TWA 800
Accident Overview

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TWA 800 Accident Overview Agenda

- Overview of the Accident Investigation
- Airplane Recovery and Reconstruction
- Review of 747 Configuration
- Airplane Break-up Sequence
- Conclusions from NTSB Investigation

Overview of the Accident Investigation

Parties to the Investigation: NTSB, FBI, FAA, Boeing, TWA, International Association of Machinists (IAM), Aerospace Workers and Flight Attendants (AWFA), Air Line Pilots Association (ALPA), National Air Traffic Controllers Association (NATCA), Pratt & Whitney, Honeywell, and HydroAire

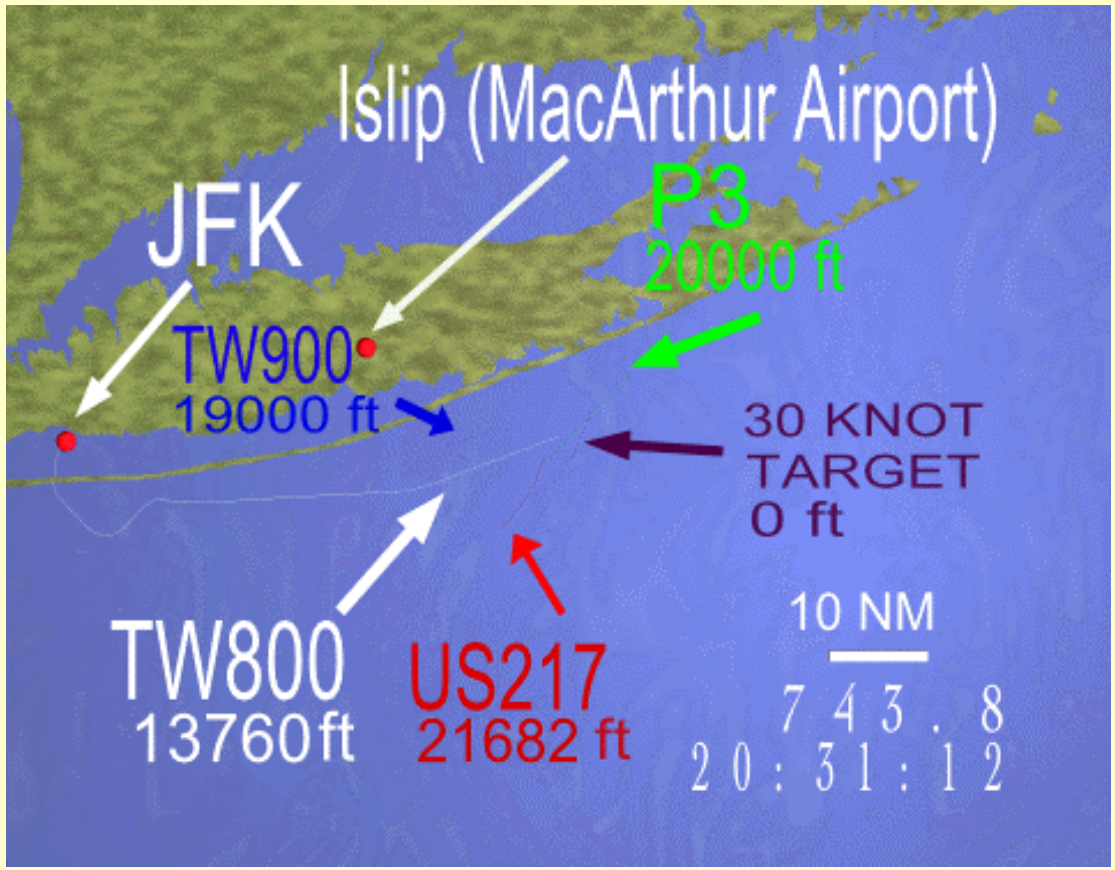
Overview of the Accident Investigation

- TWA 800 was a 747-100, l/n 153, delivered in 1971 (93,303 hours/16,869 flights)
- Operated on an IFR flight plan under provisions of Title 14 CFR Part 121
- The airplane left JFK after being delayed for approximately one hour

Overview of the Accident Investigation

- Uneventful take-off and climb, minor hold at 13,000 feet, followed by a very sudden event at 13,800 feet
- At 8:31pm EST TWA 800 crashed into the Atlantic Ocean 8 miles South of East Moriches, NY, killing all 230 people on board

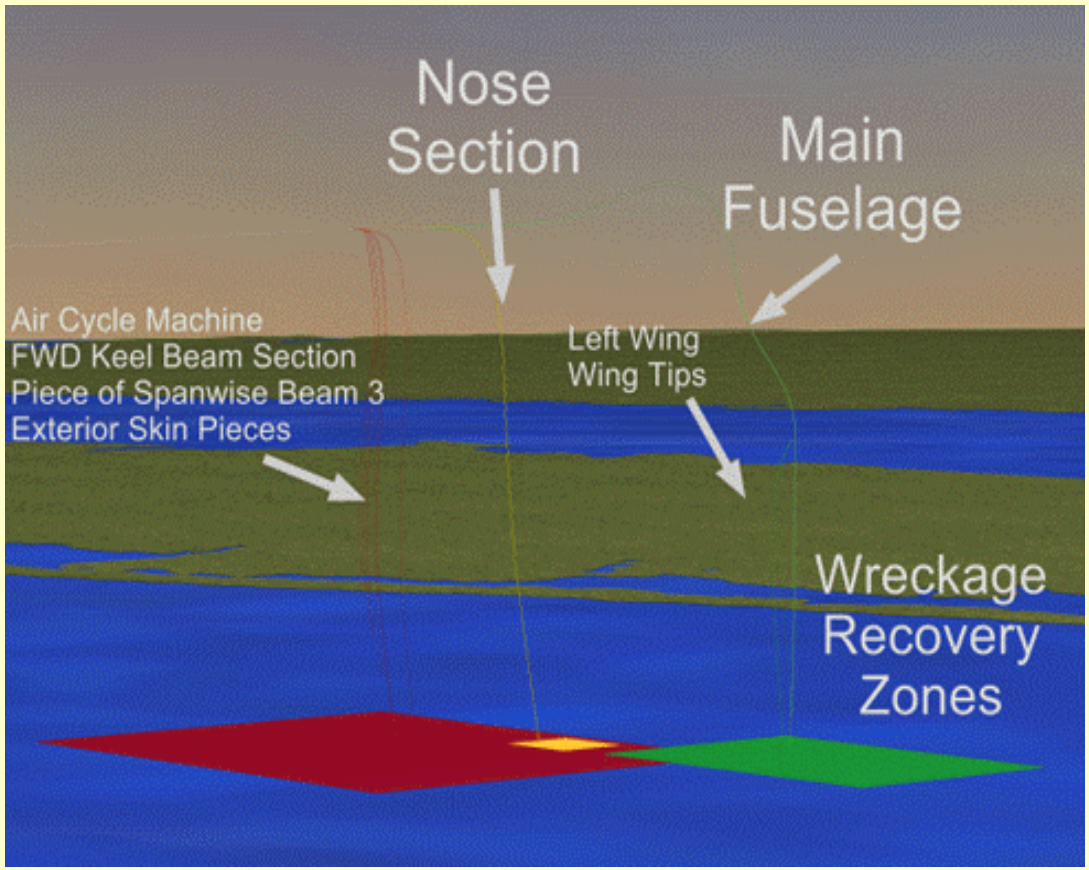
Overview of the Accident Investigation



Airplane Recovery

- Recovery Participants: US Navy, US Coast Guard, Oceaneering, Underwater Search & Survey, National Oceanic and Atmospheric Administration, National Guard, and dive teams from various counties
- All 230 victims were recovered
- 95% of the airplane was recovered

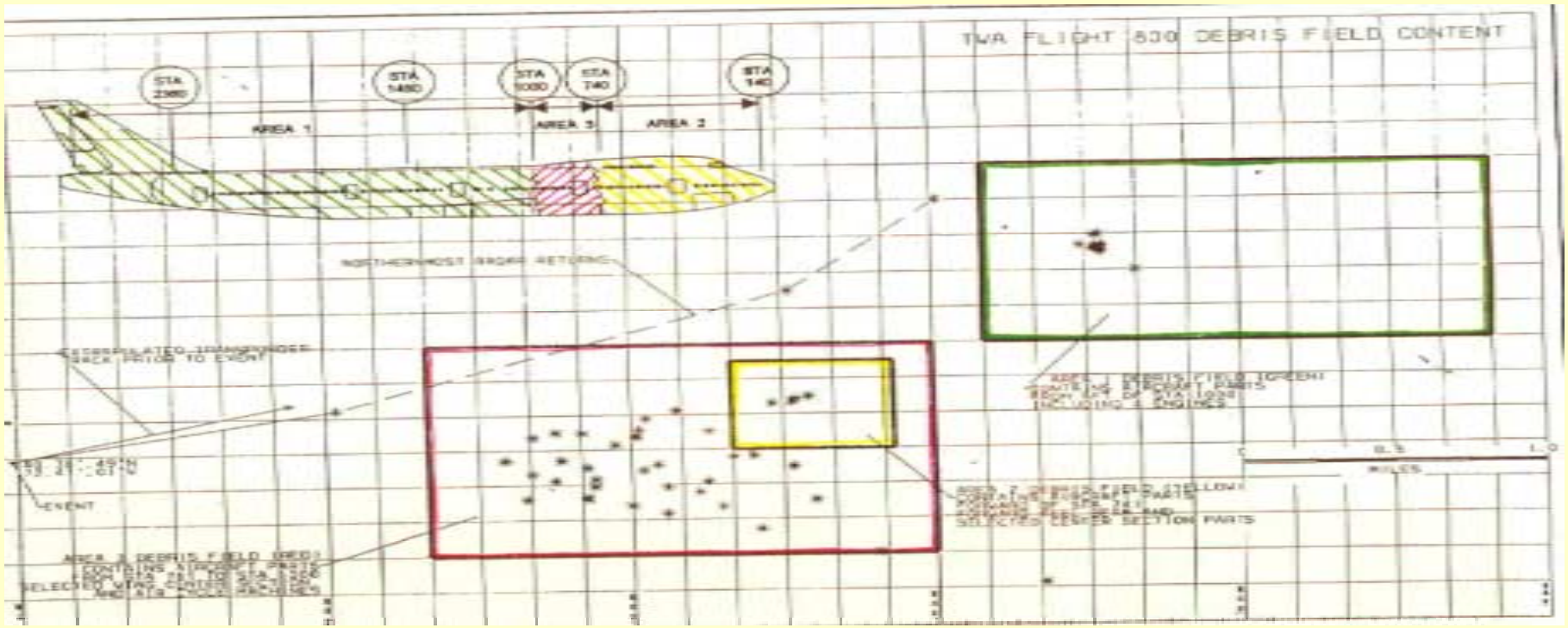
Airplane Recovery



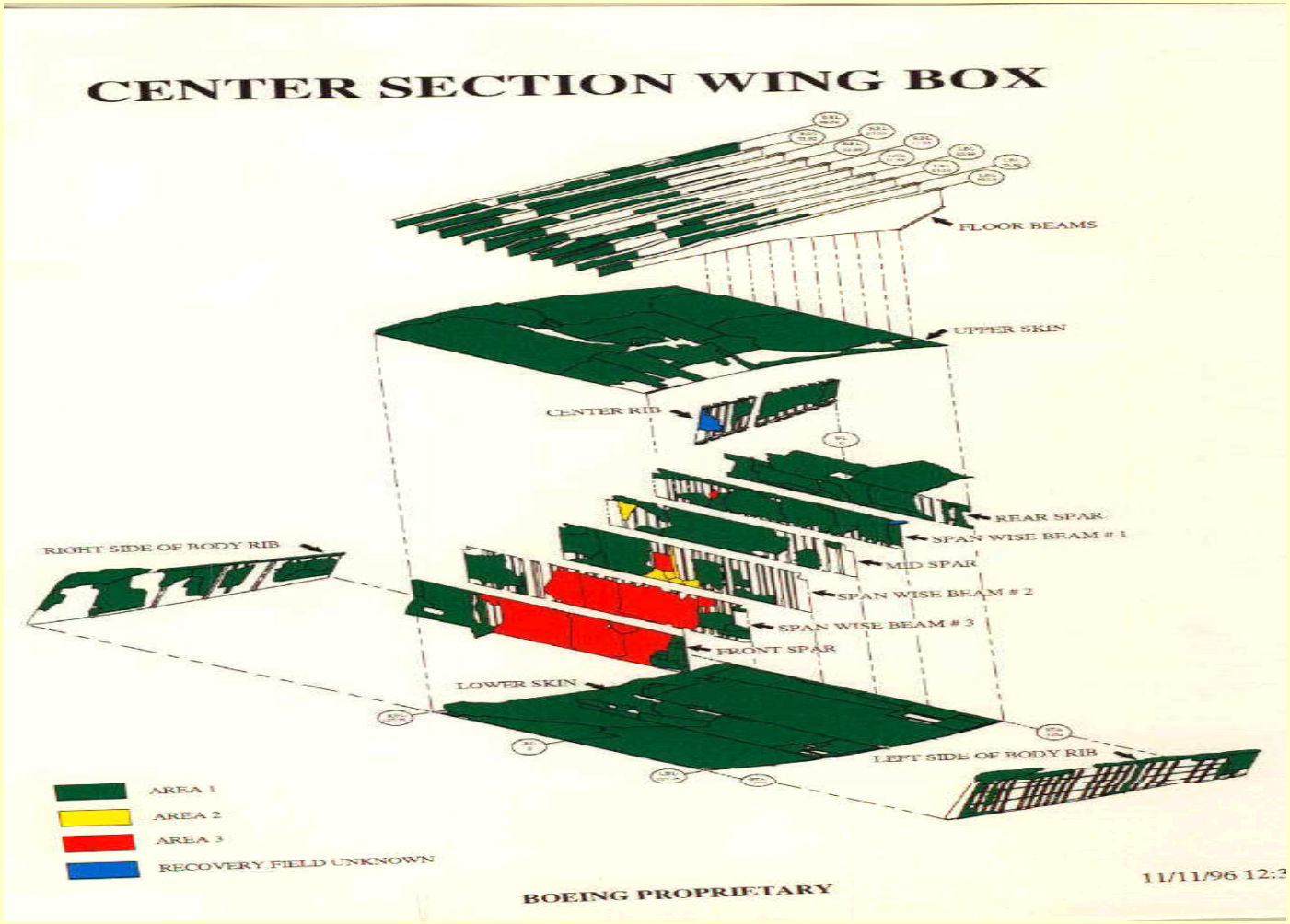
Airplane Recovery

- First pieces from the airplane were:
  - pieces of the Center Wing Tank (CWT)
  - Forward keel beam
  - Pieces of the fuselage just forward of wing
  - Air conditioning packs
- Nose section came down as one assembly
- Wings/aft fuselage came down later, with mid- air break-up(s)

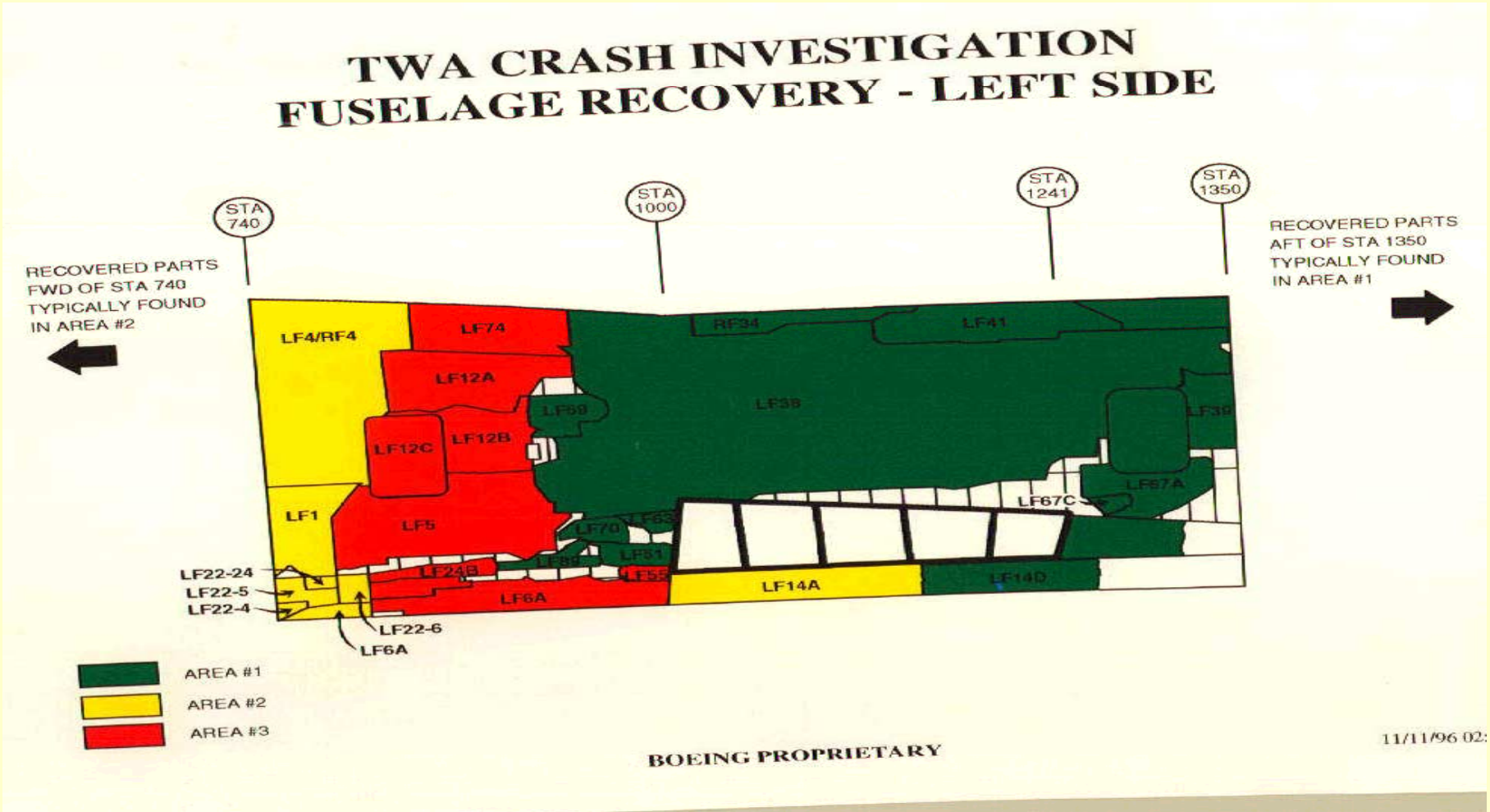
Airplane Recovery



Airplane Recovery



Airplane Recovery



Airplane Reconstruction

- Three Dimension reconstruction from station 520 to station 1640
- Reconstruction contains 876 pieces of the wreckage
- Reconstruction weighs 60,000 lbs
- Reconstruction took 2 months to build

Airplane Reconstruction

Airplane Reconstruction

Airplane Break-up Sequence

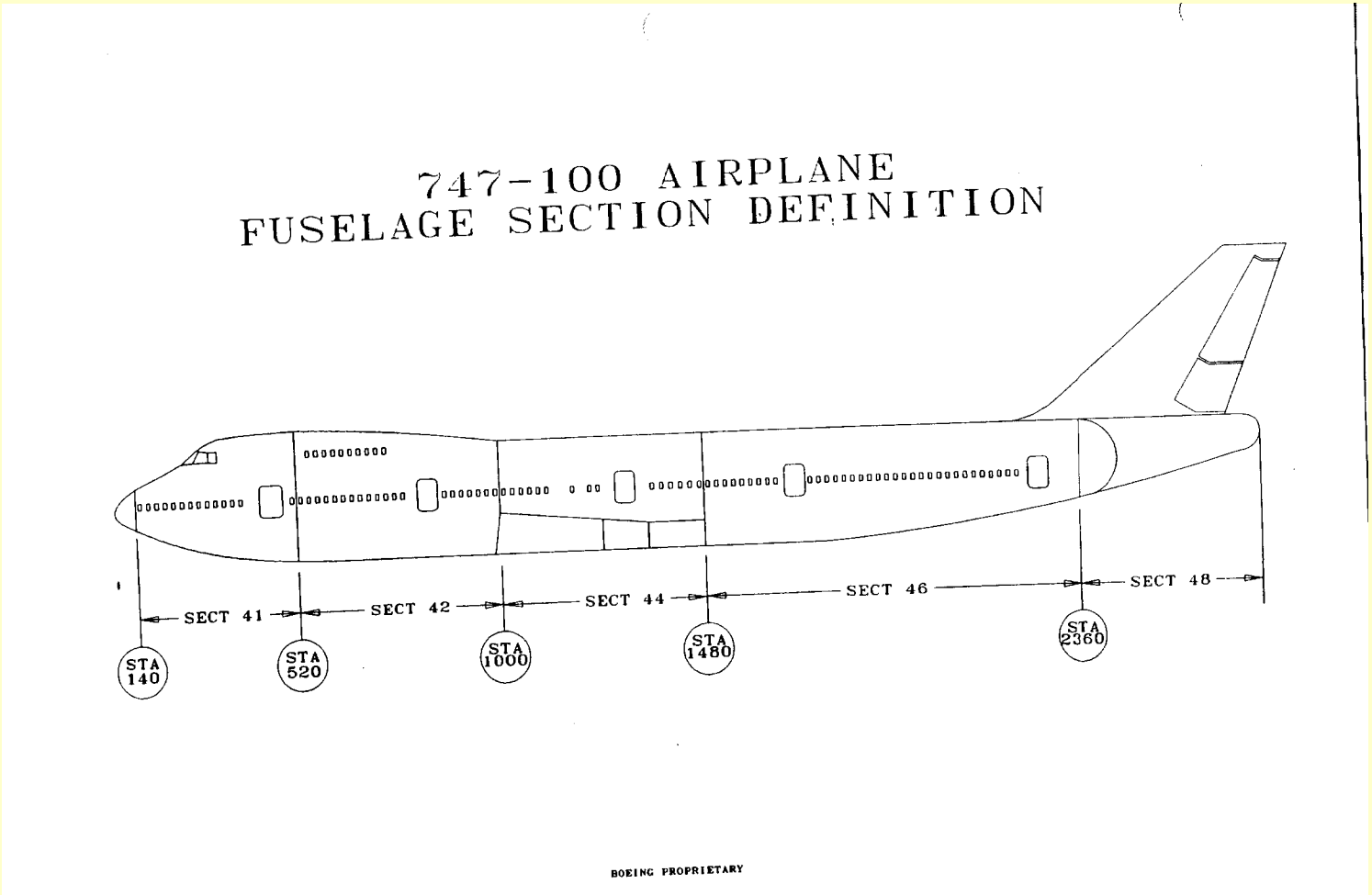
18 investigative teams were formed to look at different aspects of the accident: Systems, Structures, Propulsion, Flight Data Recorder, Medical Forensic, Fire and Explosion, Airplane Operations, etc.

Airplane Break-up Sequence

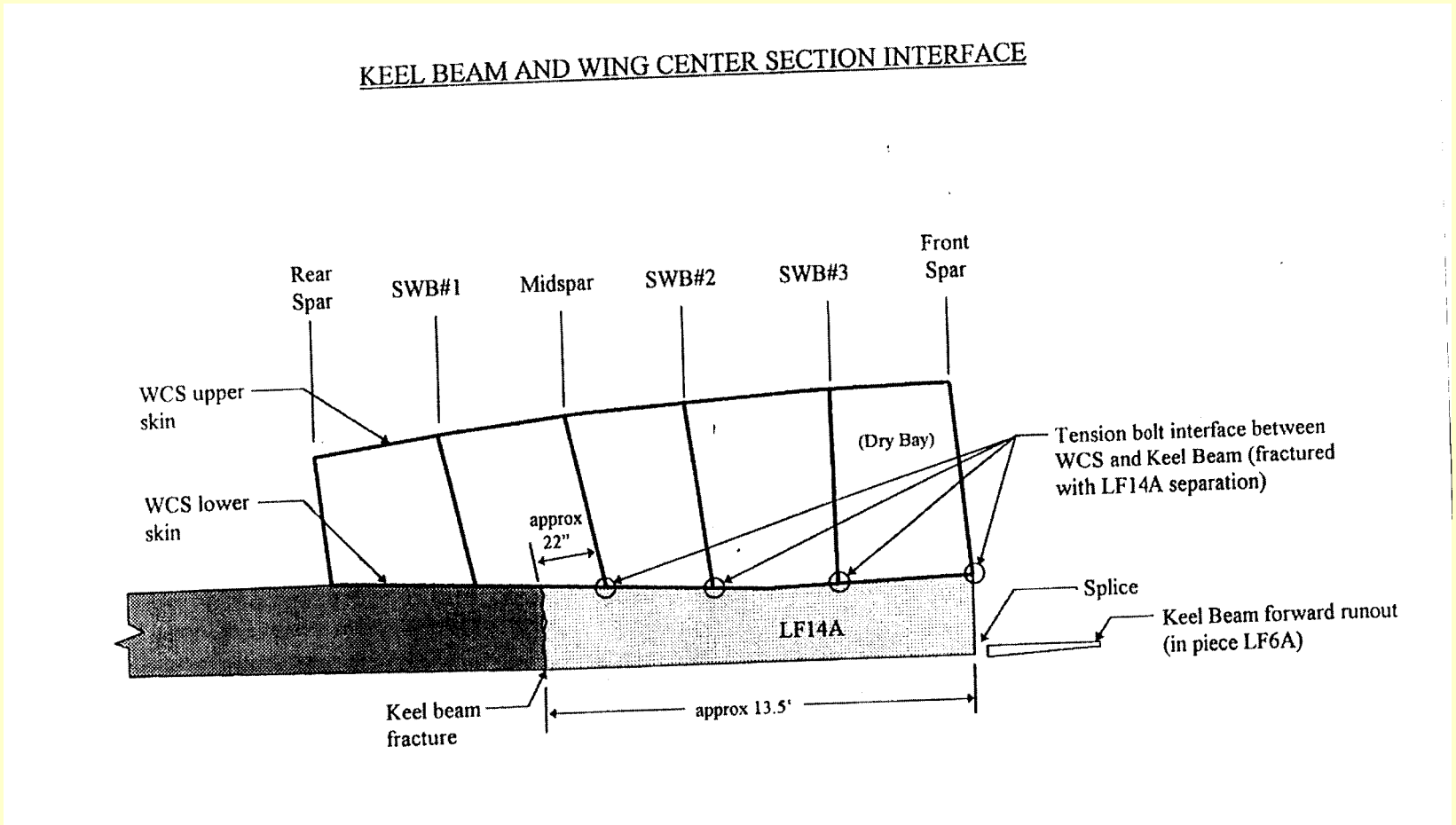
The Metallurgy and Structures Sequencing group was formed to evaluate the sequence of the structural break-up and correlate proposed scenarios with structural observations.

- wreckage recovery location and damage
- examination of wreckage fractures
- examination of soot and fire damage
- verification of sequencing conclusions

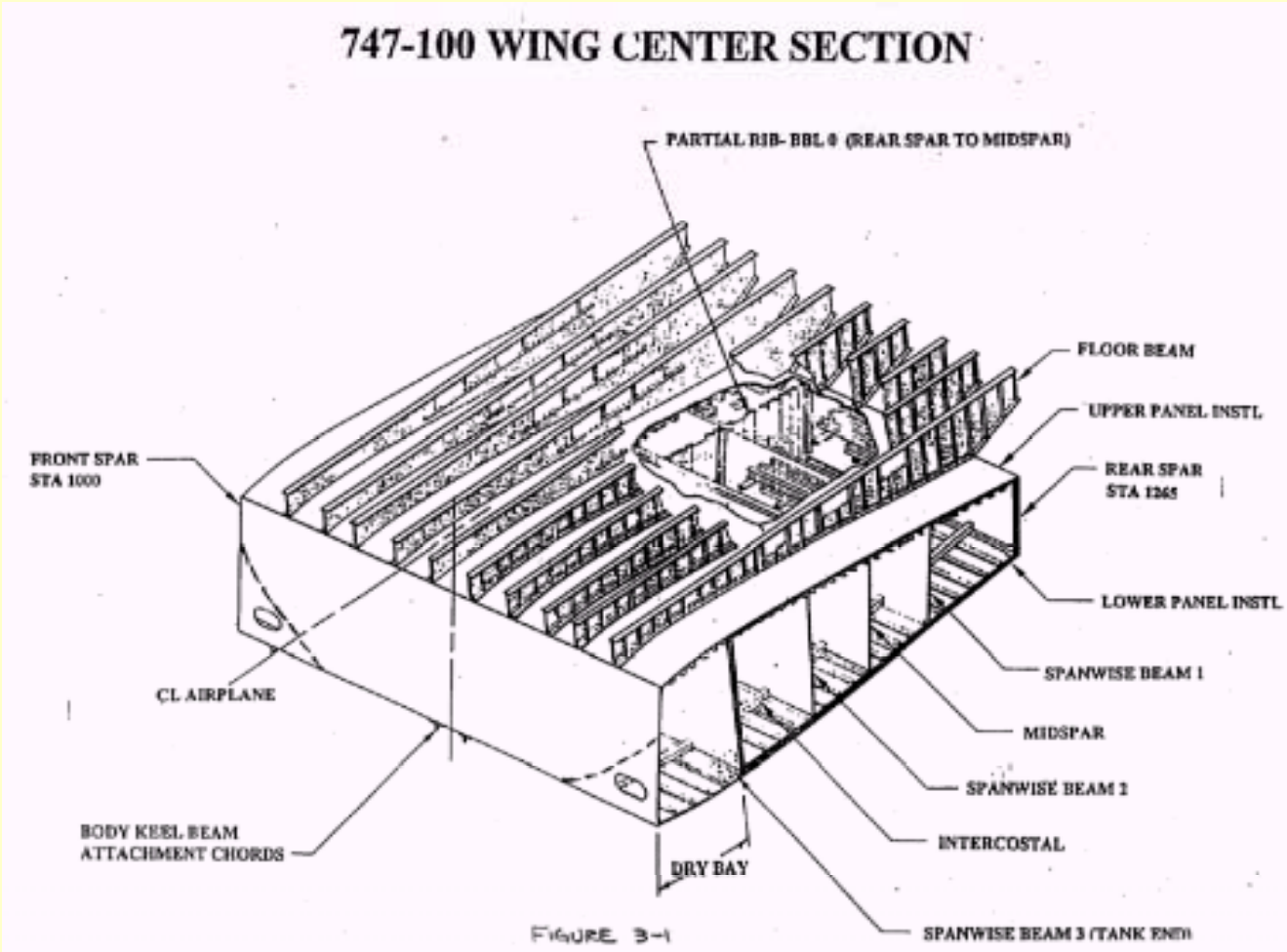
747-100 Airplane Review



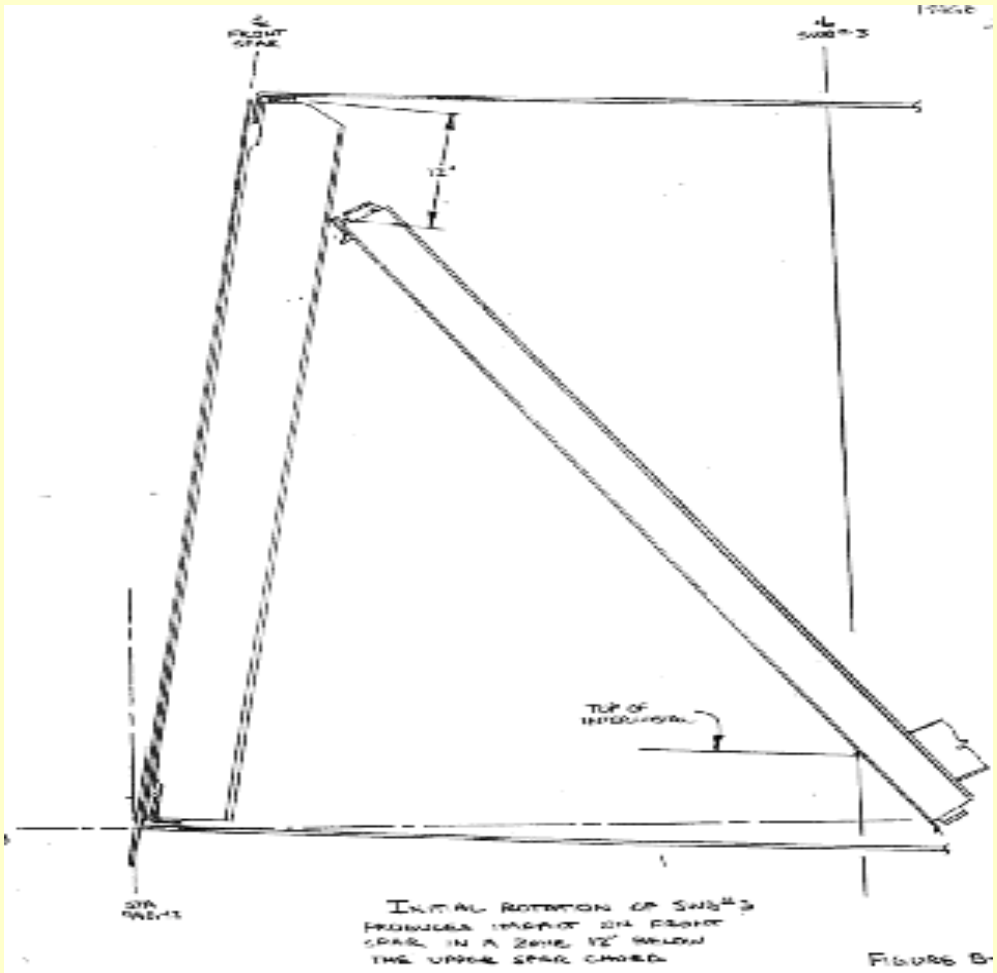
747-100 Airplane Review



747-100 Airplane Review



Airplane Break-up Sequence



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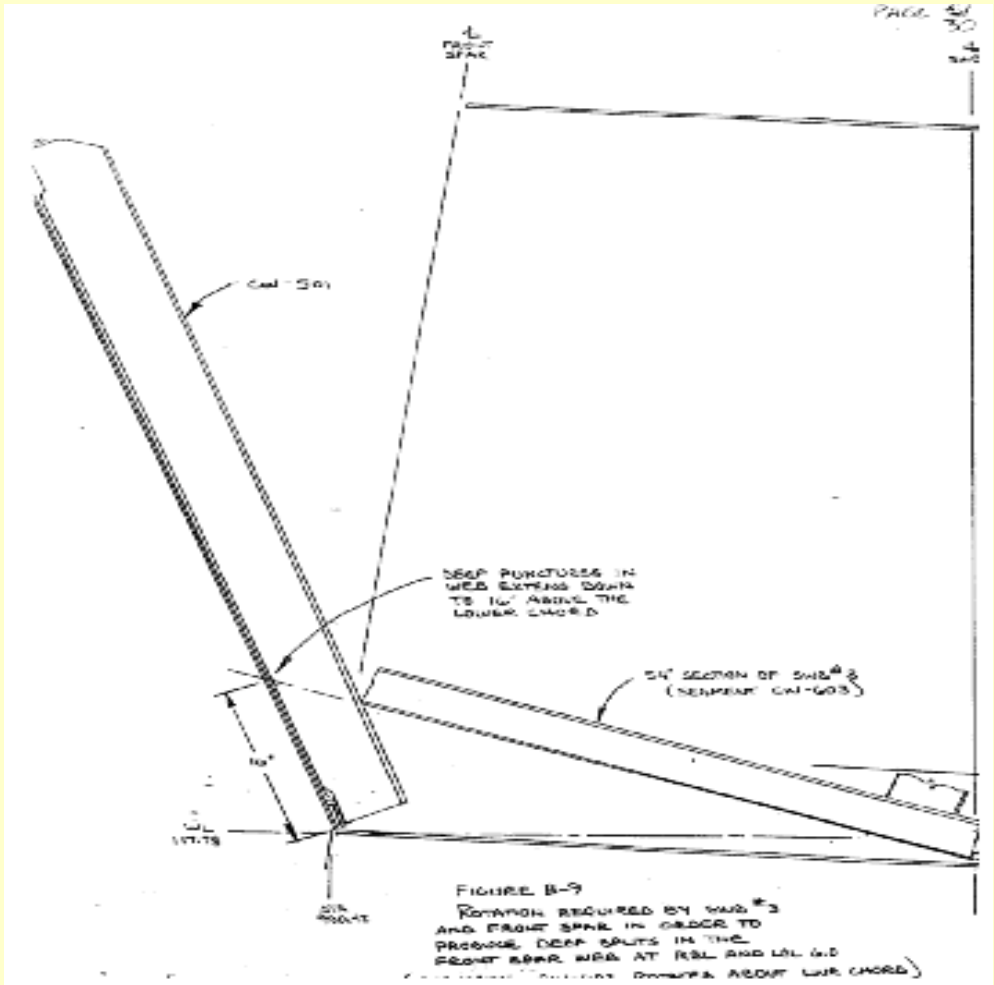
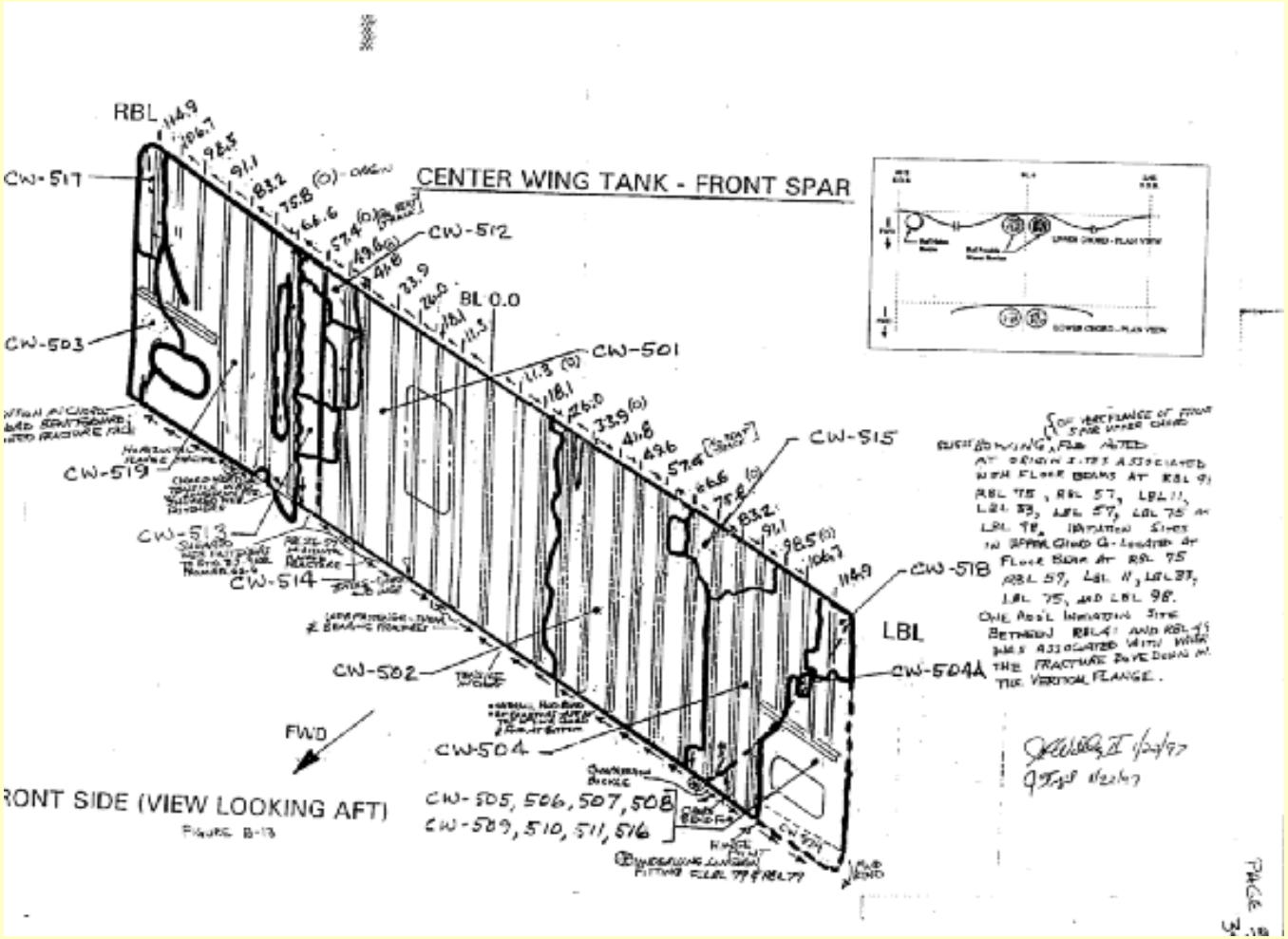


Airplane Break-up Sequence



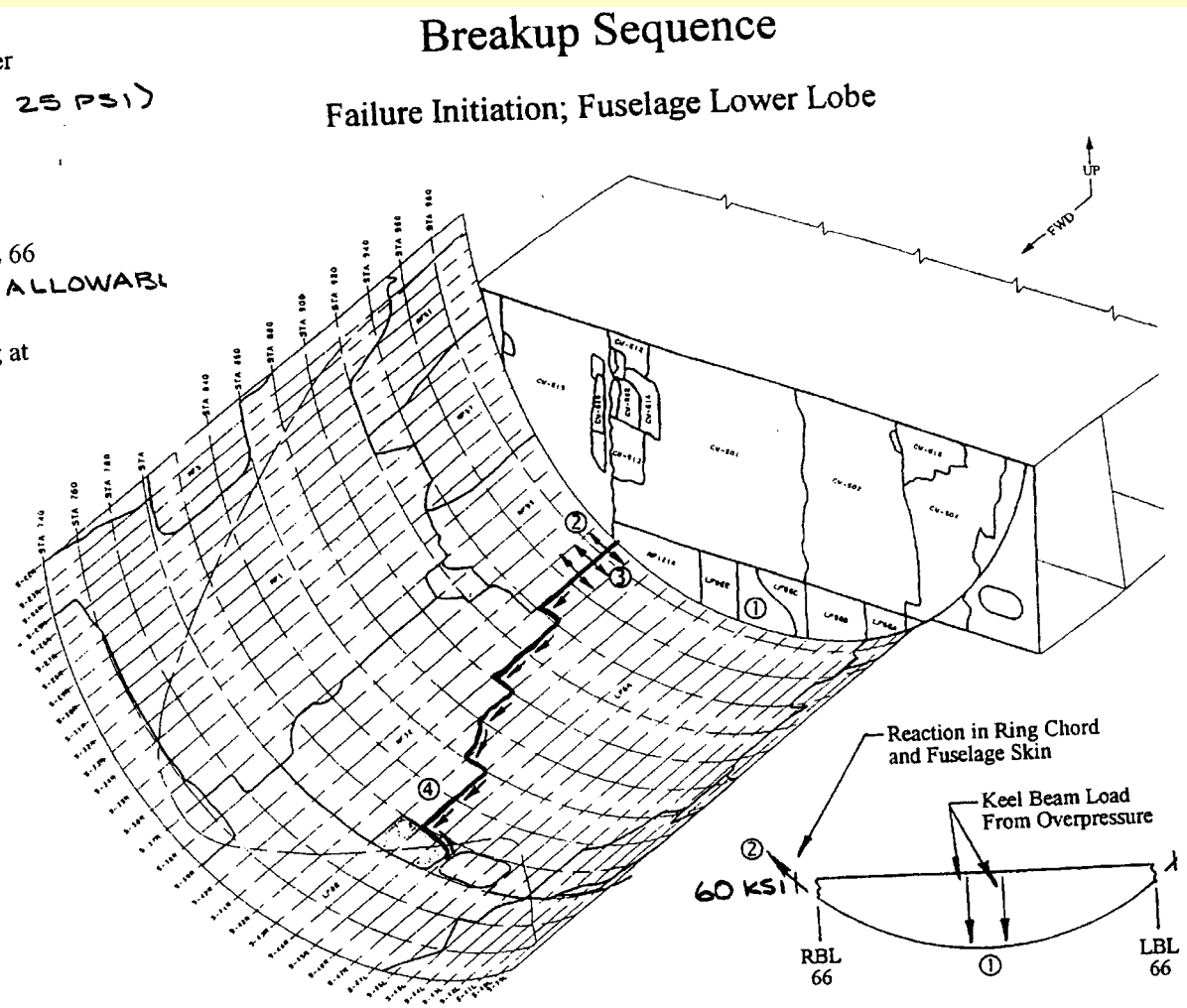
Airplane Break-up Sequence

① Keel Beam overpressure related loading still present in lower pressure bulkhead (RELATED TO ASSUMED 25 PSI)

② Load reaction is concentrated in ring chord and adjacent fuselage skin at RBL 66 and LBL 66 where web has failed

③ Ring chord and adjacent fuselage fail in net tension at RBL 66 (S-40R) 60 KSI PREDICTED 55 KSI ALLOWABL

④ Fuselage crack propagates forward to access door opening at STA 810



Airplane Break-up Sequence

Summary

- Center Wing Tank (CWT) overpressurization
- Fracture of portions of the substructure (spanwise beams, front spar, integrity of keel beam support)
- Cracking of lower lobe of fuselage forward of CWT

Airplane Break-up Sequence

Summary (cont.)

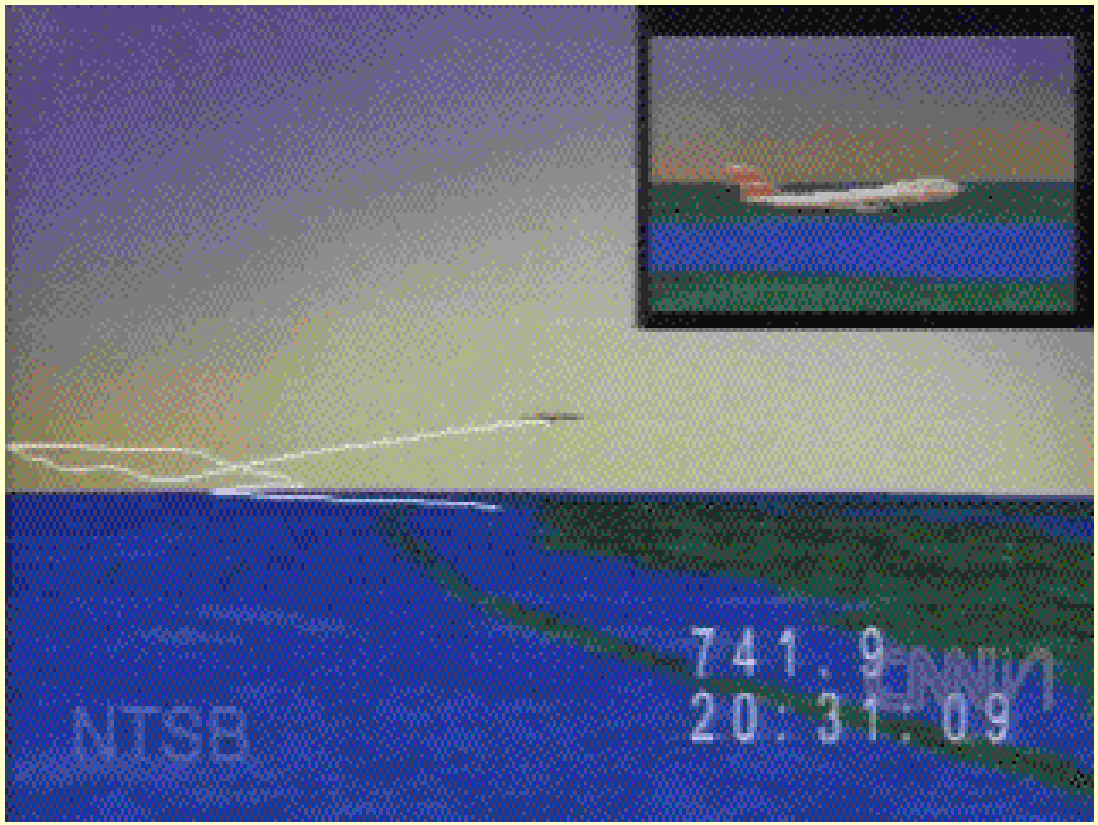
- Separation of forward end of keel beam from the wing center section
- Separation of red area fuselage pieces from lower lobe (progressed to window belt area)
- Buckling of window belt reinitiated breakup sequence which progressed over the upper lobe

Airplane Break-up Sequence

Summary (cont.)

- Forward fuselage separated from airplane (yellow area)
- Left and right wingtips fracture in bending
- Left wing separated from airplane
- Escalating fire from #3 main fuel tank damaged right wing and aft fuselage
- Right wing separated from aft fuselage

TWA Flight 800 Fuel Tank Explosion
July 17, 1996



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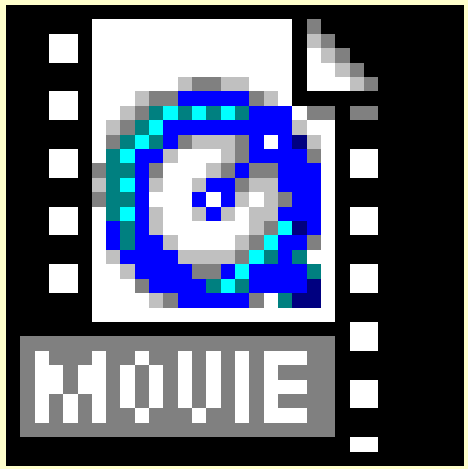

Closeup.mov

Possible Ignition Sources

Some of the proposed ignition sources:

- Explosive Device
- Jettison/override pumps
- Scavenge pump
- FQIS
- Electrical Failures
- EMI Induced Transients
- Electrostatic/Lightning

NTSB Investigation Conclusions

Probable Cause:

Explosion of CWT resulting from ignition of the flammable fuel/air mixture in CWT. The likely ignition energy source was a short circuit outside of the CWT that allowed excessive voltage to enter CWT through FQIS wiring.

NTSB Investigation Conclusions

Contributing Factors:

- Design and certification concept for prevention of fuel tank explosions
- Design and certification of 747 with heat sources located beneath CWT

NTSB Investigation Conclusions

New NTSB Recommendations:

- Design practices regarding bonding of in-tank components
- Aircraft wiring systems (identify critical systems and adequate separation)
- Corrective actions regarding silver-sulfide deposits on in-tank FQIS components.
- Aging Transport Non-Structural Systems Plan