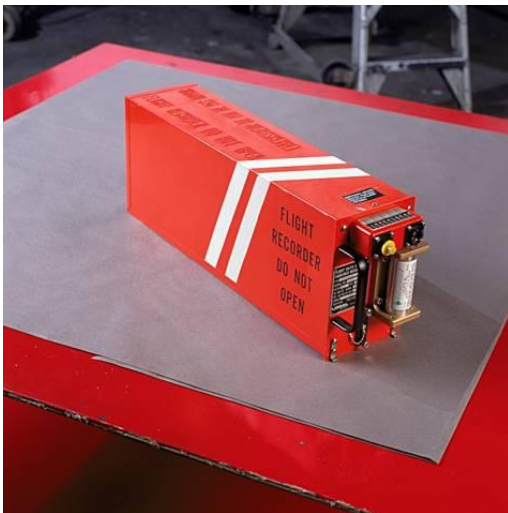
- Attitude Heading Reference System (AHRS) is the primary flight control box in every single Air Force aircraft
- During an autopilot climb from FL330 to FL350, in Day VMC, the T-43 autopilot began “pulsing” the control yoke followed by sudden flight instrument failure with attitude indicator rolling inverted as the airplane entered a spin
- Pilot used needle-ball-airspeed technique to stop the spin and recover control of airplane at 14,000 feet MSL in a valley between two mountain ranges
- Airplane recovered to Vancouver International using the “standby” partial panel instruments
- Aircraft Damage: “Oil canning” of left stabilator
- Cause: Depot procedure in overhauling AHRS gyro
- **Footnote:** Rare instance where FSO, with strong General Officer support, continued the AHRS investigation an additional 14 months to discover root cause and resolve the AHRS issue given its presence Air Force wide



“Black Boxes” – CVR and FDR – Are Actually Orange



- The Cockpit Voice Recorder has 4 channels
 - Pilot (Captain)
 - Co-pilot (First Officer)
 - Air Traffic Control (ATC) radios
 - General flight deck compartment
- Flight Data Recorder – minimum FAA requirement is to measure 88 different factors, although many FDR measure over 160 factors
- Boxes located in empennage and designed to withstand crash G-forces, temperature extremes, and all aqueous environments
 - Battery life runs 72 hours
- Black Box role has evolved from ancillary support to primary investigative tool of all investigations when installed



Navy Aviation



Lockheed P-3 Orion



Aircraft Carrier Fan Tail



Grumman A-6 Intruder



Grumman F-14 Tomcat

The PEST Factor

Political – Economic – Social – Technological

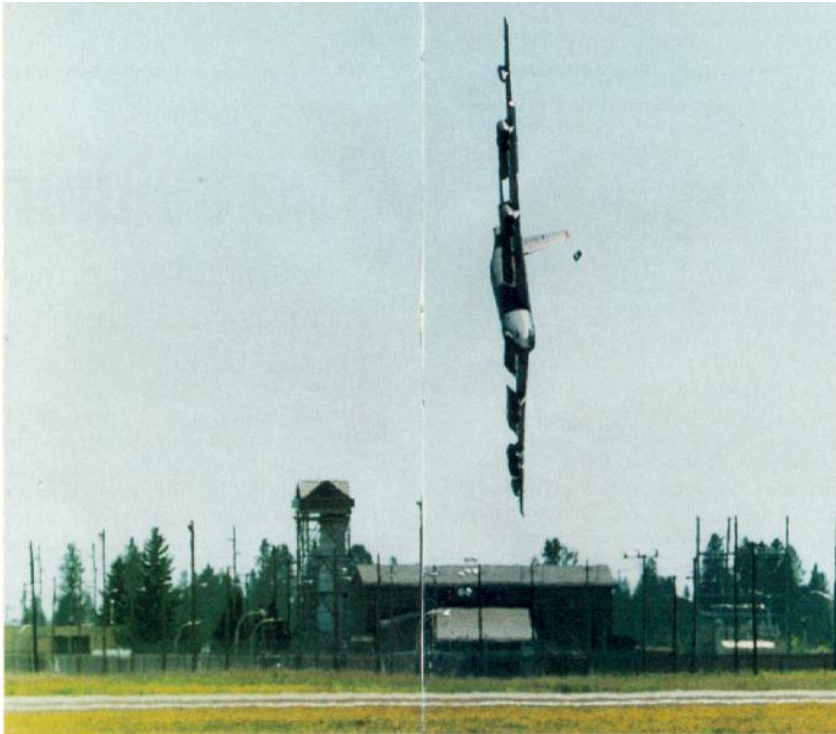


When good intentions “pesticate” leadership and aircrew into failure via political, economic, social, and technological modalities to make a point

- LT Kara “Revlon” Hultgreen and the F-14
 - USS Abraham Lincoln (San Diego)
 - 25 October 1994
- Captain Lisa Nowak and the Space Shuttle
 - 7 February 2007
 - “Houston we have a problem...”



B-52H Fairchild AFB (Spokane, WA)



24 June 1994 (7:30 PM local)

~ Earlier Base Distraction ~

On June 20 (Monday) a discharged airman, Dean Mellberg, shoots-up hospital (4 dead and 23 wounded)

- Practice for Saturday airshow
- Mishap pilot (Lt Col) known for his aggressive flying and grand standing
- All “Lt Colonel” crew
 - Experience ≠ Currency
- Buff receives clearance for 360° turn because a KC-135 is on runway
- Enters “accelerated stall” at 250 ft AGL
- All aircrew fatal – fireball consumed ejecting co-pilot (squadron commander)
- Deputy Commander of Operations convicted for “dereliction of duty”
 - Turned a “blind eye” to:
 - Flying regulations
 - Leadership in subordinates
 - 1st Uniformed top-management accountability for “command influence”

Attitude & Speed Control on Approach to Landing

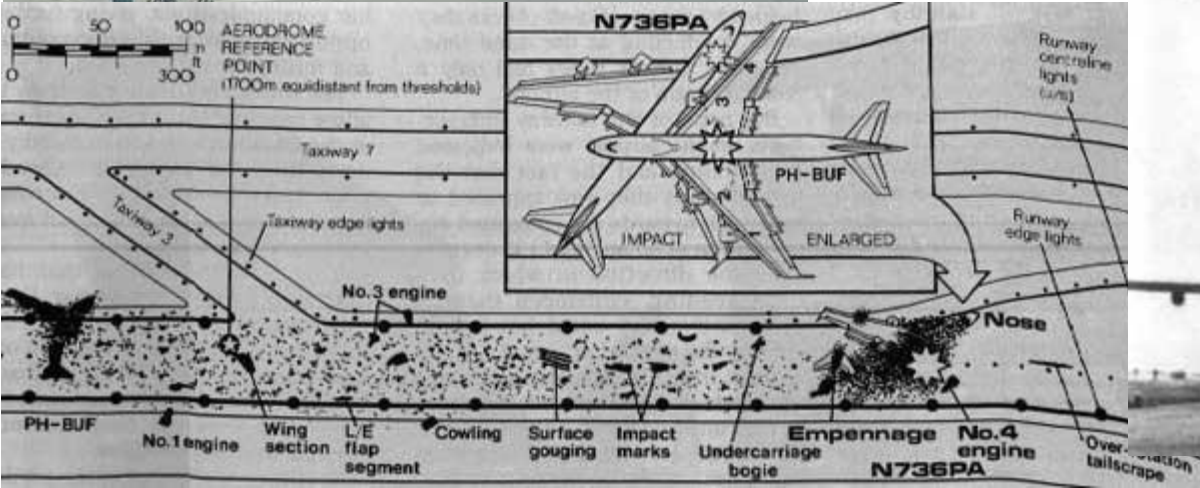
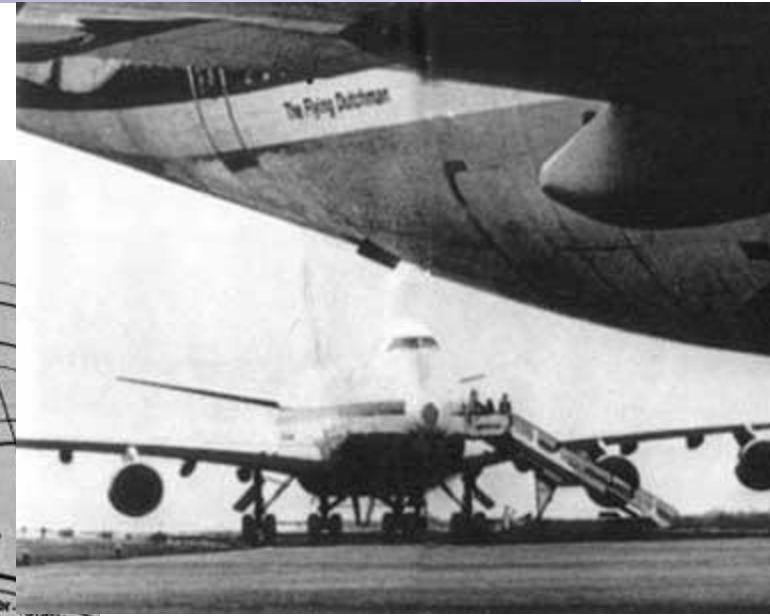
- DC-9 Landing with passengers
- Attitude Performance
- 6 Degrees of Freedom
- Pilot needs to control:
 - Runway alignment
 - Airspeed
 - Rate of Descent



Behold an approach and landing...

Tenerife, Canary Islands

27 March 1977 – Foggy Afternoon



Tenerife: ATC Clears 2 Boeing 747 Aircraft to be on Same Runway as Fog Enshrouds Airfield

KLM Rwy 12
Takeoff

Computer
Simulation



Tenerife continues to hold the dubious distinction as the world's most deadly airplane accident – 583 deaths and 64 survivors



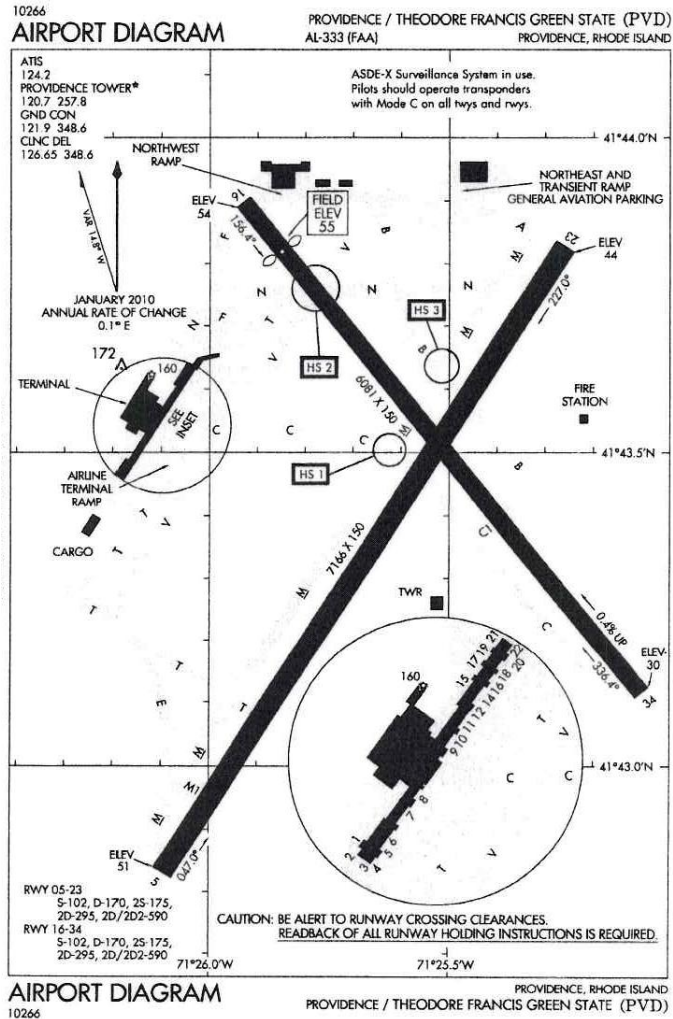
KLM 4805



PanAm 1736

Hero Emerges on a Dark and Foggy Airport Morning

6 December 1999 – Providence, RI



- Controllers cannot see airplanes on ground or in the air
- UA1448 (B-757) lands Rwy 5R and told to use Taxiways N / T to reach terminal
- UA1448 inadvertently gets on “B” and unknowingly gets on active runway
- FedEx 1662 (B-727) takes-off and just misses UA 1448 as it flies over top
- UA 1448 and PVD Ground have considerable communication confusion and arguments
- US Air 2998 – “We’re going to stay clear of all runways until this thing gets sorted out”
“We’ll hold until 1448 is at the gate”

Lessons **ARE** Learned in the Tightly Knit Aviation Community

“We’re kind of like a bunch of brothers. We’re quite close.” ~ L Gordon Cooper

Jimmy Carter's Debacle in the Iranian Desert

24 April 1980

- Joint Force Rescue Attempt: "Operation Eagle Claw"
 - 53 Hostages from State Department
- Pilots from Army
- Ground Rescue by USN-USMC SEALS
- USAF C-130
- 8 Sea Stallions from USS Nimitz in the Persian Gulf
 - Sikorsky RH-53 (S-65)
 - 2 Aborts
- 8 Fatalities following crash from RH-53 air taxi into EC-130
- 5 RH-53 left in Iran
- MC-130 evacuates to Wadi Abu Shihat followed by C-141 medical transport to Ramstein Air Base



How Many Sea Stallions Were Needed?



- 3 RH-53 Electrical Failures
- MX Records – 20 Hrs MTBF
- No practice before hand... “jointness” came about for “recruiting” ads
- No consideration of “sand storms”
- Actually needed 15 minimum Sea Stallions to depart the Nimitz!

Calculations Are NOW Mandatory

$$R(14) = P(T > 14),$$

where T is exponential with $\lambda = 1/20$

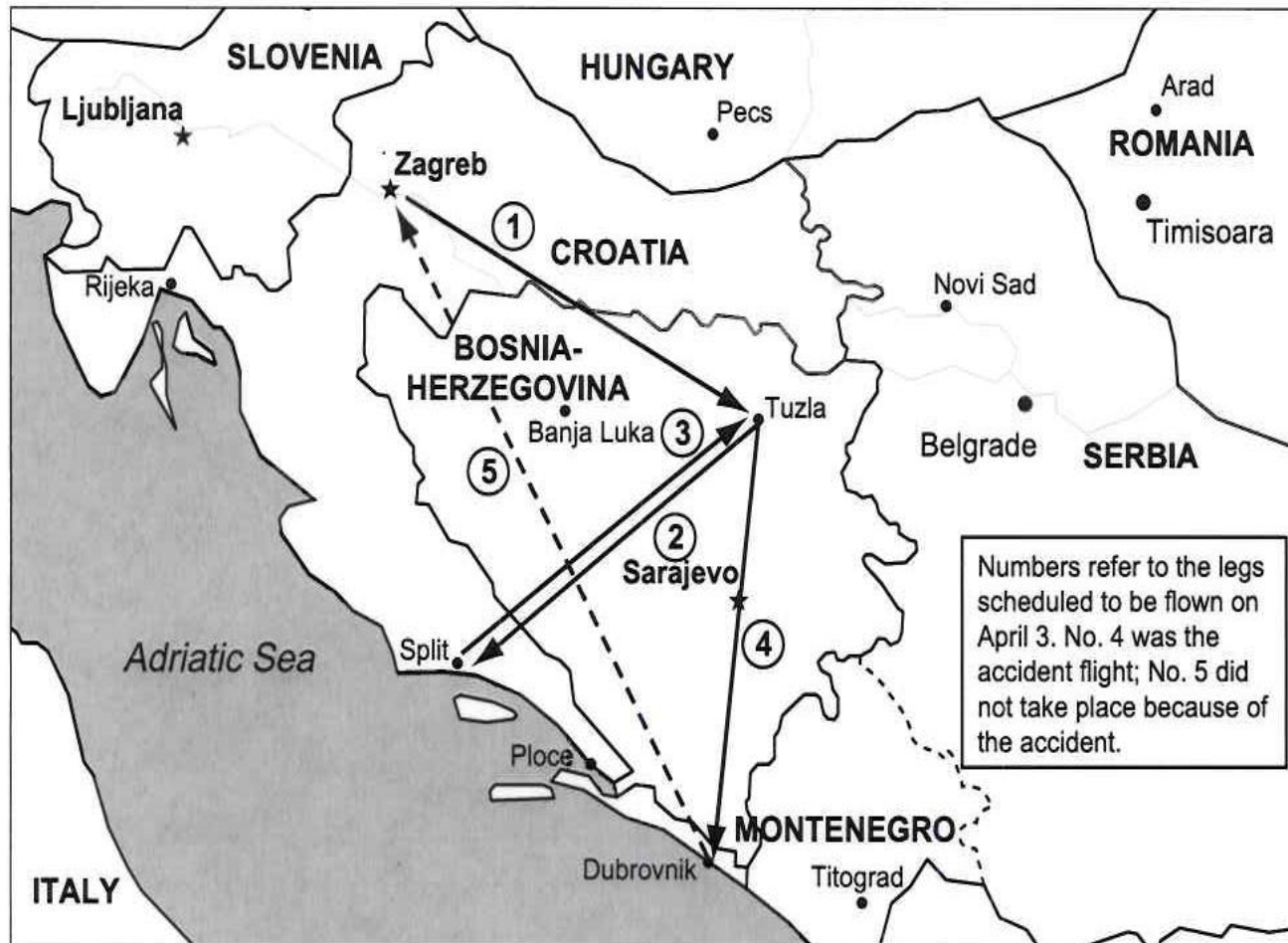
$$R(14) = e^{-(1/20)14} = 0.4966 \approx 0.5$$

$$\begin{aligned} P(X \geq 6) &= P(X > 6) + P(X = 7) + P(X = 8) \\ &= 0.1094 + 0.0312 + 0.0039 \\ &= 0.1445 \end{aligned}$$

Round-up to 15

Dubrovnik, Bosnia-Herzegovina and Another T-43 (Yugoslavia falls into civil wars after Tito dies)

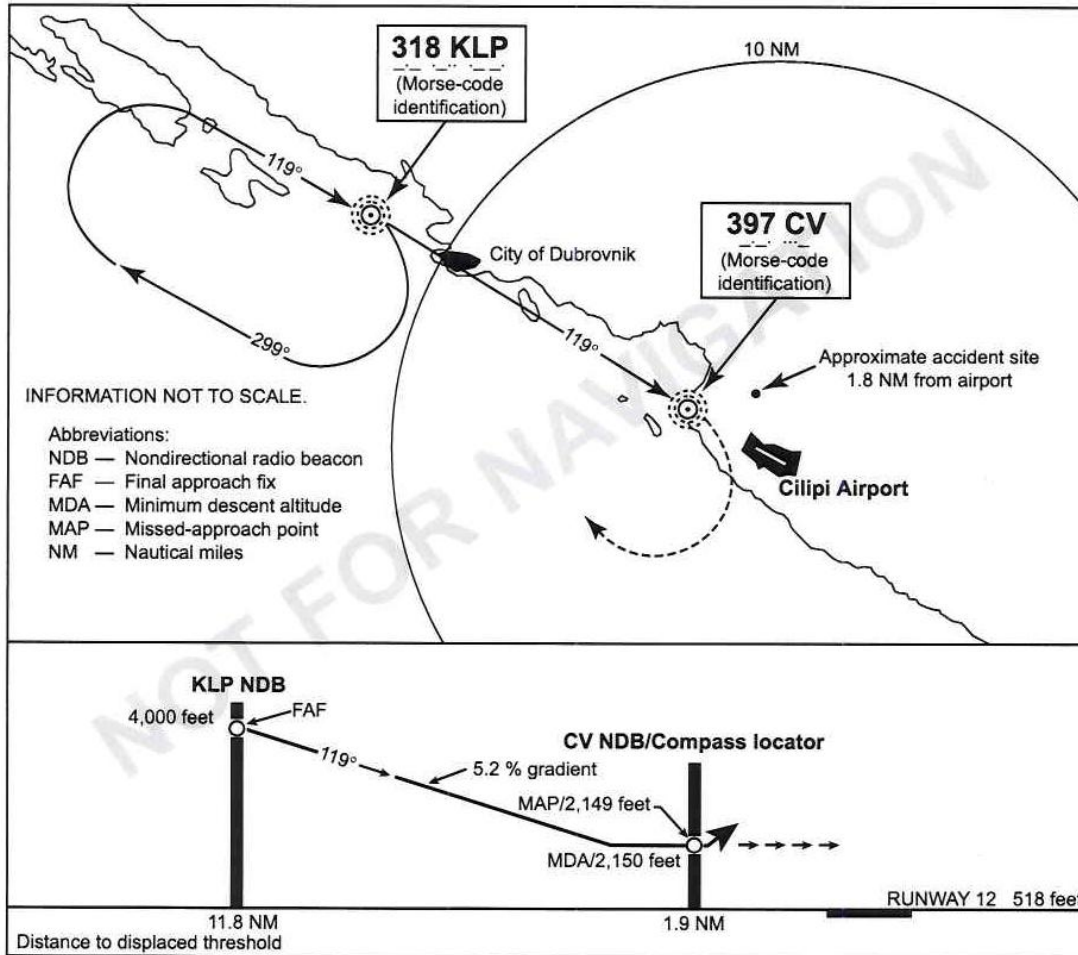
Itinerary for U.S. Air Force CT-43A, April 3, 1996



Source: U.S. Air Force

NDB Instrument Approach into Dubrovnik

Illustration of NDB Approach to Runway 12, Cilipi Airport, Dubrovnik, Croatia



Source: Adapted from Accident Investigation Board Report United States Air Force CT-43A 3 April 1996 Dubrovnik, Croatia.

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FACTS

Requires two (2) separate and independent NDB nav aids to fly the approach

The T-43 (Boeing 737) has a grand total of one (1) NDB

US Air Forces in Europe (USAFE) issued the T-43 crew a special written waiver to fly and land throughout Europe on approaches below HQ Air Force published approach and landing minimums

T-43 Impacts Terrain at 120 KIAS



- Crew had previously flown into airport once in day VMC
- Crew attempted to fly the approach on the T-43's single NDB
- Crew recognized their dangerous position following a brief "peak" through the clouds / fog
- Impact occurs 75 feet below the mountain top in a climb
- Secretary of Commerce, Ron Brown, is the key passenger on a trade mission from President Bill Clinton
- Tremendous "command influence" is on the pilots to make Brown's itinerary and schedule happen
- Mishap investigation becomes a political football
- Finding / Cause / Remedy: HQ USAFE – to include its 4-Star General Officers – cannot lower HQ Air Force minimums

The 1st and Only T-43 Destruction – 100% Preventable



- Aircraft 73-1149 before and after photos
- 1149 Received new paint job when it was “pulled” from the downsizing navigator training program and reassigned to “executive transport”

- Aircraft Commander had many years of KC-135 flight time
- Co-pilot was a former T-38 Instructor Pilot on his second assignment (and trained by the top T-43 IP of all time)



The Passionate USAFA Cadet Pilot

1

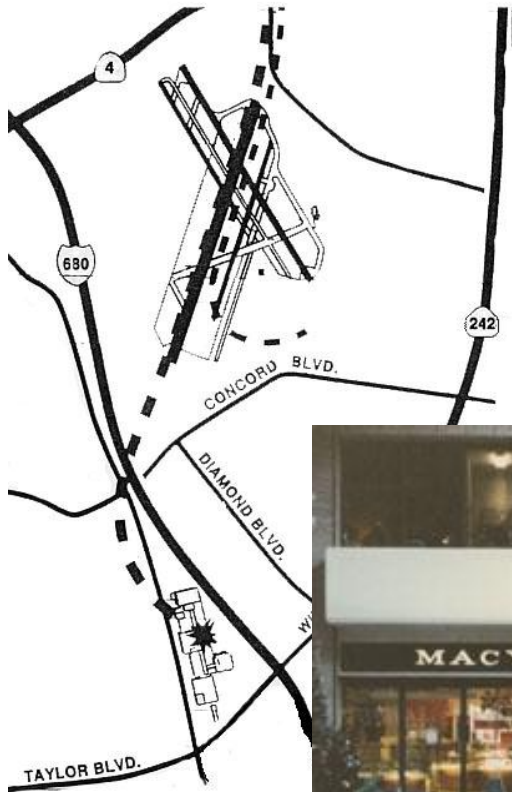


2



- Good student, working on private pilot license
- Wants to attend SUPT and become a fighter pilot
- Incident #1: Cadet reported rough air while doing ground reference maneuvers
- Incident #2: Cadet reported fuel starvation from a leak not detected during preflight (two weeks after 1st incident)
- The “Billy-Jeff” Factor (without compartmentalization) in action

Sun Valley Mall: Concord, CA – 23 December 1985



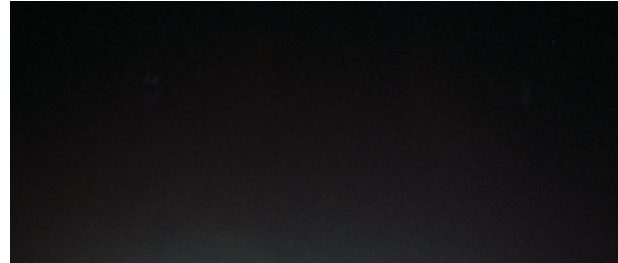
- Foggy, 8:33 PM (local)
- Baron traveling from Oakland to Concord with 3 people on board
- Instrument rated pilot last transmission was with Travis Approach before switching to Buchanan Field Tower inbound on 19R
- Pilot lost control (stall) on missed approach climb into dense clouds and impacted glass ceiling of the 3 story mall filled with Christmas shoppers
 - Napalm drop in 'Nam similarity
 - 83 Treated for burns / cuts
 - 4 Burn fatalities
- Insurance company made the entire \$5 million policy available in March 1993

Piper Saratoga PA-32R

16 July 1999, N9253N



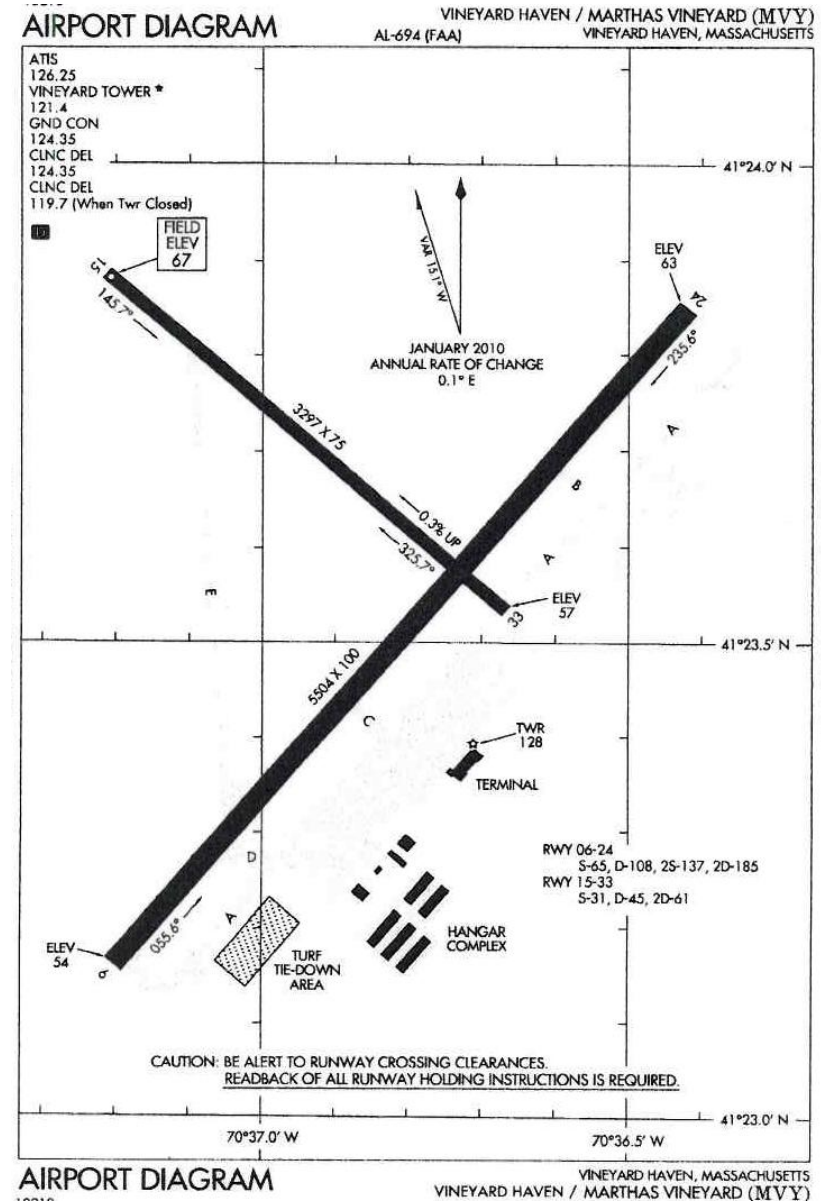
Saratoga Pilot at Night, Low Visibility, Non-Current



Night Haze
~ No Moon ~
Forward Visibility

FAA requires in the preceding 90 calendar days, 3 night landings to a full-stop in order to carry passengers

- Autopilot can fly to center of airfield
- 7 “Clicks” on pilot microphone illuminates ALL runway and taxiway maximum lighting intensity
- Airplane attained “red line” in spin



Tracy, CA: CAVU Mid Air Collision 24 August 1989

- Computer animation approved for use in the liability trial by California Supreme Court



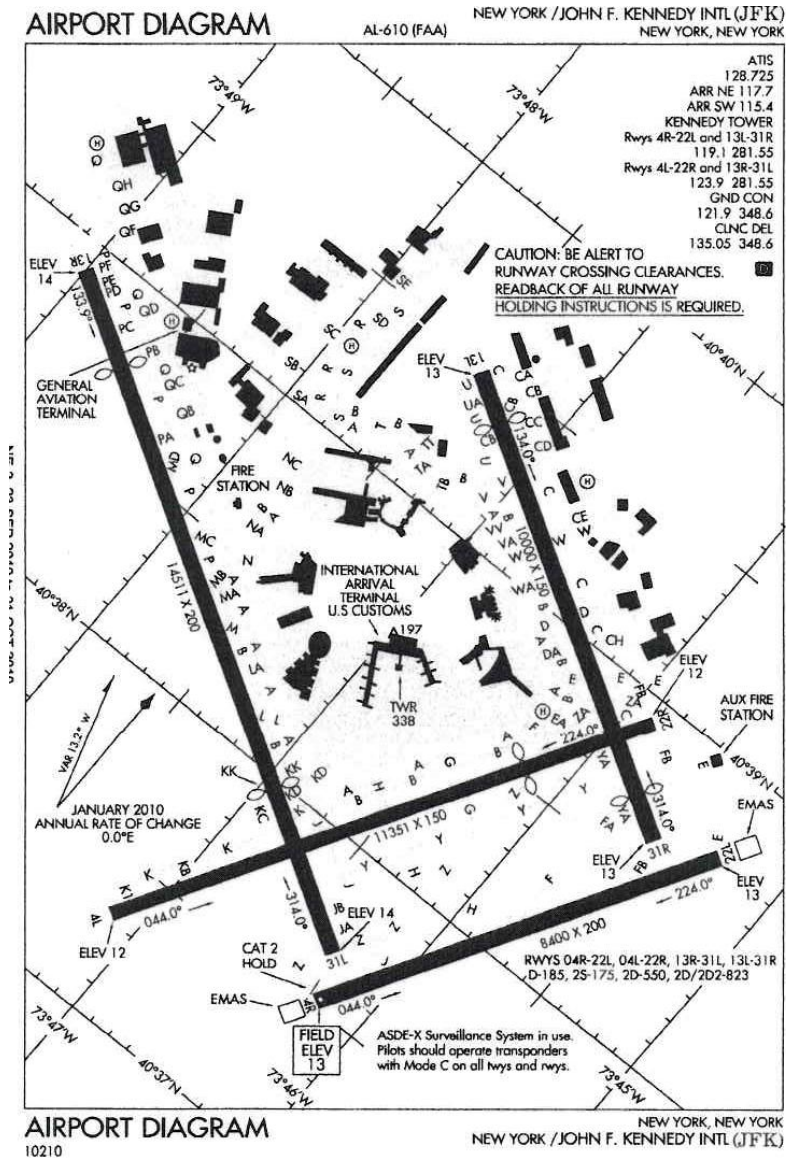
Baron (N9750Y) had taken off from Sacramento Executive (SAC) enroute to Santa Maria (SMX) 5,500 MSL 185 knots and 180 degrees track

“See and Avoid” does not always work

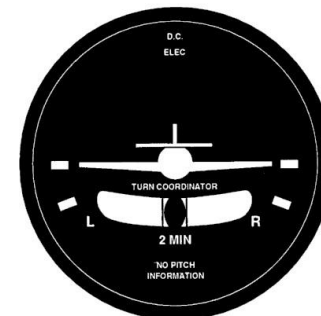
Cessna (N42695) had taken off from San Rafael (DVO) enroute to Fresno (FAT) and flying SE direction 5,500 MSL 147 knots on track of 118 degrees



JFK Baron Emergency – Handling “Stress”



- Beech Baron (N821BE) advises Center that he is “having trouble” in the clouds and could use some help
 - Commercial pilot, 600 Hours
- Controller initially handles as “routine”
- Delta 623 (DC-10 Captain) recognizes the situation as a severe emergency
 - Automatically orbits NYC at FL240 and talks young pilot through basic aircraft control and recovery
- Both pilots deviated from “routine” which was right thing to do
- Baron’s left aileron disconnected
 - 10,000 Ft altitude loss in 36 seconds!
- DC-10 Captain credited with “Save”



Imitating NASA at a Non-Towered Airport



12 Dec 1999 (Sunday) Plant City, FL



Eastern Airlines Flight 401 and the L-1011



L-1011 TriStar



Advanced Jumbo Jet

- New York to Miami flight went in holding over the Everglades because of a nose-gear light not illuminating on 11:32 PM approach
 - 29 December 1972
 - Airplane 4 months old
- No one on flight deck was consciously flying the airplane
 - 4 Pilots fixated on landing gear position light
 - No one cross-checking altitude of 2,000 feet
 - Everglades is a “black hole” – no reference lights all directions
- Maintenance had replaced an inoperable L-1011 control yoke with a B-727 control yoke
- B-727 control yoke movement disengages L-1011 autopilot at 14 pounds of pressure vice 27 pounds of pressure for the L-1011 yoke
 - Captain (#50 on line list) leaned into yoke, disengaging it
- Everglades “muck” absorbed impact energy and stopped bleeding
 - Microbes in muck caused other health concerns
- CRM – Cockpit Resource Management initiated post-crash

C-5 Galaxy



- Largest airplane in the entire Air Force fleet
- Based at Travis AFB, CA and Dover AFB, DE
- Dover Reserve crew departing for the Middle East in one of the 33 (down from 77) C-5 airplanes is the story of interest, but first some facts...

C-5 Facts



- Becomes operational 67 years after Orville and Wilbur proved manned flight possible
- Entire flight of Orville and Wilbur could occur inside the fuselage's cargo bay... with room to spare
- C-5 can hold and airlift:
 - 2 M-1 Abrams tanks
 - 19 Greyhound buses
- C-5 Galaxy fuel weight alone equals the entire maximum gross weight of its smaller and “middle” brother, the C-141 Starlifter
- It's the ultimate strategic airlifter in terms of capacity and ability to be air refueled
- Mishap crew experiences failure of Engine #2 ...

And on a rainy 4 April 2006 morning...



Ejections and Mishaps

- Ejections 2,000 feet AGL and higher
 - 95% Survivability rate
- Ejections < 2,000 Feet AGL
 - < 90%
- Mishap Rate per 100,000 hours of flying time
 - 1947 45.00
 - 1986 1.47
 - 2009 1.32

Alcohol Consumption and Pilots

- Air Force: Demonstrate no adverse effect
- FAA: “8 hours Bottle-to-Throttle” rule
- U.S. Navy (December 1986) – Simulator study with Control Groups
 - Aircraft: P-3 Orion and F-14 Tomcat
 - 3 Phase Assessment
 - Phase I – All pilots perform a flight profile to include a routine emergency and instrument approaches
 - Phase II – All pilots (other than control group) consume alcohol and attain blood-alcohol content of 0.10
 - Pilots perform Phase I flight simulator profile
 - Phase III – assess pilot performance for next 10 days following Phase II completion
 - Pilots perform Phase I flight simulator profile

Insurance Hull Rate Table – MBB Project

	HULL RATES:		MEDIUM TWIN	
	Beech 58TC, 58P			Beech Duke
	Cessna 414		Cessna 401	Piper PA60 Aerostar
INSURED	Cessna 421		Cessna 402	All Other Commanders
VALUE	Piper PA31 Navajo		Commander 500	All Others
Up to \$75,000	\$3.50	\$5.00	\$6.25	\$7.50
\$75,000 to \$95,000	\$2.50	\$3.50	\$4.38	\$5.25
\$95,000 to \$115,000		\$1.50	\$1.88	\$2.25
\$115,000 to \$135,000		\$1.40	\$1.75	\$2.10
\$135,000 to \$155,000		\$1.30	\$1.63	\$1.95
\$155,000 to \$175,000		\$1.22	\$1.53	\$1.83
\$175,000 to \$195,000		\$1.16	\$1.45	\$1.74
\$195,000 to \$215,000		\$1.10	\$1.38	\$1.65
\$215,000 to \$235,000		\$1.07	\$1.34	\$1.61
\$235,000 to \$255,000		\$1.04	\$1.30	\$1.56
\$255,000 to \$275,000		\$1.01	\$1.26	\$1.52
\$275,000 to \$295,000		\$0.98	\$1.23	\$1.47
\$295,000 to \$315,000		\$0.95	\$1.19	\$1.43
\$315,000 to \$335,000		\$0.93	\$1.16	\$1.40
\$335,000 to \$355,000		\$0.91	\$1.14	\$1.37
\$355,000 to \$375,000		\$0.89	\$1.11	\$1.34
\$375,000 to \$395,000		\$0.87	\$1.09	\$1.31
\$395,000 to \$415,000		\$0.85	\$1.06	\$1.28
\$415,000 to \$435,000		\$0.84	\$1.05	\$1.26
\$435,000 to \$460,000		\$0.83	\$1.04	\$1.25
\$460,000 to \$490,000		\$0.82	\$1.03	\$1.23
\$490,000 to \$525,000		\$0.81	\$1.01	\$1.22
\$525,000 & Over		\$0.80	\$1.00	\$1.20

Corporate Jet Performance Summary Tables (MBB)

Model	DIMENSIONS			ENGINE			Pax Seats	Range	DISTANCE		SPEED		Fuel Load	WEIGHTS			Number in Service	
	Length	Width	Ht - Int	Model	Thrust	Alt			T/O	Lndg	M mo	Cruise		Ramp	T/O	Lndg		Zero
Beechcraft																		
400A	48.4'	43.5'	4.8'	P&W	2900	45	7/9	1635	4082	2830	0.78	447	4,912	16,300	16,100	15,700	13,000	67
				JT15D-5														
Cessna Citation																		
500	43'6"	47'		P&W	2200	41	6/7	1131			0.7		3,780		11,850			336
				Citation I														
525	42.6'	46.8'	4.8'	R-R/Wm	1900	41	5/6	1275	2960	2800	0.71	380	3,220	10,500	10,400	9,700	7,900	20
				CitationJet														
550	47.2'	52.2'	4.8'	P&W	2500	43	6/11	1662	2990	2270	0.71	374	4,972	14,300	14,100	13,500	11,800	832
				Citation II														
550B	47.3'	52.2'	4.69'	P&W	2750	43	2/7	1900	3400	3010	0.7	394	4,860	14,500	14,300	13,500	11,000	
				Bravo														
560	48.9'	52.2'	4.8'	P&W	2900	45	7/13	1596	3160	2920	0.75	427	5,771	16,500	16,300	15,200	12,200	229
				Citation V														
560XL	52.1'	55.7'	5.7'	P&W	3640	45	2/8	2055	3414	3315	0.75	430	6,540	18,900	18,700	17,400	13,400	
				Excel														
650	55.5'	53.5'	5.7'	Garrett	3650	51	7/13	1855	5180	2900	0.83	463	7,329	22,200	22,000	20,000	15,900	202
				Citation III														
660	55.5'	53.5'	5.7'	Garrett		51	7/13	1770	4950	3000	0.83	462	7,329	22,650	22,450	20,000	16,500	26
				Citation VII														
670	58'8.5"	59'0"	5'10"	Garrett	4000	51		2710	4900	2700	0.82	462	8,700	24,200	24,000	20,000	16,400	30
				Citation IV														
750	72.2'	63.9'	5.7'	Allison	6000	51	8/15	3004	5100	2900	0.9	513	13,000	34,800	34,500	31,000	23,000	2
				Citation X														
Gulfstream																		
II	79.9'	71.7'		RR	11400	43	12	3361			0.85		26,800	65,900	65,500			246
				Spey Mk511-8														
III	83.1'	77.8'		RR	11400	45	14/19	3728			0.85	488	28,300	70,200	69,700			178
				Spey Mk511-8														
IV	88.3'	77.8'	6.1'	RR	13850	45	14/19	4033	5280	3386	0.88	480	29,280	75,600	74,600	66,500	49,000	209
				Tay Mk 611-8														
V			6.1'					6500			0.8							0

Insightful Safety Quotes

- I've never had an experience of leaning to respect two people more than I do the Wright Brothers. They were innovative. They couldn't be stopped. And they were so open minded that no matter what problem presented to them, they found a solution.
~ Scott Crossfield
- Never fly the 'A' model of anything. ~ Ed Thompson
- Never put yourself in a situation where a pathologist administers your final flight physical.
~ Chuck Yeager
- When a prang seems inevitable, endeavour to strike the softest, cheapest object in the vicinity, as slowly and gently as possible. ~ RAF pilot advice during W.W.II
- If you're faced with a forced landing, fly the thing as far into the crash as possible.
~ Bob Hoover
- You're not scared... there's got to be an opening, there's got to be a backdoor.
~ Scott Crossfield
- You've got to expect things are going to go wrong. And we always need to prepare ourselves for handling the unexpected. ~ Neil Armstrong
- That's what we're trained to do. ~ Chesley B. 'Sully' Sullenberger III

Insightful Safety Quotes

- Always know where your nose is relative to the horizon, along with the requisite thrust and control inputs to maneuver the aircraft to a stable, wings level attitude on the horizon... and keep it there. ~ Gregg Monaco
- Landings. A good landing is any landing from which you, the pilot, can walk away from unassisted. A great landing is one in which the airplane can immediately be used again. ~ Anonymous
- It's a very sobering feeling to be up on a test flight and realize that one's safety factor was determined by the lowest bidder on a government contract.
~ Alan Shepard

MAINTAIN AIRCRAFT CONTROL
STOP – THINK – COLLECT YOUR WITS

Aviate – Navigate – Communicate

FLY THE AIRPLANE

~ Section 3, Page 1

Air Force Tech Order for EVERY Airplane

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