Airline Perspectives on the Constraints of Bonded Repair Size Limits

May 17th, 2011

Presented by:
Todd M. Herrington
Principal Engineer
Composite / Bonded Repair

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Part 1 – Examples of OEM authorized repairs by part type

Part 2 – Examples of damages not supported by OEM repairs

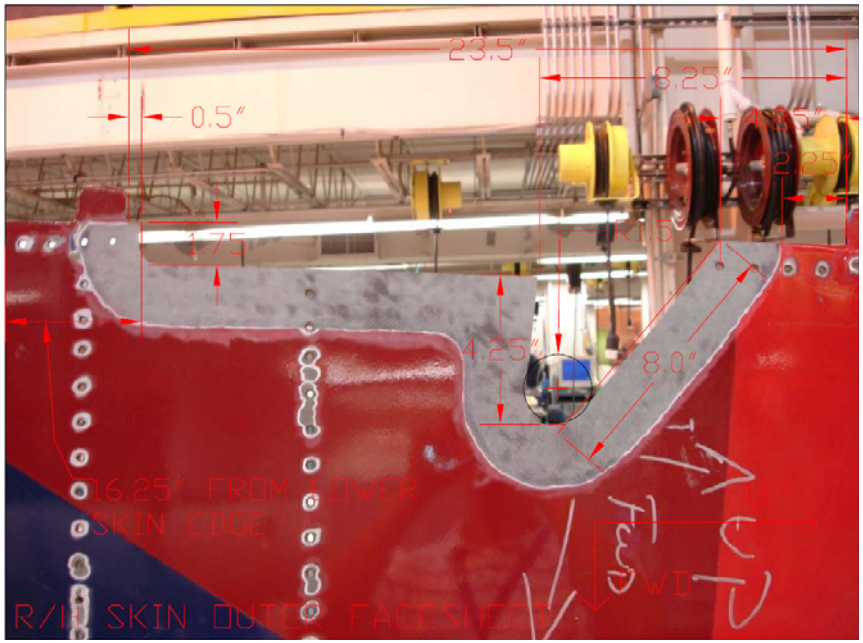
Part 3 – Available resources at Airline / MRO organizations

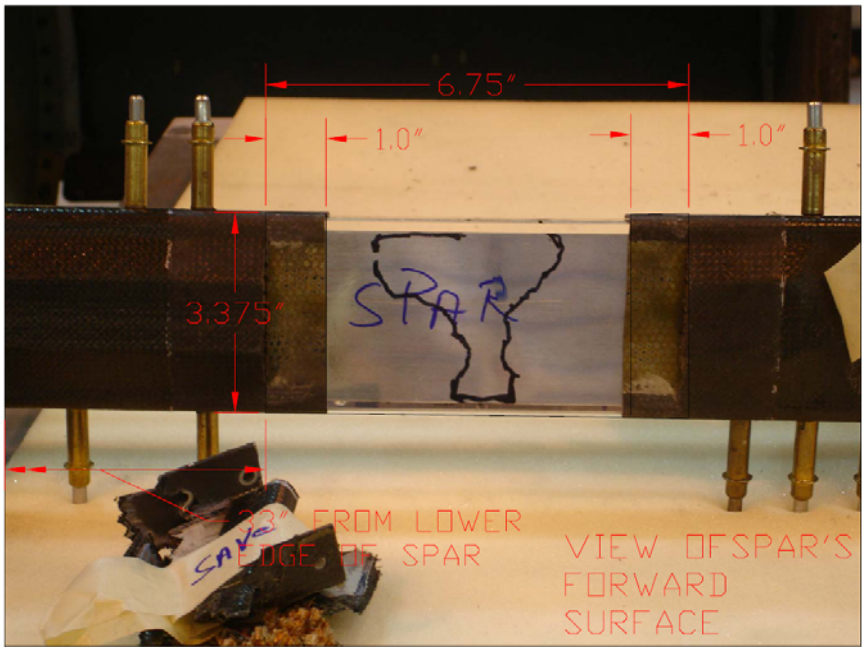
Part 1:
Examples of OEM Authorized Permanent Repairs by Part Type

- **PSE / FCS Structure**
- **Non-FCS Flight Control Structure**
- **Secondary Structure**

PSE / FCS: Flight Control Assemblies

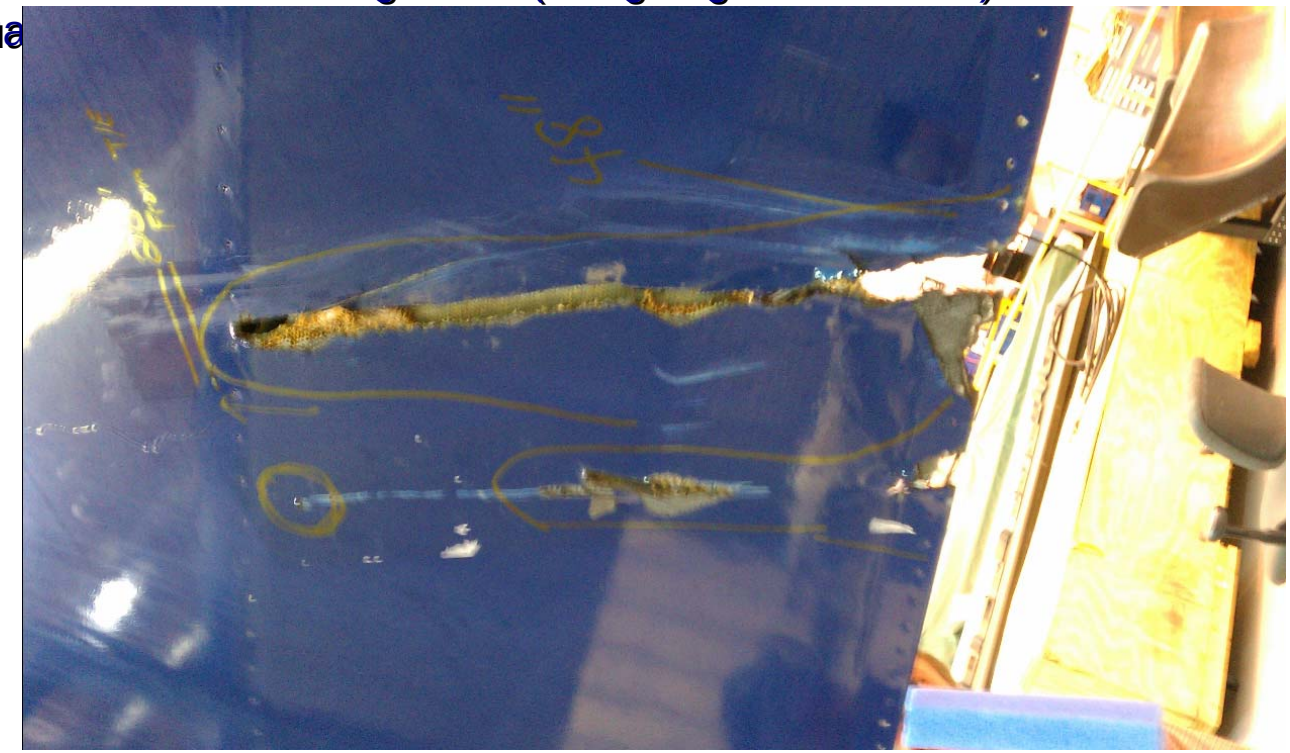
MD88 Rudder - OEM authorized splice of rear spar (right) and significant trailing edge skin replacement. Techniques consist of pre-cured autoclave patches cured at 350 degrees F (using original materials) and secondarily bonded to part using 250 degree F vacuum pressure.





PSE / FCS: Flight Control Assemblies

767 Rudder – In non-critical areas, OEM SRM authorizes unlimited size repair of rear spar and skins. Techniques consist of vacuum bag cured repairs cured at 350 degrees F (using original materials). Critical areas are usua



PSE / FCS: Flight Control Assemblies

767 Aileron - OEM SRM authorizes replacement of skins and core with use of 250 degree F prepreg repair processes in non-critical areas. This repair example ext

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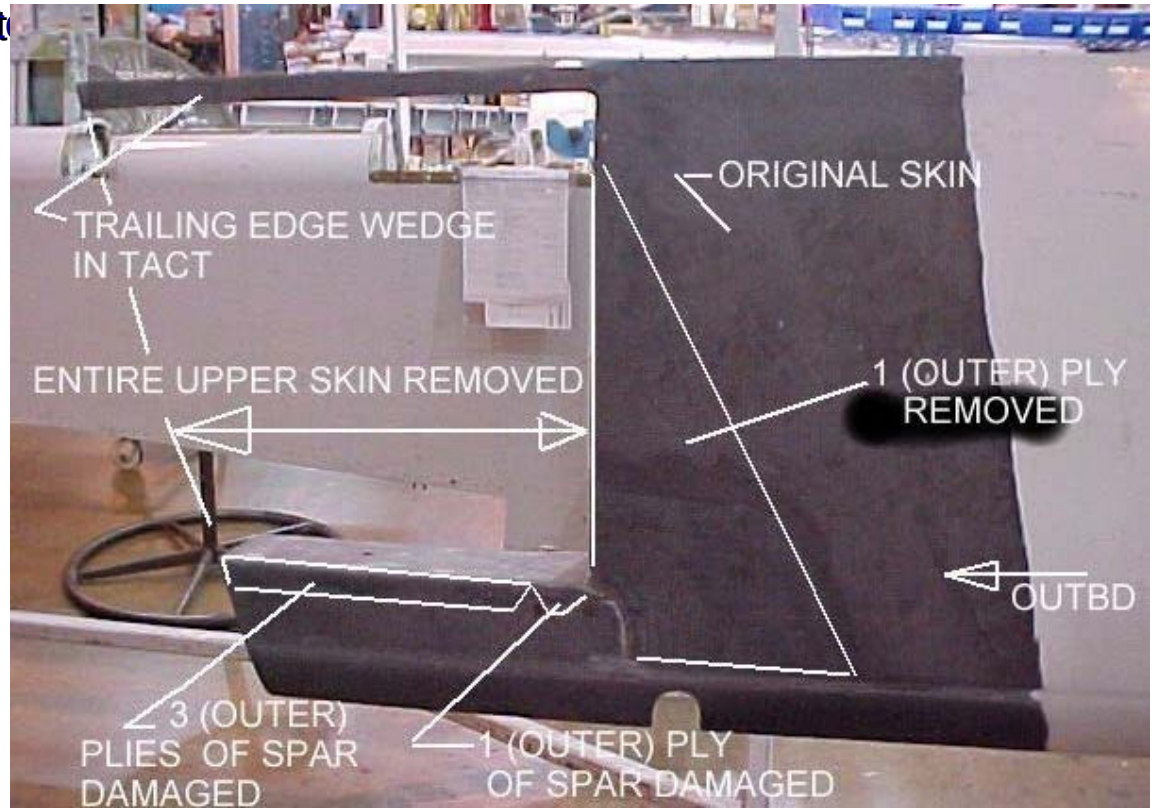
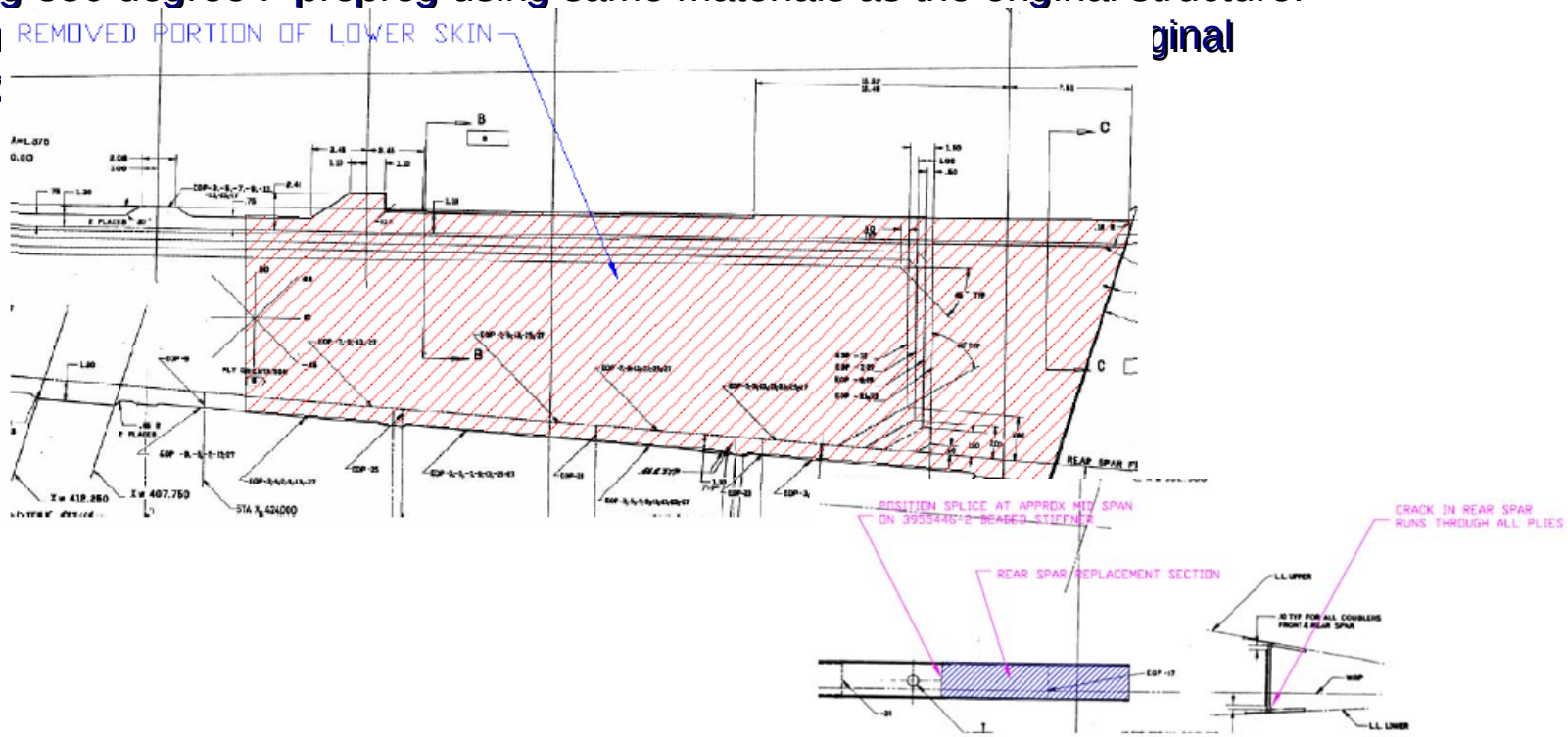


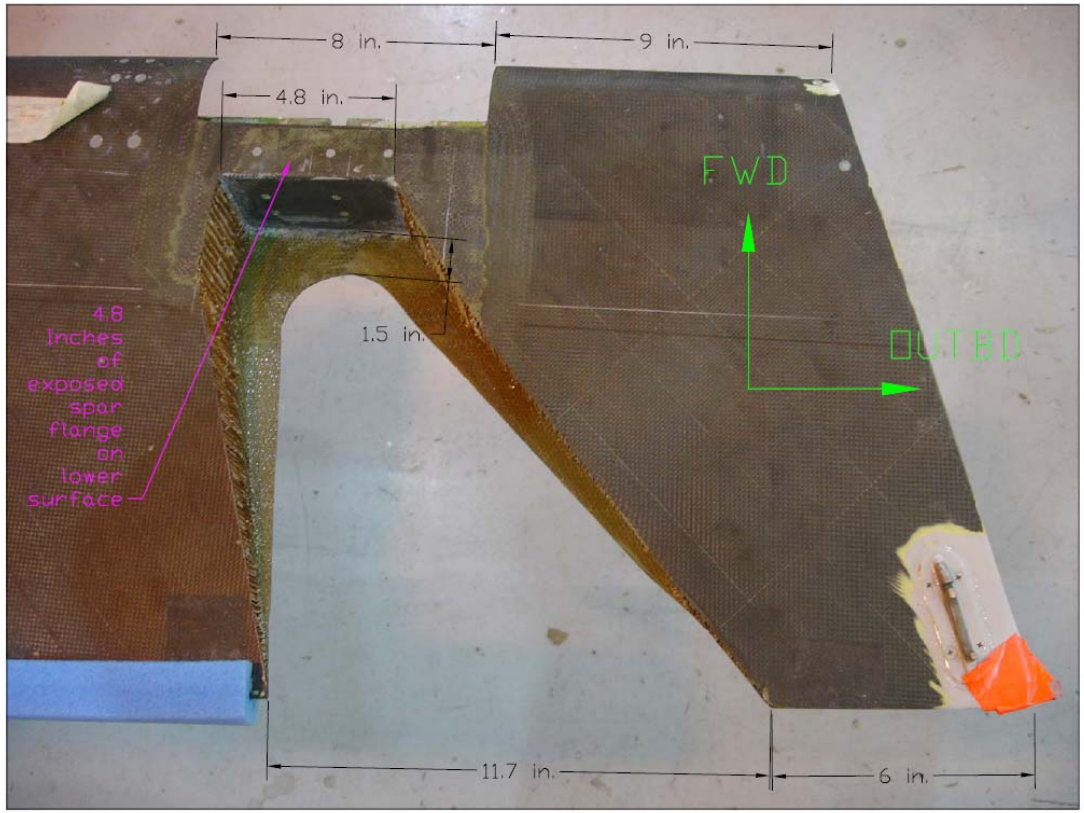
PSE / FCS: Flight Control Assemblies

MD88 Elevator - OEM SRM authorizes some repairs of limited size, however, on case by case basis, repairs are authorized for significant sizes using 350 degree F prepreg using same materials as the original structure. Exa ginal struc



Non-FCS Flight Control Structure

757 Aileron - OEM SRM authorizes replacement of skins and core with use of 350 degree F prepreg repair processes using original materials in non-critical areas. the spar and was



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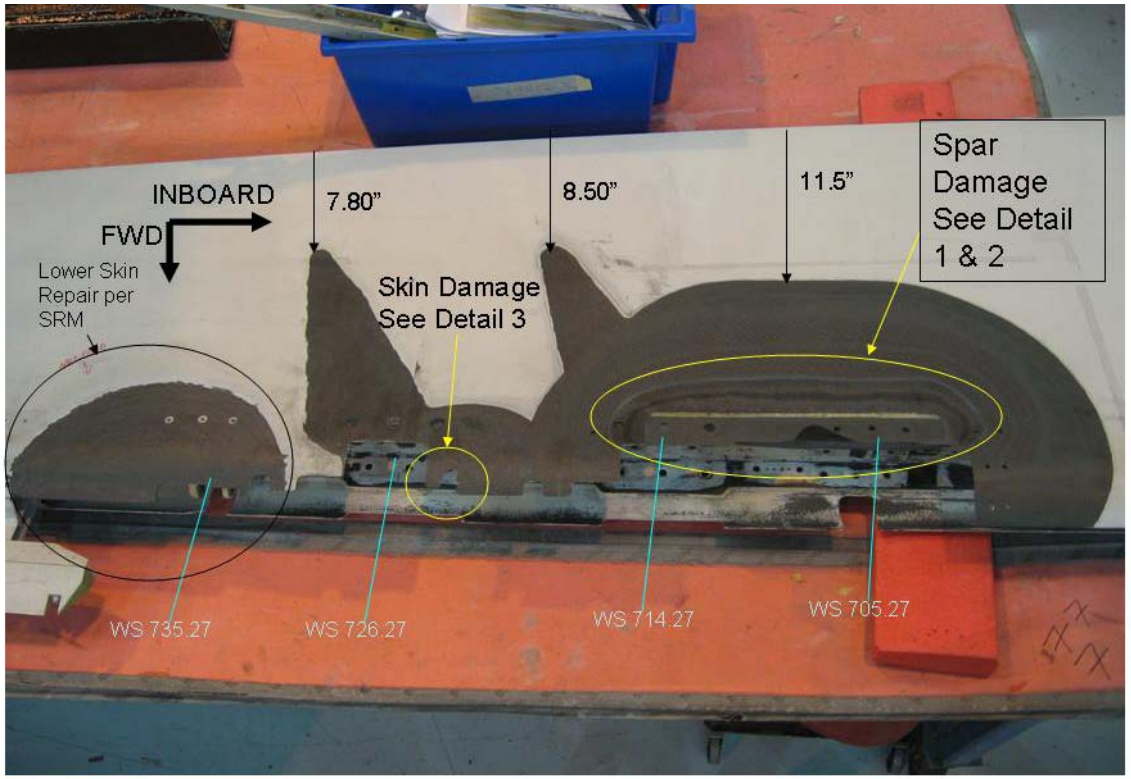

Non-FCS Flight Control Structure

757 Aft Flap - OEM SRM authorizes replacement of skins and core with use of 350 degree F prepreg repair processes using original material. There are no size, proximity or any other restrictions. There are no critical areas.

Non-FCS Flight Control Structure

MD90 Spoiler - OEM SRM authorizes some repairs of limited size, however, on case by case basis, repairs are authorized for significant sizes using 350 degree F pre

Non-FCS Flight Control Structure

767 Aft Flap - OEM SRM authorizes virtually unlimited size repairs using original materials and processes common to the original structure. All metal bond repairs, regardless of lo ssification have the same reparability for

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Non-FCS Flight Control Structure

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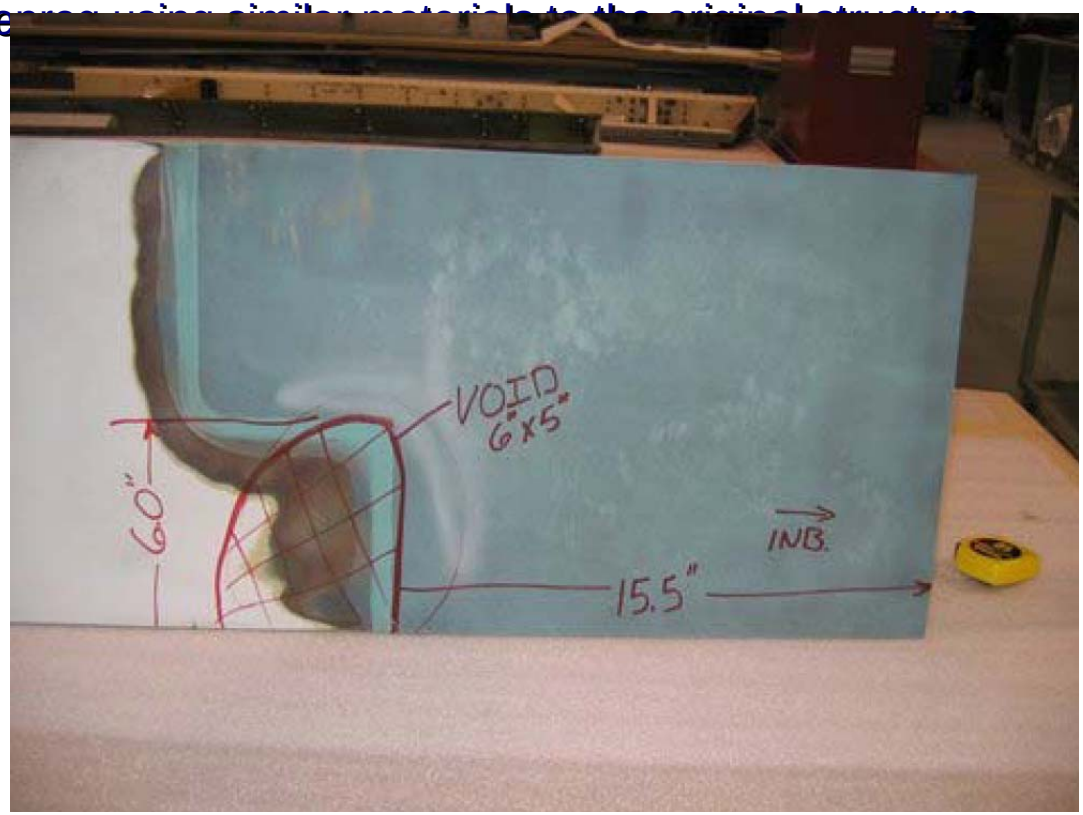
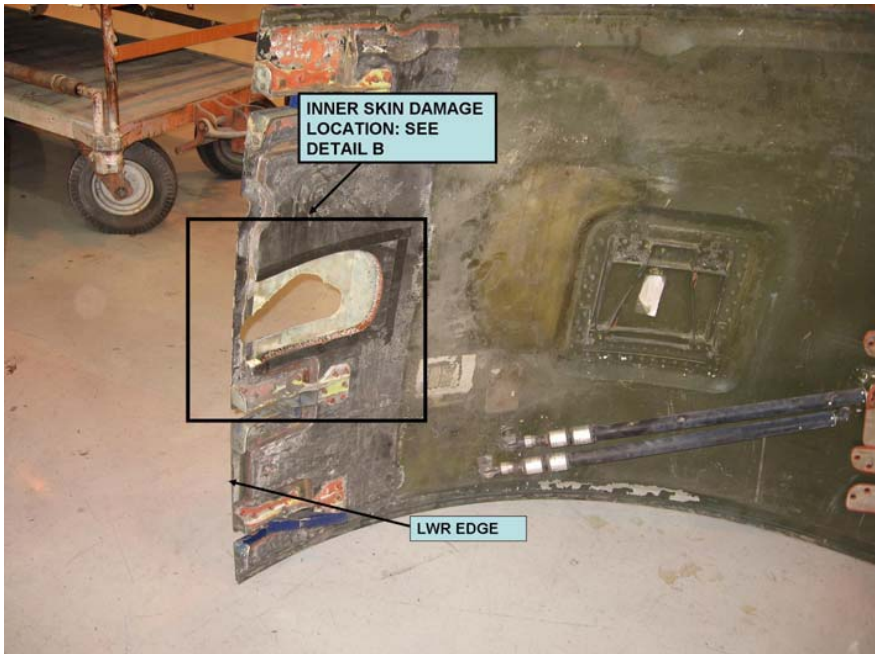
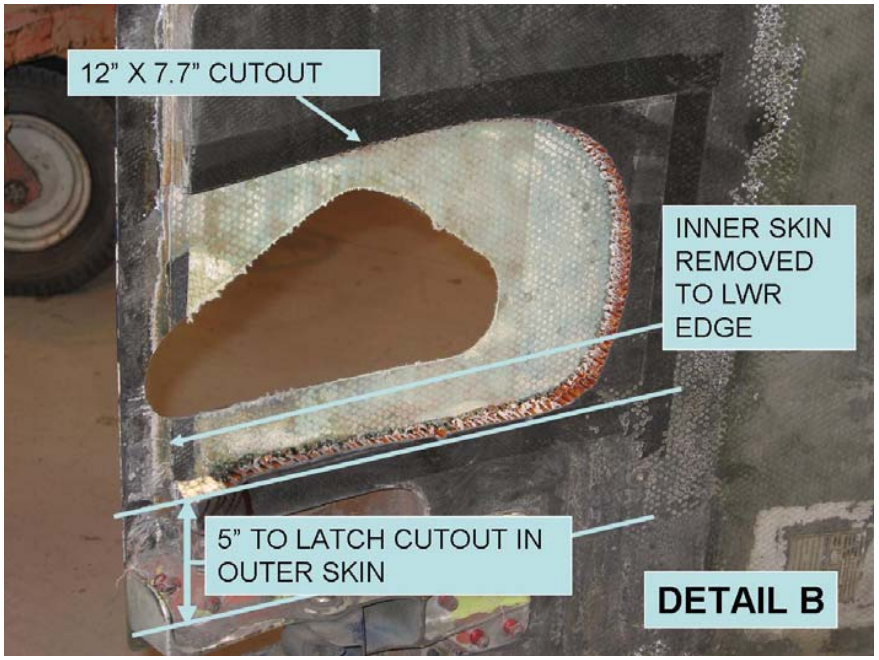


Secondary Structure

757 Fan Cowl (PW 2000) - OEM SRM authorizes unlimited size repairs in non-critical areas using 350 degree F prepreg repair processes using same materials as original structure. This example shows an OEM approved repair in a critical area near a latch.





Secondary Structure

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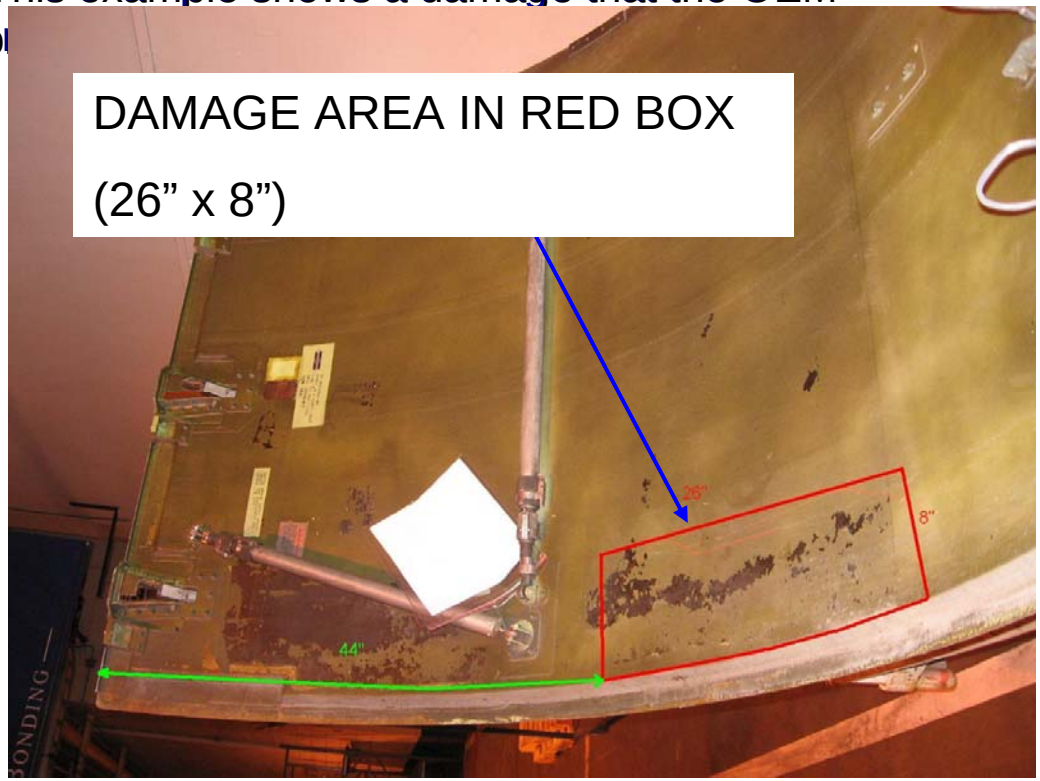
Part 2:

Examples of damages not supported by OEM repairs

- **PSE / FCS Structure**
- **Non-FCS Flight Control Structure**
- **Secondary Structure**

Secondary Structure

767 Fan Cowl (CF6-80C2) - OEM SRM authorizes very small damage sizes using wet lay-up repairs. There are no 350 degree F repair options. This example shows a damage that the OEM considered beyo



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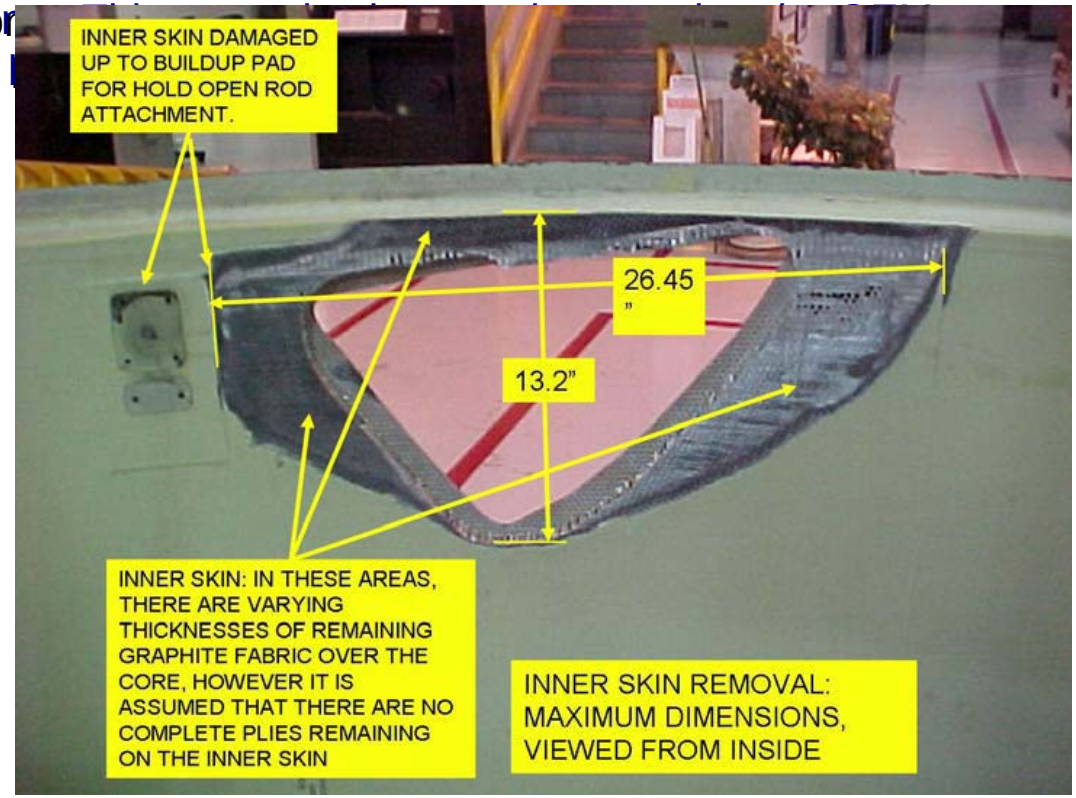
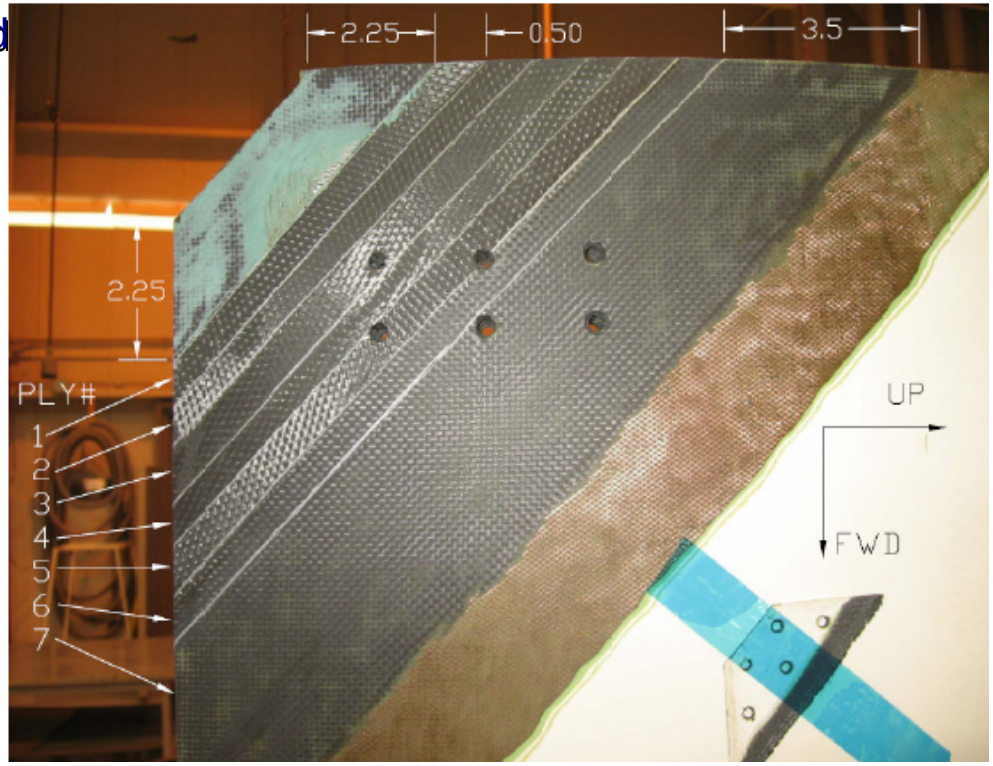


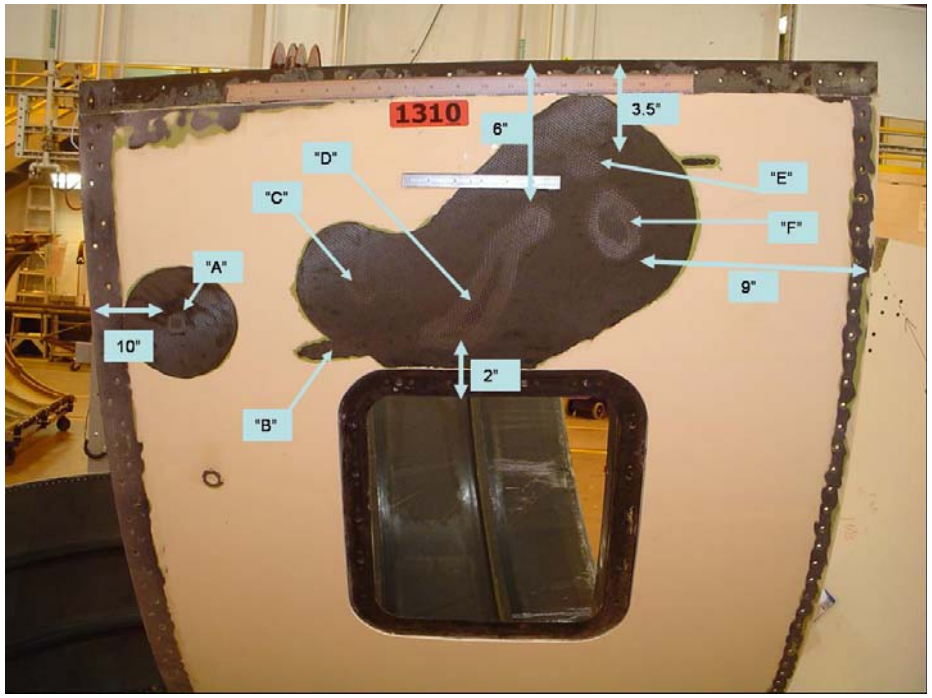
Secondary Structure

MD90 Fan Cowl (V2500-D5) - OEM SRM authorizes very small damage sizes using wet lay-up repairs. There are no 350 degree F repair options. This example shows a small corner damage that the OEM considered



Secondary Structure

MD90 Nose Cowl (V2500-D5) - OEM SRM authorizes very small damage sizes using wet lay-up repairs. There are no 350 degree F repair options. This example shows a small corner damage that the OEM considered beyond repair.



Secondary Structure

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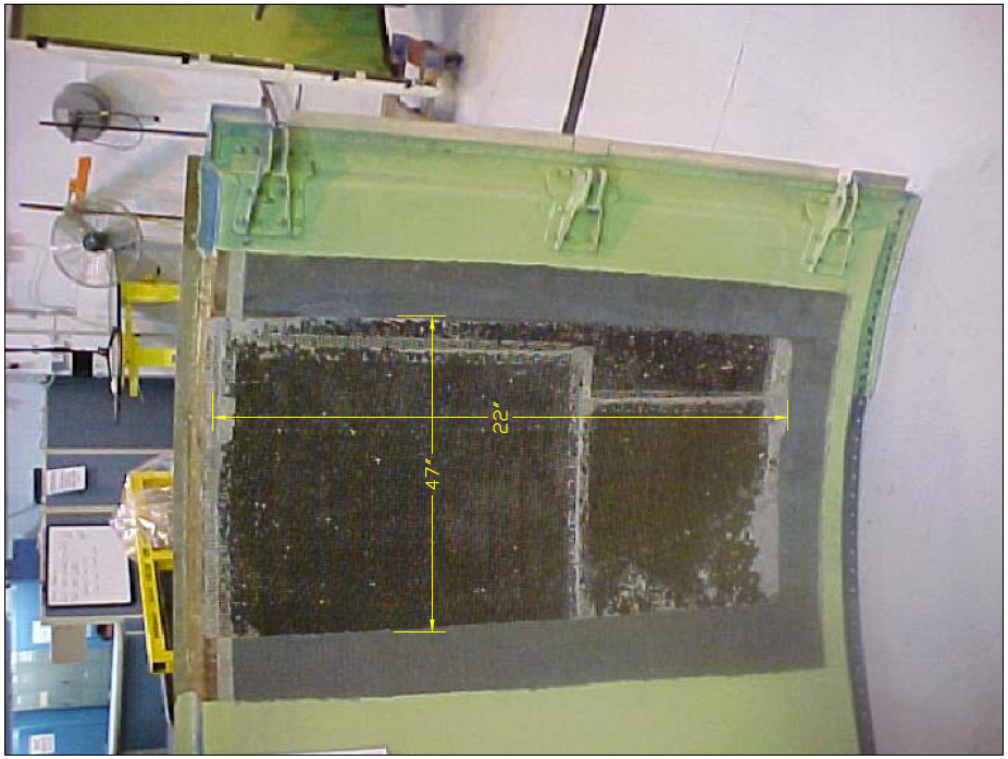


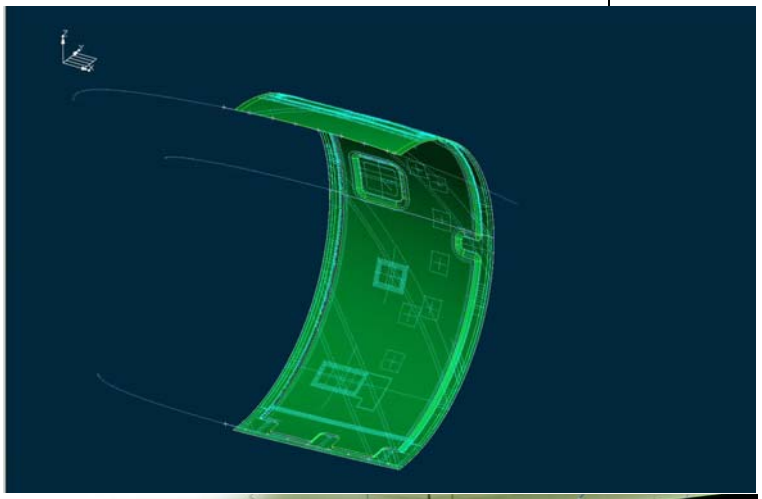
Part 3:

Available resources at Airline / MRO organizations

- **Technology Snap Shot**
- **Maintaining Critical Dimensions**
- **Maintaining Critical Processes and Cleanliness**

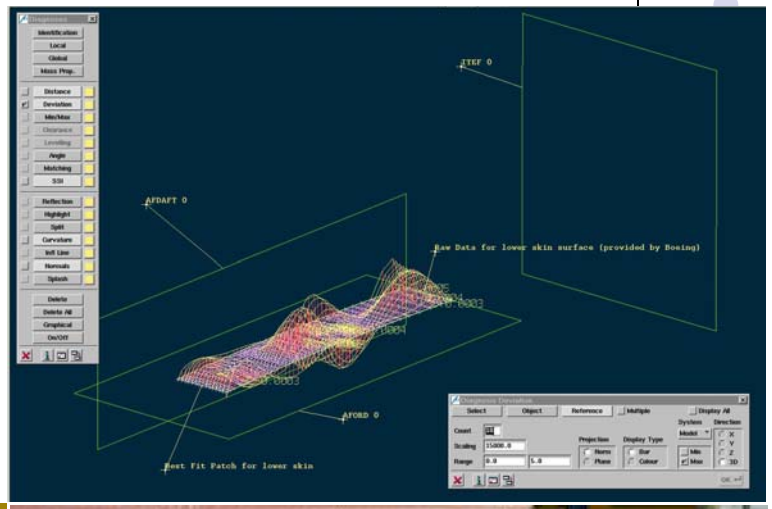
Complying with OEM Restorative Repair Procedures

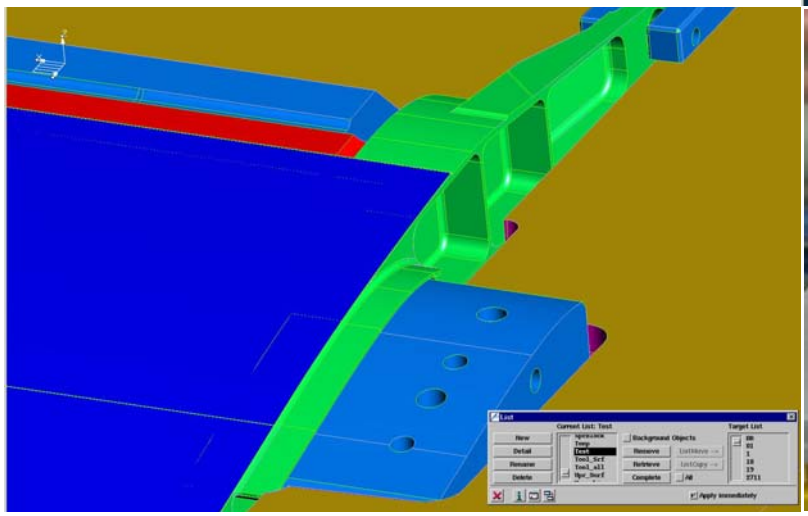
Manufacture data, technology for design and fabrication of proper tools, automation and equipment are widely available today in the repair station industry.

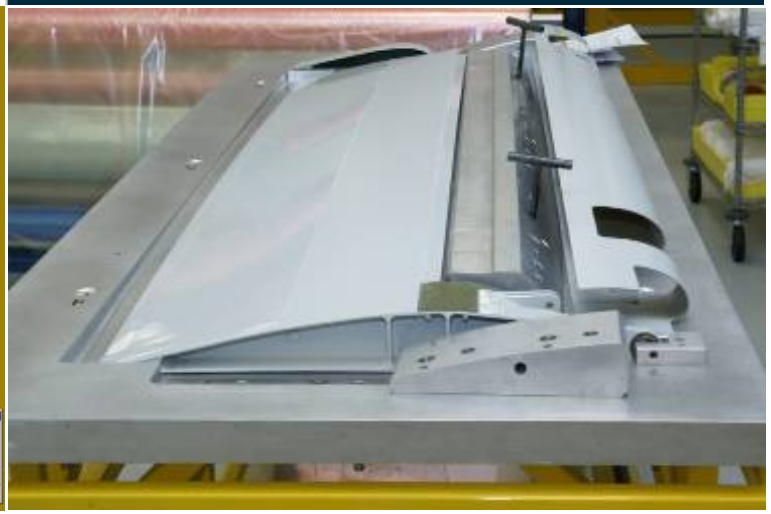


Complying with OEM Restorative Repair Procedures

Reverse Engineering tools, loft data transfers from OEMs and bondline control tests are becoming more widely used by airlines and top tier repair stations.

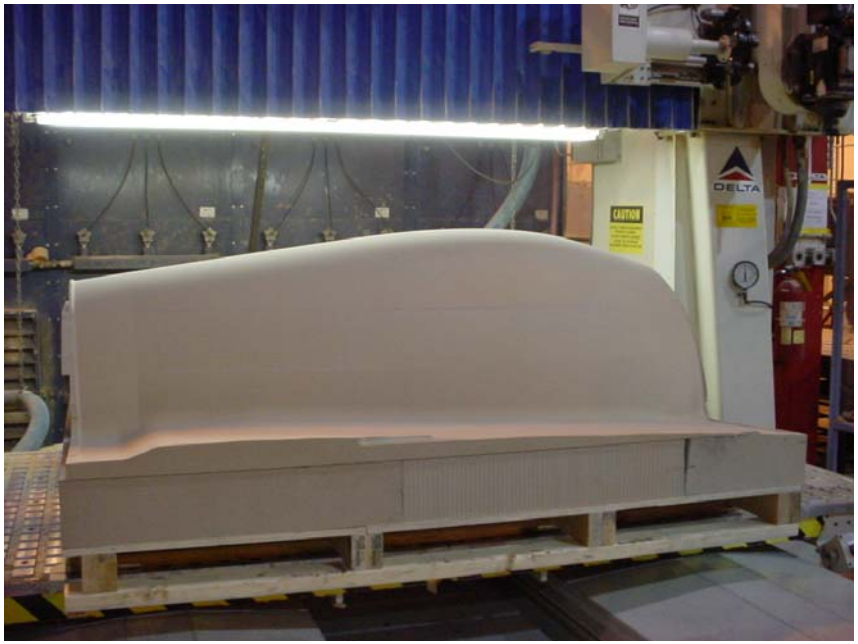


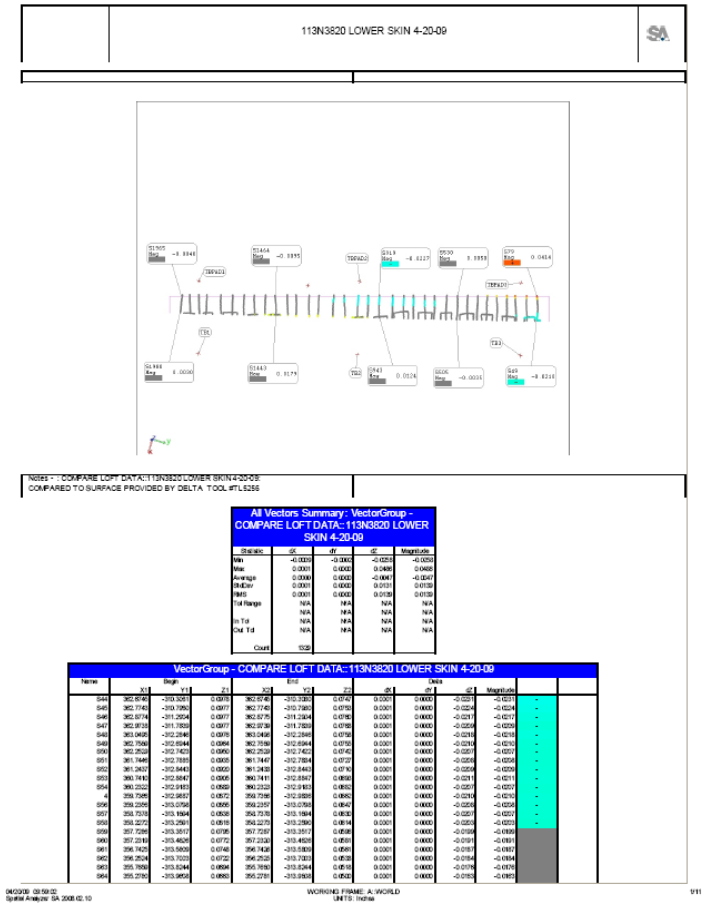




Complying with OEM Restorative Repair Procedures

Quality assurance tools such as various self generating surface check reports, NDI advances and First Article / Qualification plans help catch problems in the repair design before flight.





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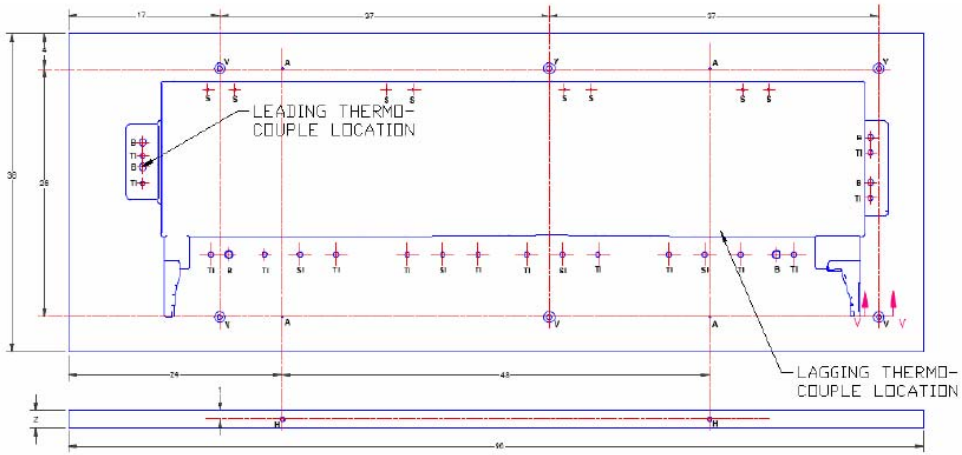
Complying with OEM Restorative Repair Procedures

Advances in CAD desktop systems has increased the speed and comfort level for mechanics, engineers and inspectors during accomplishment of QA oversight procedures.

On the floor, design can be overlaid digitally on the repair parts and tools so that a manufacturer's level of control can be maintained in a repair environment.



Complying with OEM Restorative Repair Procedures

Many repair stations have pursued manufacture certifications for bonding, implementing Controlled Contamination controls, time and temperature sensitive QA environments and adherence to OEM specs and standards for bonding.

Questions?

Thank You