

Airframe Manufacturer's Perspective

Agenda

August 6, 2002

1. Boeing's Perspective on RVSM
2. Approved Airframes
3. Non Group Airframes
4. Accuracy, Degradation and Maintenance
5. Future Airframe and Airplane System Development
6. Related Issues



Boeing's Perspective on RVSM

- RVSM Benefits:
 - Increased Operating Capacity
 - Increased Controller Flexibility
 - Improved Operating Efficiency

- Impact to Production, Airplane System Development, and Airplane Maintenance:
 - Minimal impact to production
 - Few modifications are required to in-service airplane
 - Minimal impact to existing airplane maintenance

Boeing's Perspective on RVSM (con't)

- No new airplane system installation is required
 - Two or more independent digital air data systems that use cross-coupled static sources
 - Two altitude reporting transponders
 - One altitude alert system
 - Dual or Triple channel autopilot with altitude hold capability

- Height monitoring results validate airframe design and airplane systems performance.

Approved Airframes

Current Production Airplanes

Model	Service Bulletin	Service Letter	Skin Check	Pitot Static Probe Life	Air Data Computer	Operational Change
717-200	N/A		None	N/A	No Change	No Change
737-600/-700/ 800/900/BBJ	N/A	737-SL-02-017-C	N/A	N/A	No Change	No Change
747-400 5" Probes	747-53-2398 747-53-2394	747-SL-02-011-B	Detailed Measurements	Unplated - 3 yrs Plated - No Limit	No Change	Mach≤0.90 in RVSM Airspace
747-400 10" Probes	747-53-2393	747-SL-02-011-B	Visual	Plated - No Limit	No Change	Mach≤0.90 in RVSM Airspace

Approved Airframes

Current Production Airplanes

Model	Service Bulletin	Service Letter	Skin Check	Pitot Static Probe Life	Air Data Computer	Operational Change
757-200	757-53-0074 757-34-0132	757-SL-02-016-D	Visual	N/A	ADC Upgrade & New SSEC	No Change
757-300	N/A	757-SL-02-016-D	N/A	N/A	No Change	No Change
767-200/-300	767-53-0068 767-34-0058 767-34-0237	767-SL-02-011-C	Visual	Unplated - 3 yrs Plated - No Limit	-206 and 767-300 SSEC required for all Models	No Change
767-400	N/A		N/A	Plated - No Limit	No Change	No Change
777-200/-300	777-53-0007	777-SL-02-002-B	Visual	N/A	No Change	No Change

Approved Airframes

Current Production Airplanes

Model	Service Bulletin	Service Letter	Skin Check	Pitot Static Probe Life	Air Data Computer	Operational Change
MD-81, -82, -83, -87, -88	MD-80 34-289	N/A	Detailed Measurements (Static Plate)	N/A	No Change	No Change
MD-90-10, -30, -40	MD-90 34-006	N/A	Detailed Measurements (Static Plate)	N/A	No Change	No Change
MD-11 Combi, Freighter, Passenger	MD-11 34-065	N/A	Detailed Measurements	N/A	No Change	No Change

Approved Airframes

Out-of-Production Airplanes

Model	Service Bulletin	Service Letter	Skin Check	Pitot Static Probe Life	Air Data Computer	Operational Change
727-100/-200	727-53-0220	727-SL-02-004	Visual	N/A	New DADC and SSEC	No Change
737-200	737-53-1191	737-SL-02-015	Visual	No limit	May require new DADCs	No Change
737-300/-400/-500	737-53-1180	737-SL-02-014-A	Visual	No Limit	No Change	No Change
747-100/-200/-300/SP	747-53-2405 747-53-2394 747-34-2135	747-SL-02-012-B	Detailed Measurements	Unplated - 4 yrs Plated - No Limit	Specific SSEC required	Mach ≤ 0.90 or 0.87 @ low weight in RVSM airspace
DC-10	DC-10 34-134	N/A	Detail Measurements (static Plate)	N/A	No Change	No Change

Non-Group Airframes

Out-of-Production Airplanes

Model	
707	No Group/Non-Group RVSM Qualification Package Development planned by Boeing. We recommend that operators contact AeroMech Inc for non-group data package development. AeroMech has advised that they have developed a non-group data package for three different operators that has been approved by the necessary regulatory agency.
737-100	No Group/Non-Group RVSM Qualification Package Development planned by Boeing
DC-9	No group approval is planned and no service bulletins are released. Preliminary equipment analysis indicates that some equipment requires upgrades (ADC, altimeters, altitude alerters, ATC transponders). Aircraft will require detailed measurements of both static plates and flush mounted static ports depending on static plate production cut-in.
DC-8	No group approval is planned. Service Bulletin DC-8 34-134 (11/96) is a static port skin waviness inspection bulletin only. Equipment analysis indicates that some equipment required upgrades (ADC, altimeters, altitude alerters, ATC transponders). All static ports are flush mounted.

Accuracy, Degradation and Maintenance

Model	Altitude Range	Air Data System Accuracy	Altimeter Splits (Capt's vs F/O's)
757 / 767	Sea level	+/- 15 FT	+/- 25 FT
	0-10,000 FT	+/- 20 FT	+/- 60 FT
	10,000 TO 30,000 FT	+/- 40 FT	+/- 135 FT
	30,000-50,000 FT	+/- 80 FT	+/- 160 FT

Accuracy, Degradation and Maintenance

- Altimetry system components degradation
 - Scheduled maintenance
 - Cross panel checks (FRM)
- Event Driven Maintenance – Damage/Repairs
 - Assess damage
 - Measure skin waviness
 - Perform repairs (shimming/flush)

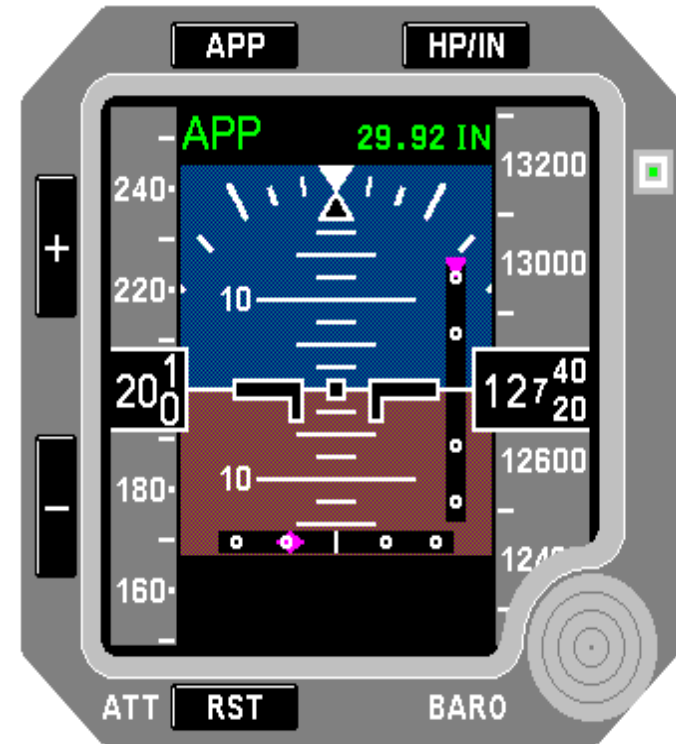
Future Airframe and Airplane System Development

- All current production airplanes are delivered RVSM qualified.
- All current airplane systems are adequate for RVSM.
- Any new airplane systems and new airframe type will be RVSM compliant.

Airframe Manufacturer's Perspective

Future Airframe and Airplane System Development (con't)

- Boeing has developed an Integrated Standby Flight Display (ISFD) for 737NG/757/767 and 747-400 model airplanes (and subsequently for 777).
 - The ISFD has the potential to meet RVSM altimetry system accuracy requirements (ISFD is SSEC capable).
 - Currently, Boeing has no plans to apply ISFD for RVSM.
 - Boeing would like to solicit operator feedback/interest on using the ISFD for RVSM operations.

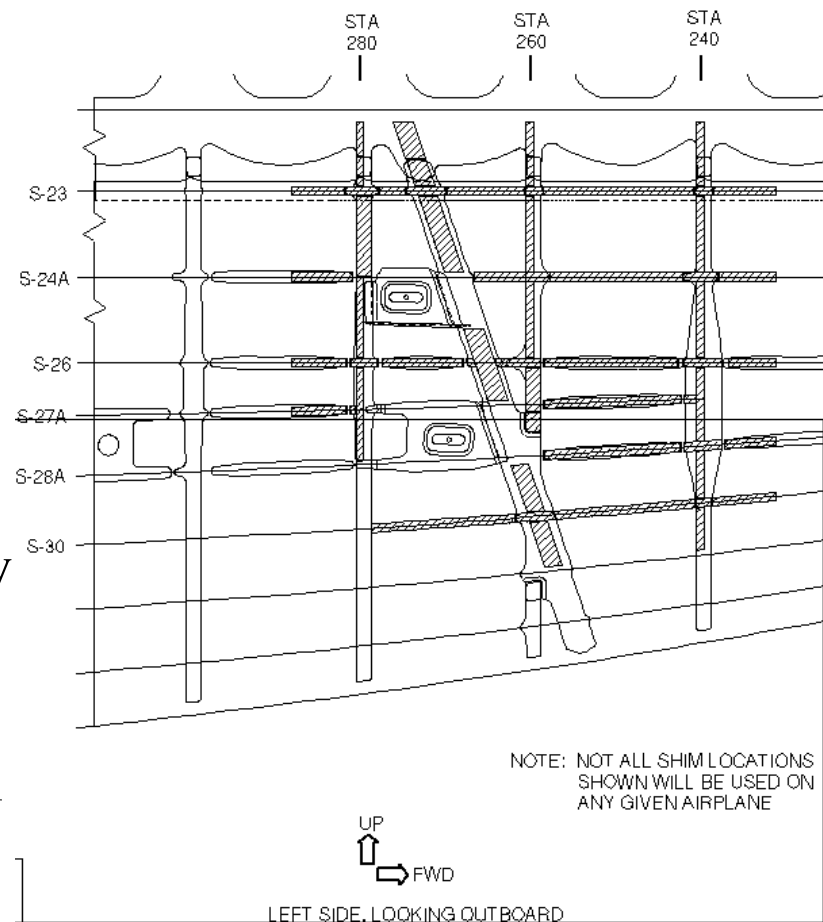


Related Issues

- Skin waviness
 - Measuring skin waviness
 - Tool not calibrated properly
 - Tool not situated properly
- Stencils and markings in the RVSM critical area

Related Issues (con't)

- Shimming repair
 - Fabricate shims according to Boeing shim package
 - Identify shim locations
 - Remove fasteners within 10 inches from shim locations
 - Install shims (flat side out) using temporary fasteners
 - Measure skin waviness to verify improvements to waviness
 - Install permanent fasteners
 - Measure skin waviness for final qualification



Related Issues (con't)

- Nuisance TCAS alerts
 - Change 7 TCAS service bulletins are available

TCAS Advisory	Altitude Threshold 6.04A	Altitude Threshold 7.0
Traffic Advisory		
FL200-FL300	850 Feet	850 Feet
FL300-FL420	1200 Feet	850 Feet
Corrective RA		
FL200-FL300	600 Feet	600 Feet
FL300-FL420	700 Feet	600 Feet
Preventive RA		
FL200-FL300	700 Feet	700 Feet
FL300-FL420	800 Feet	700 Feet