**Docket No. SA-522**

**Exhibit No. 15-B**

# NATIONAL TRANSPORTATION SAFETY BOARD

**Washington, D.C.**

Materials Specialists' Submission
Selected Results of the Nondestructive Examination of the
Vertical Stabilizer and Rudder

(29 Pages)

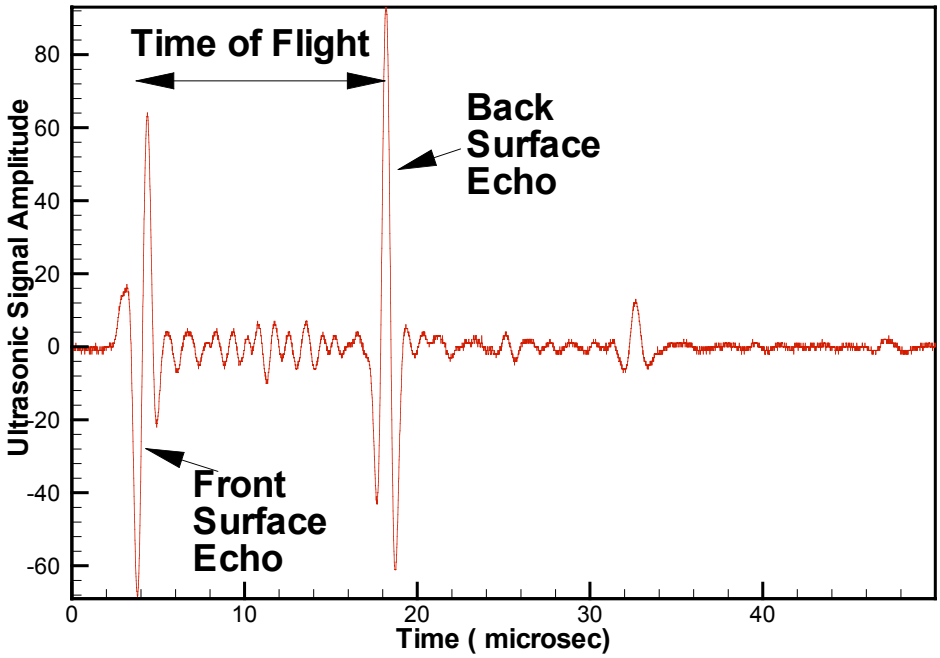



Figure 1.01 Typical time response of ultrasonic wave propagating in composite layer.

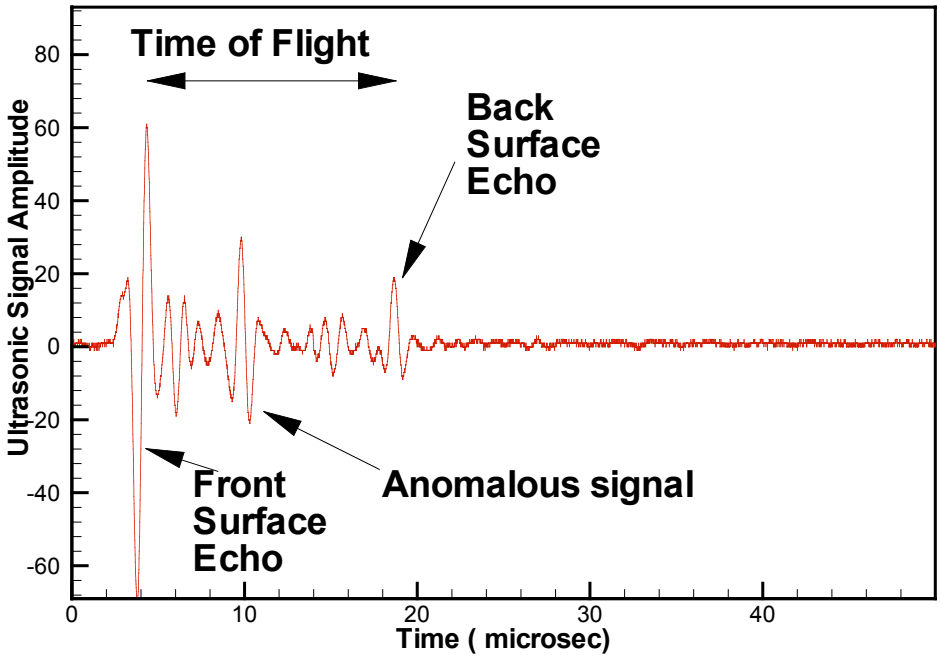



Figure 1.02 Typical ultrasonic signal from region of specimen with anomalous signal.

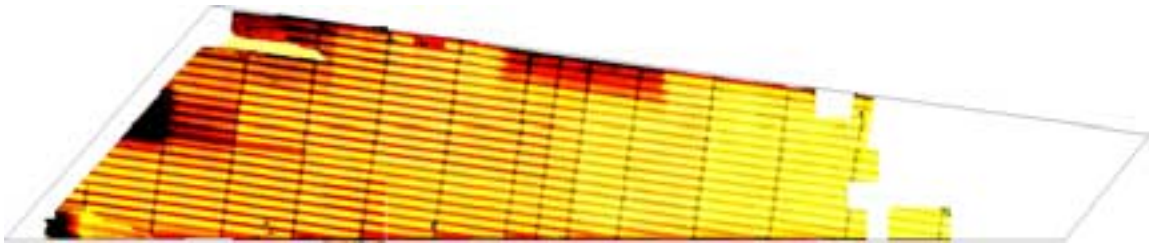


Figure 1.03 Ultrasonic time of flight measurements performed on the left side of the composite tail.

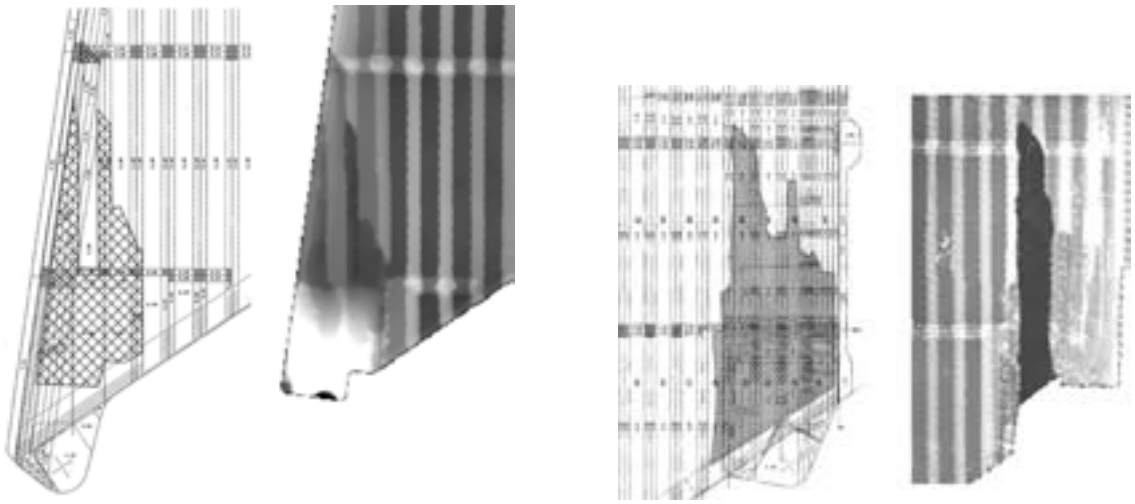


Figure 1.04 Expanded view showing delaminations at the lower end near the forward and aft spars.

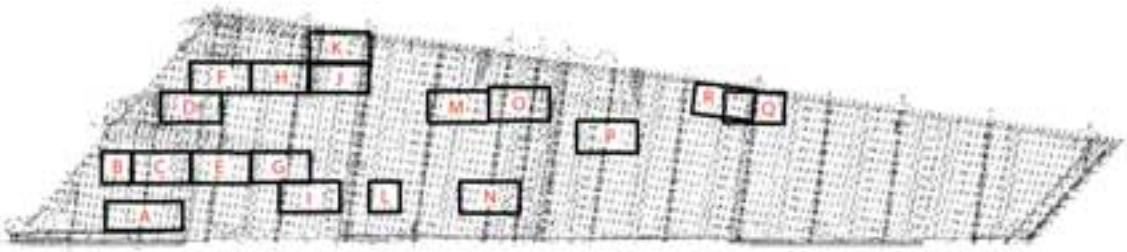



Figure 1.05 Region definitions used in subsequent images for the left side of tail. These are the regions with significant anomalies in ultrasonic attenuation responses.

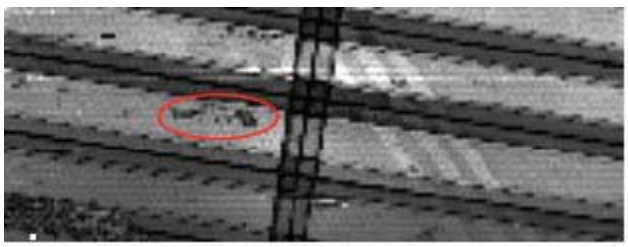


Figure 1.06 Ultrasonic attenuation image of left side tail region A.

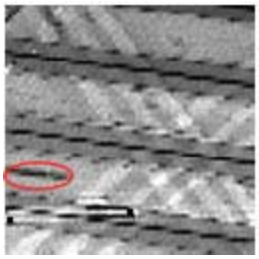


Figure 1.07 Ultrasonic attenuation image of left side tail region B.

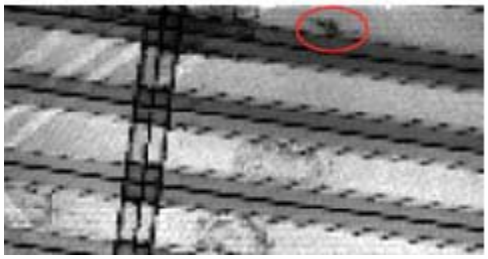


Figure 1.08 Ultrasonic attenuation image of left side tail region C.

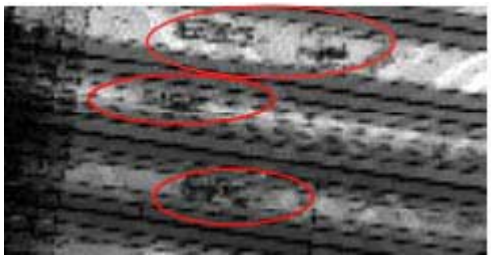


Figure 1.09 Ultrasonic attenuation image of left side tail region D.

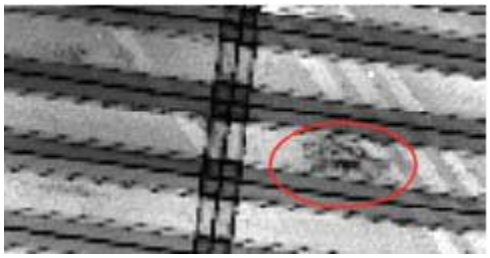


Figure 1.10 Ultrasonic attenuation image of left side tail region E.

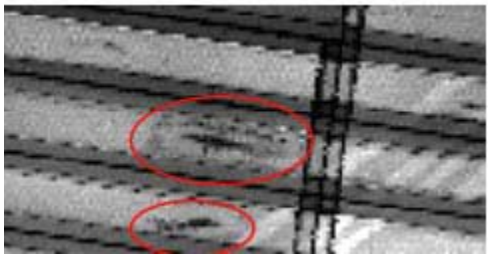


Figure 1.11 Ultrasonic attenuation image of left side tail region F.

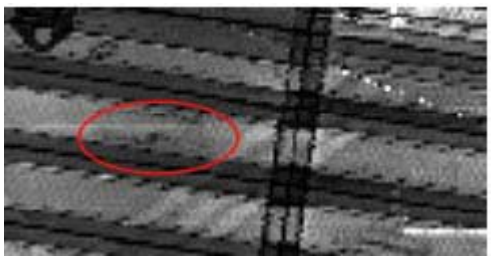


Figure 1.12 Ultrasonic attenuation image of left side tail region G.

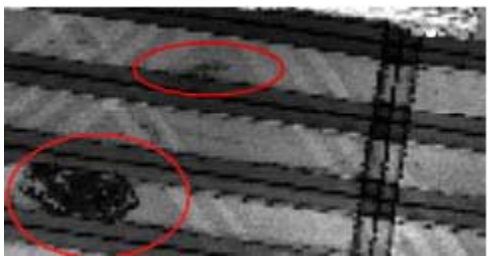


Figure 1.13 Ultrasonic attenuation image of left side tail region H.

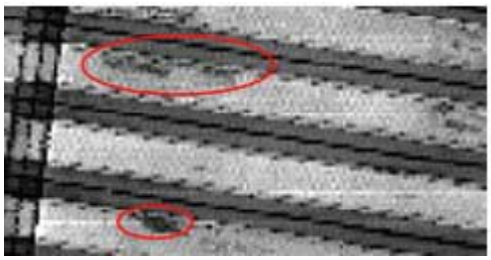


Figure 1.14 Ultrasonic attenuation image of left side tail region I.

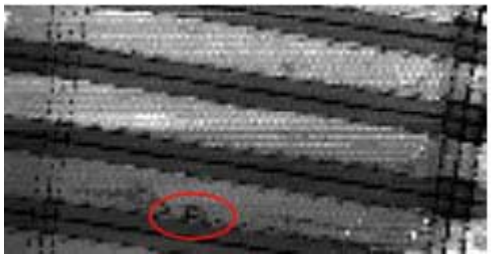


Figure 1.15 Ultrasonic attenuation image of left side tail region J.

Figure 1.16 Ultrasonic attenuation image of left side tail region K.

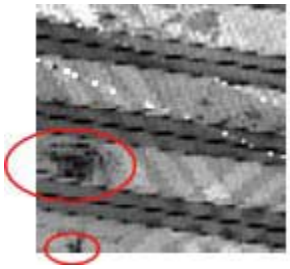


Figure 1.17 Ultrasonic attenuation image of left side tail region L.

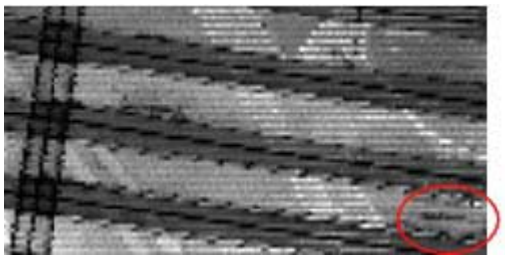


Figure 1.18 Ultrasonic attenuation image of left side tail region M.

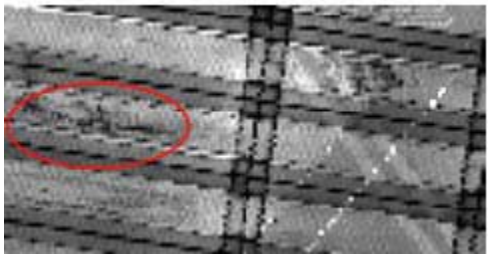


Figure 1.19 Ultrasonic attenuation image of left side tail region N.

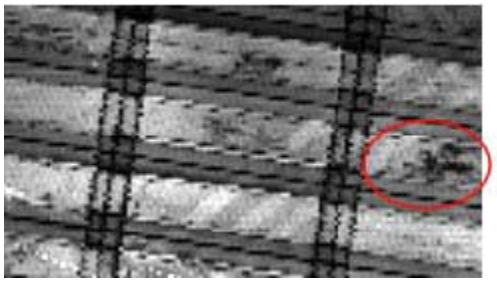


Figure 1.20 Ultrasonic attenuation image of left side tail region O.

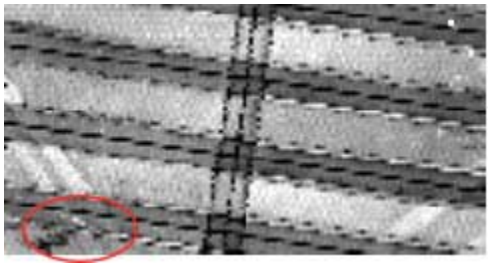


Figure 1.21 Ultrasonic attenuation image of left side tail region P.

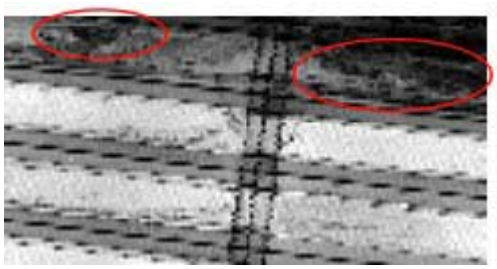


Figure 1.22 Ultrasonic attenuation image of left side tail region Q.

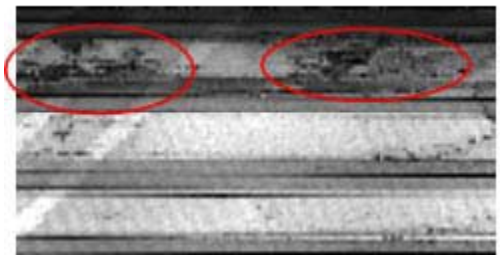


Figure 1.23 Ultrasonic attenuation image of left side tail region R.

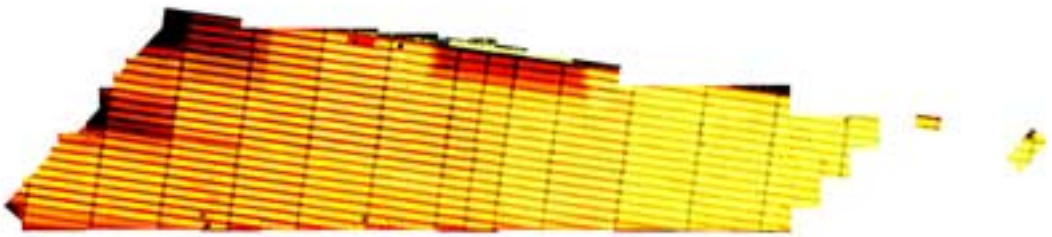


Figure 1.24 Ultrasonic time of flight measurements performed on the right side of the composite tail.

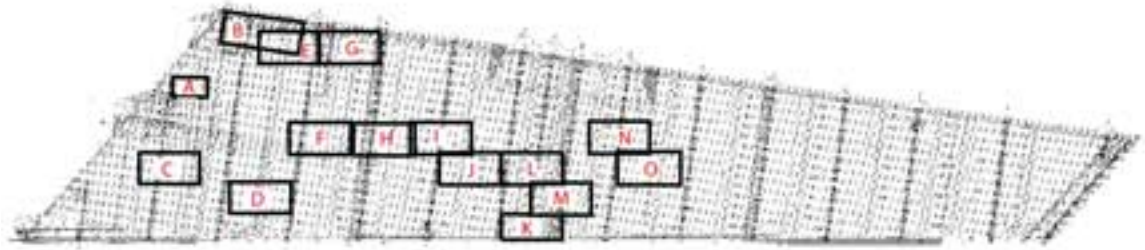



Figure 1.25 Region definitions used in subsequent images for the right side of tail. These are the regions with significant anomalies in ultrasonic attenuation responses.

Figure 1.26 Ultrasonic attenuation image of right side tail region A.

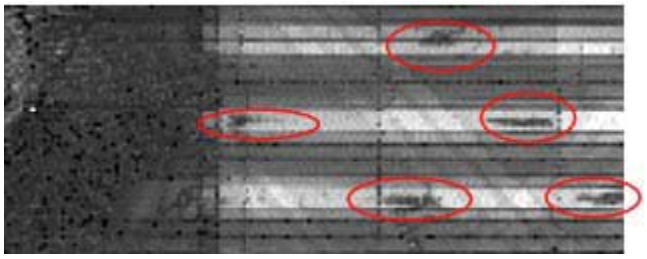


Figure 1.25 Ultrasonic attenuation image of right side tail region B.

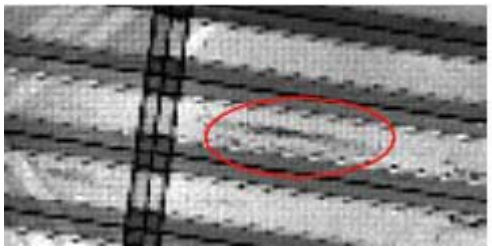


Figure 1.26 Ultrasonic attenuation image of right side tail region C.

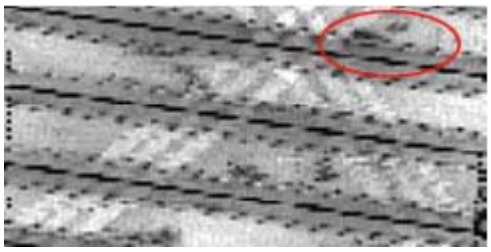


Figure 1.27 Ultrasonic attenuation image of right side tail region D.

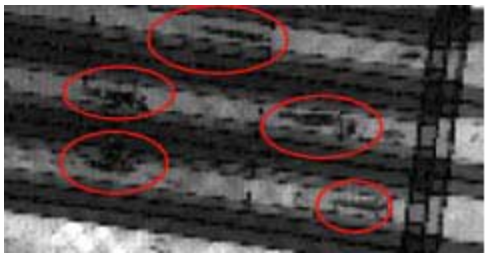


Figure 1.28 Ultrasonic attenuation image of right side tail region E.

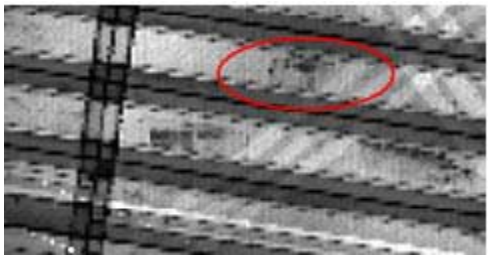


Figure 1.29 Ultrasonic attenuation image of right side tail region F.

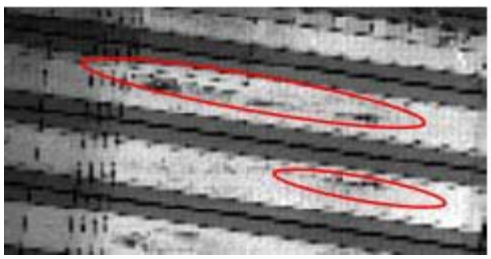


Figure 1.30 Ultrasonic attenuation image of right side tail region G.

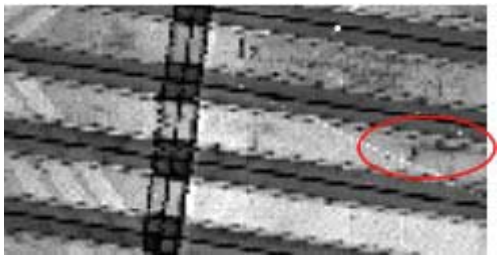


Figure 1.31 Ultrasonic attenuation image of right side tail region H.

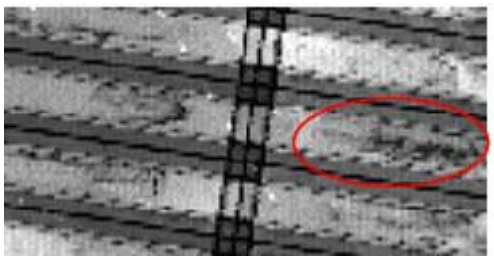


Figure 1.32 Ultrasonic attenuation image of right side tail region I.

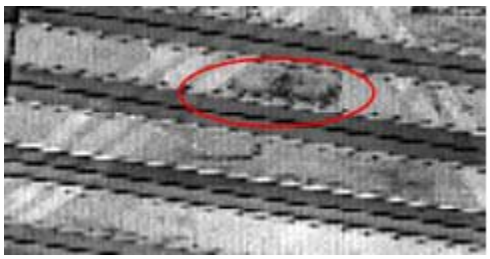


Figure 1.33 Ultrasonic attenuation image of right side tail region J.

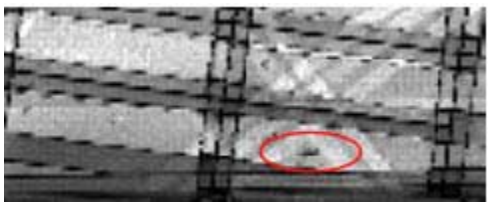


Figure 1.34 Ultrasonic attenuation image of right side tail region K.

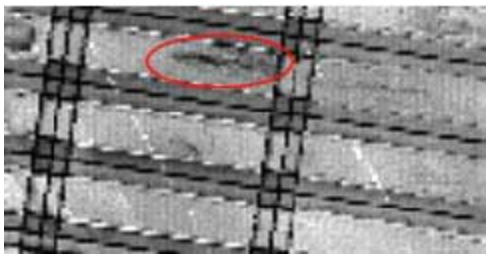


Figure 1.35 Ultrasonic attenuation image of right side tail region L.

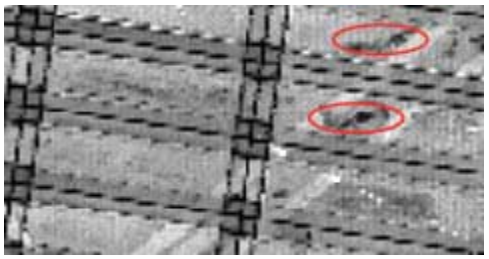


Figure 1.36 Ultrasonic attenuation image of right side tail region M.

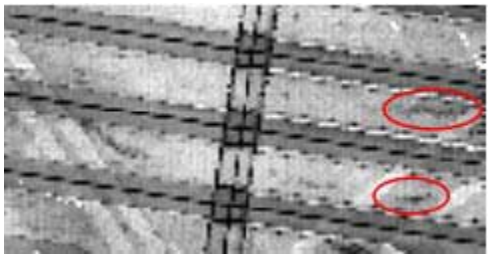


Figure 1.37 Ultrasonic attenuation image of right side tail region N.

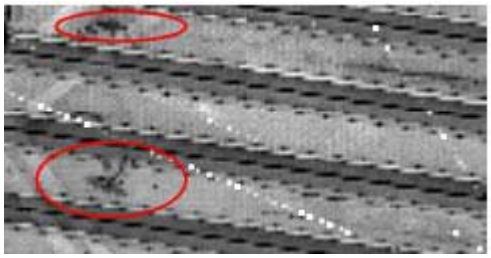


Figure 1.38 Ultrasonic attenuation image of right side tail region O.

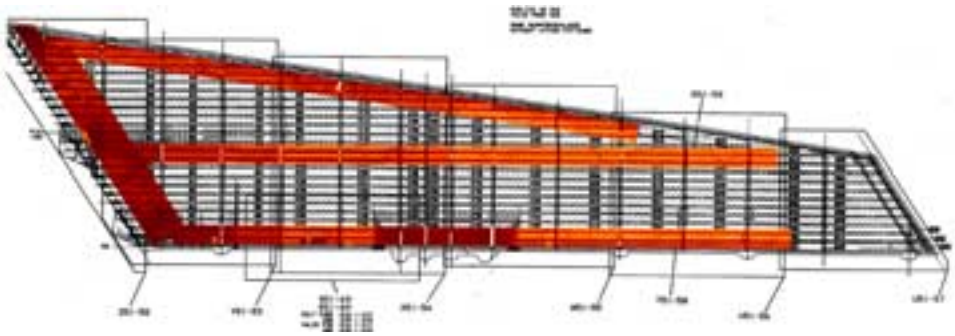


Figure 2.01 Lamb wave results for the right side of the composite tail.

Figure 2.02 Lamb wave results for the left side of the composite tail.

Figure 3.01 Radiographic image of water in honeycomb of rudder.

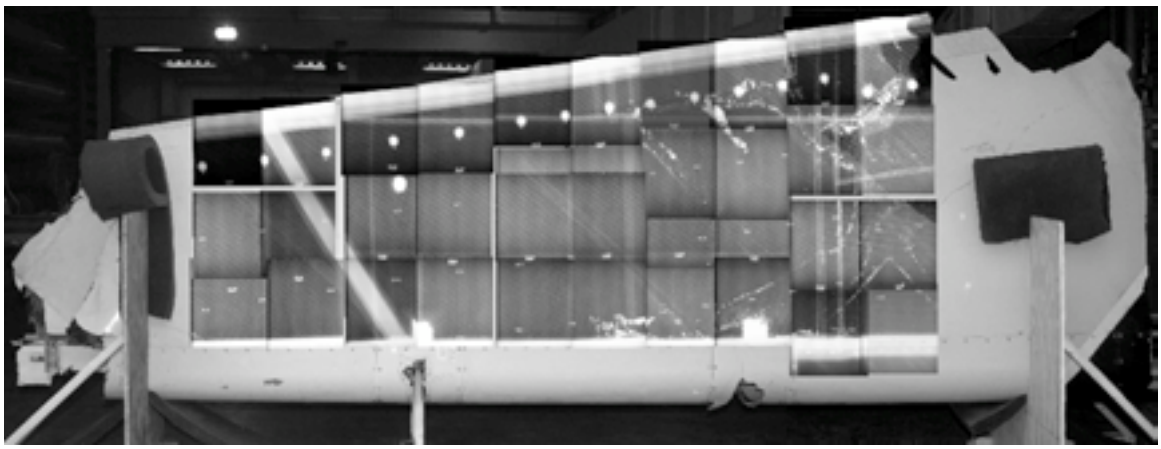


Figure 3.02 Compilation of radiography results superimposed on picture of the section of rudder examined.

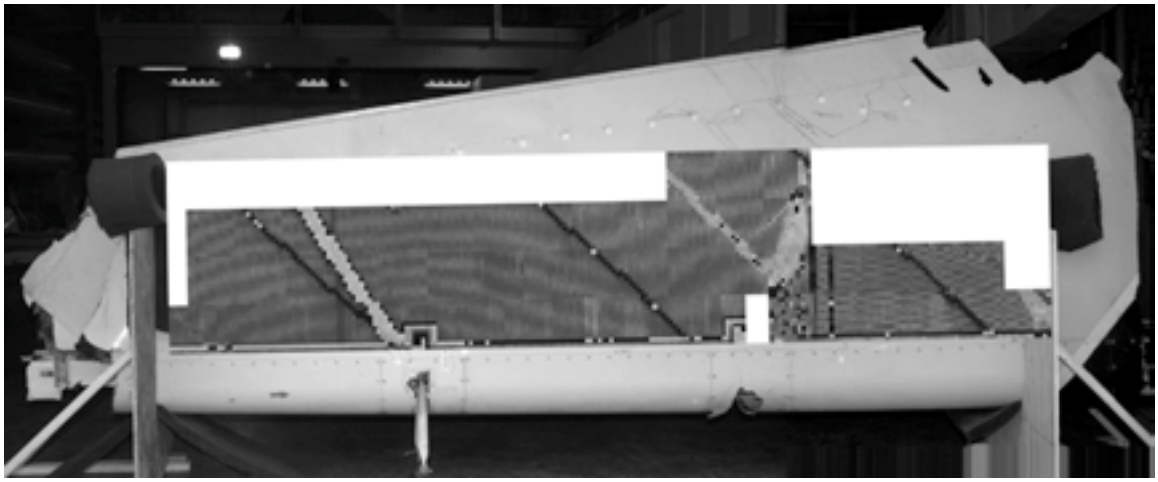


Figure 4.01 Lamb wave results on the right side of the rudder superimposed on a picture of the right side of the rudder.

Figure 4.02 Lamb wave results on the left side of the rudder superimposed on a picture of the right side of the rudder.

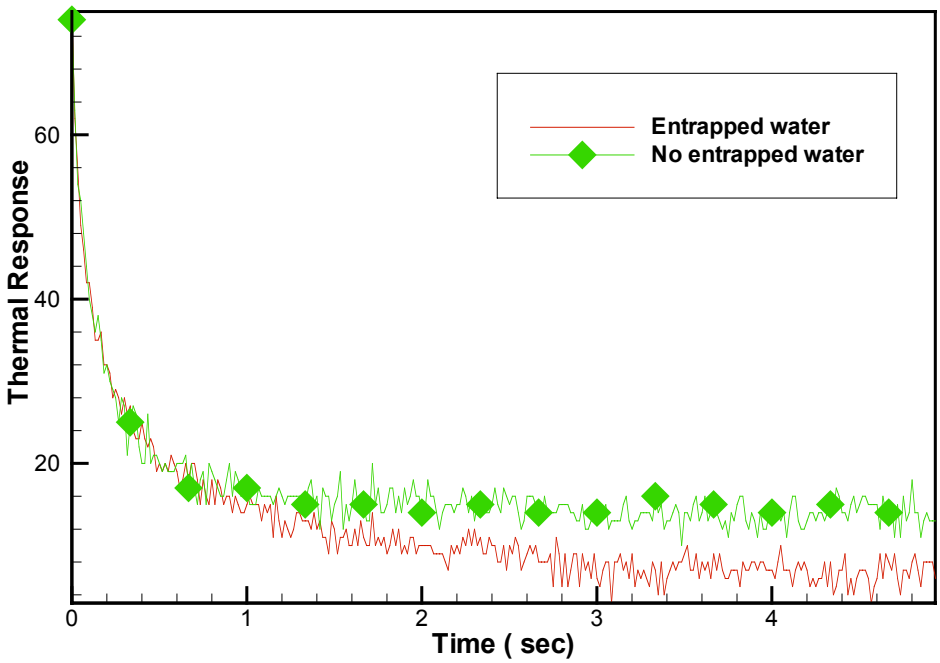



Figure 5.01 The thermal time response for a region of the rudder with and without entrapped water in the honeycomb

Figure 5.02 A compilation of all the data from the right side of the rudder superimposed on a picture of the right side of the rudder

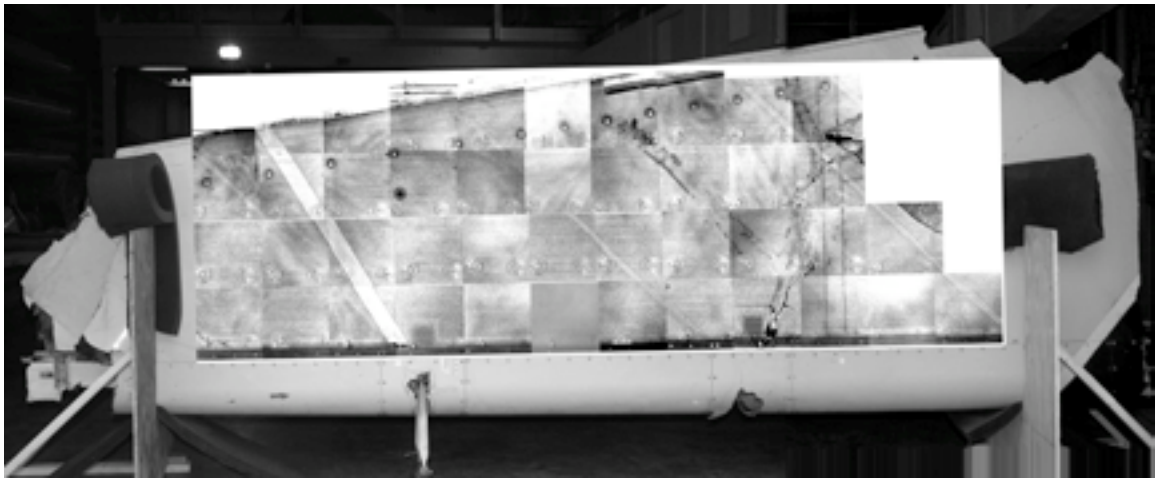


Figure 5.03 A compilation of all the data from the left side of the rudder superimposed on a picture of the right side of the rudder

Figure 5.04 A compilation of all the data from the right side of the rudder superimposed on a picture of the right side of the rudder with water highlighted in red

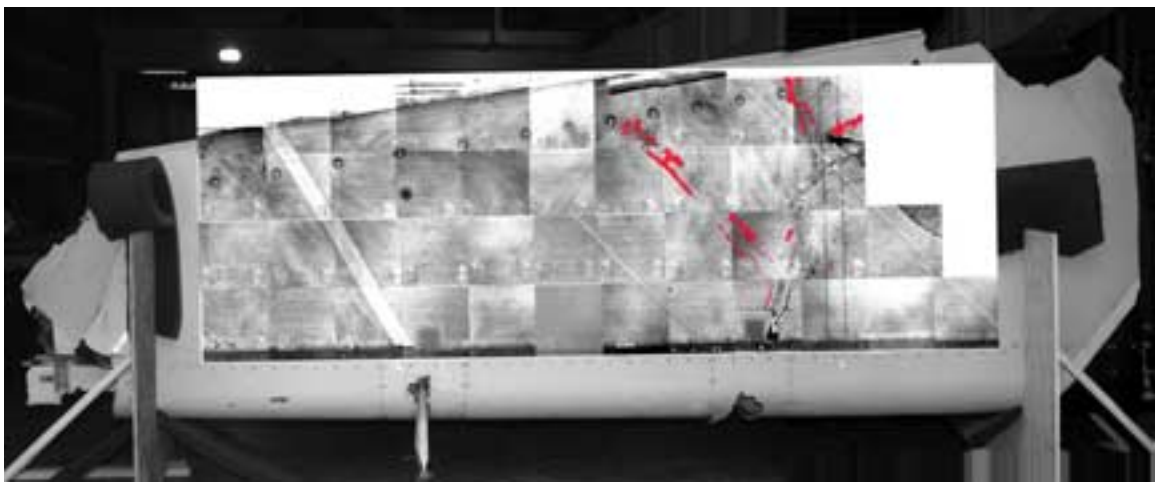


Figure 5.05 a compilation of all the data from the left side of the rudder superimposed on a picture of the right side of the rudder with water highlighted in red

Inspection areas:

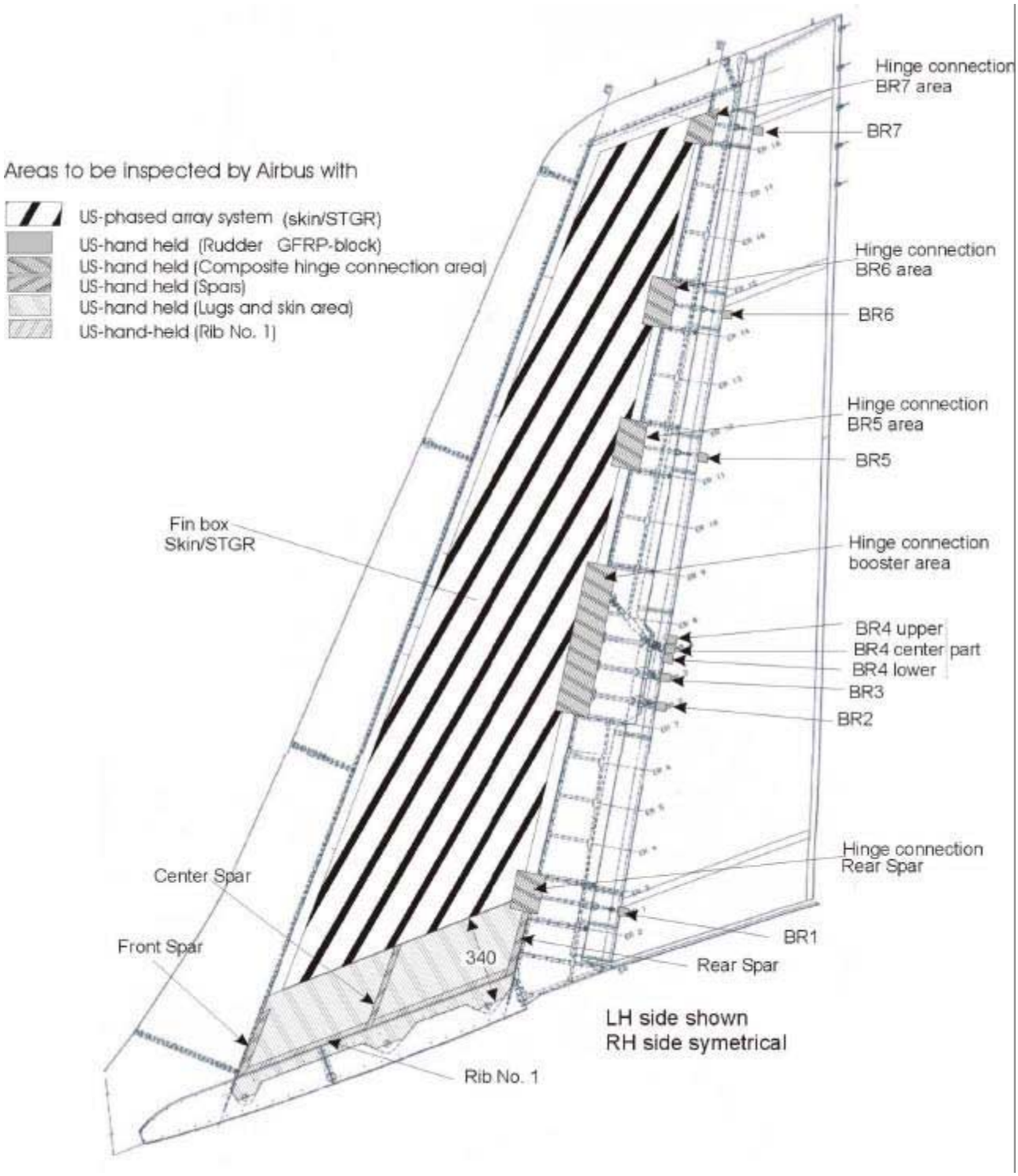



FIG. 01: Areas to be inspected by Airbus ESWNG at Vertical Stabilizer of MSN 420

Test Results:

No.I: HAND HELD ULTRASONIC INSPECTION AT FIN BOX

A. Condition during Inspection
The fin box was approx. 1 m jacked up in horizontal position on trestles so that the LH side was directed downward. From this it follows that the LH side inspection has to be done in an overhead work position which required a lot of human static muscularity. The RH side inspection could be done in a normal inspection position.

(1) Test results of shell (skin) and lug inspection with Ultrasonic.

(a1) LH side

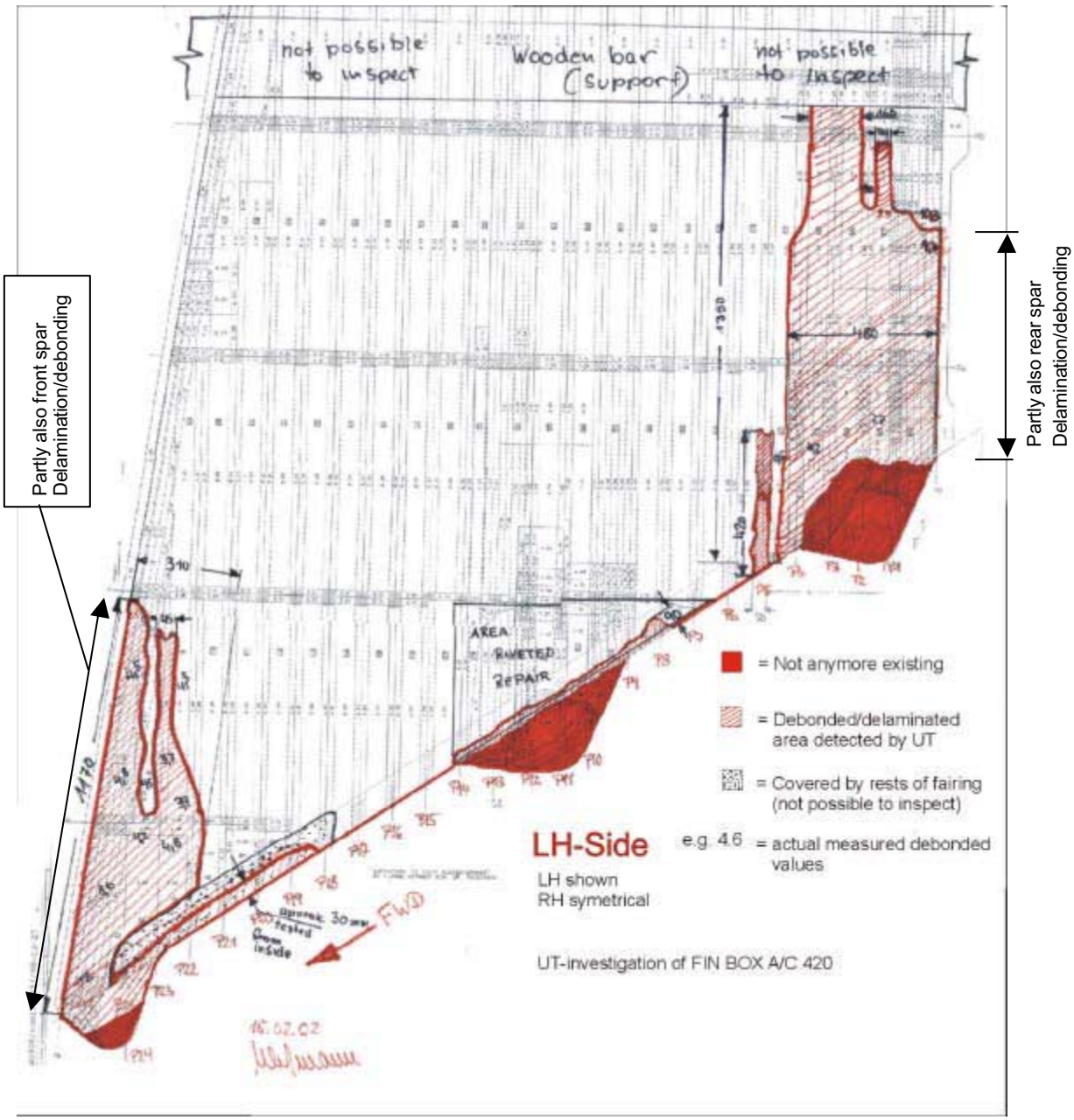



Fig.02: Test Results of Lug region from LH-side and shell above the lugs

(a2) RH side

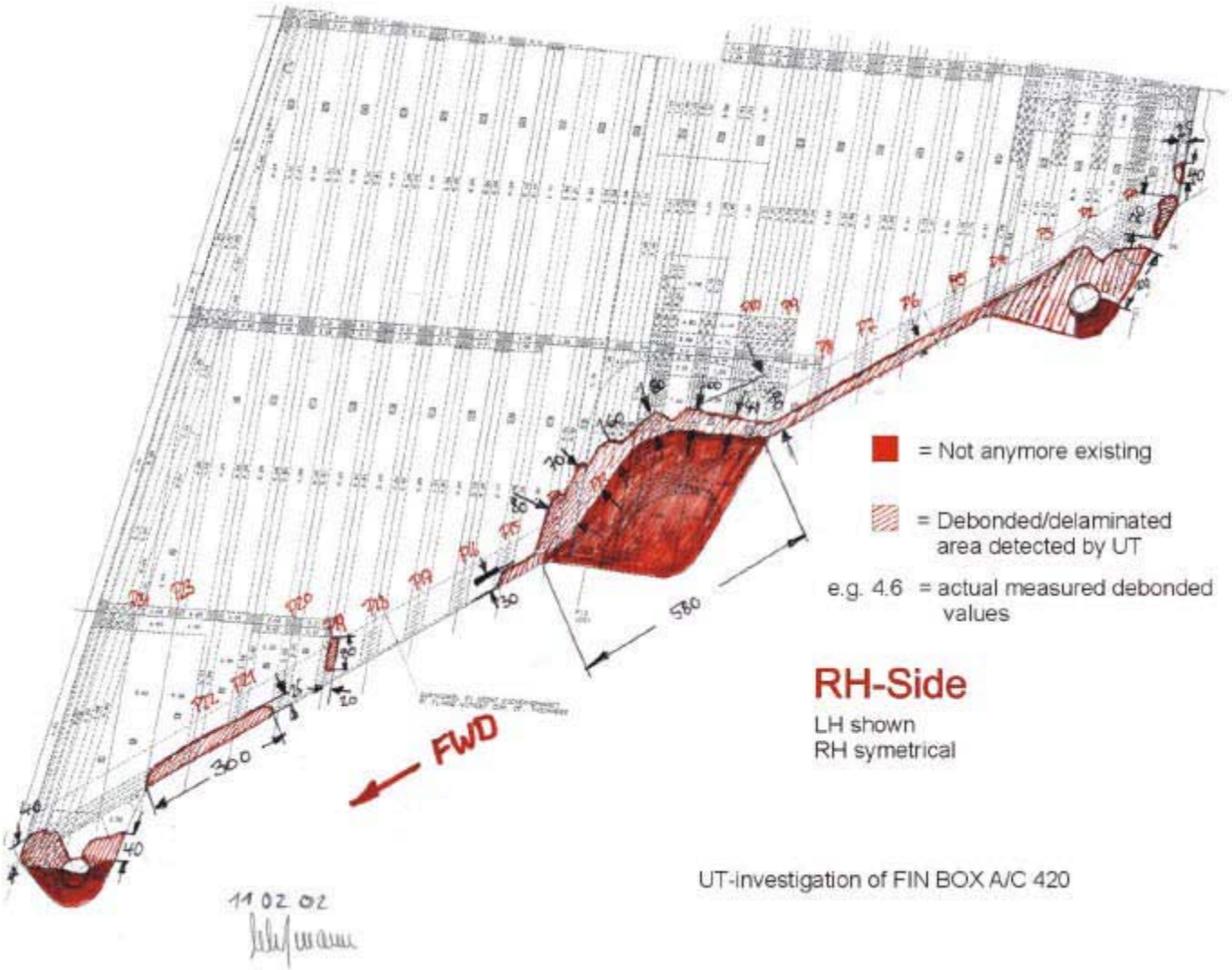



FIG. 03: Test Results of Lug region from RH-side and shell above the lugs

(b1) Front Spar /Stiffener No. 1 (see also photo no. 1)

! Length Dimension of debondings between Skin and Front Spar angle are illustrated in Fig. 02/03

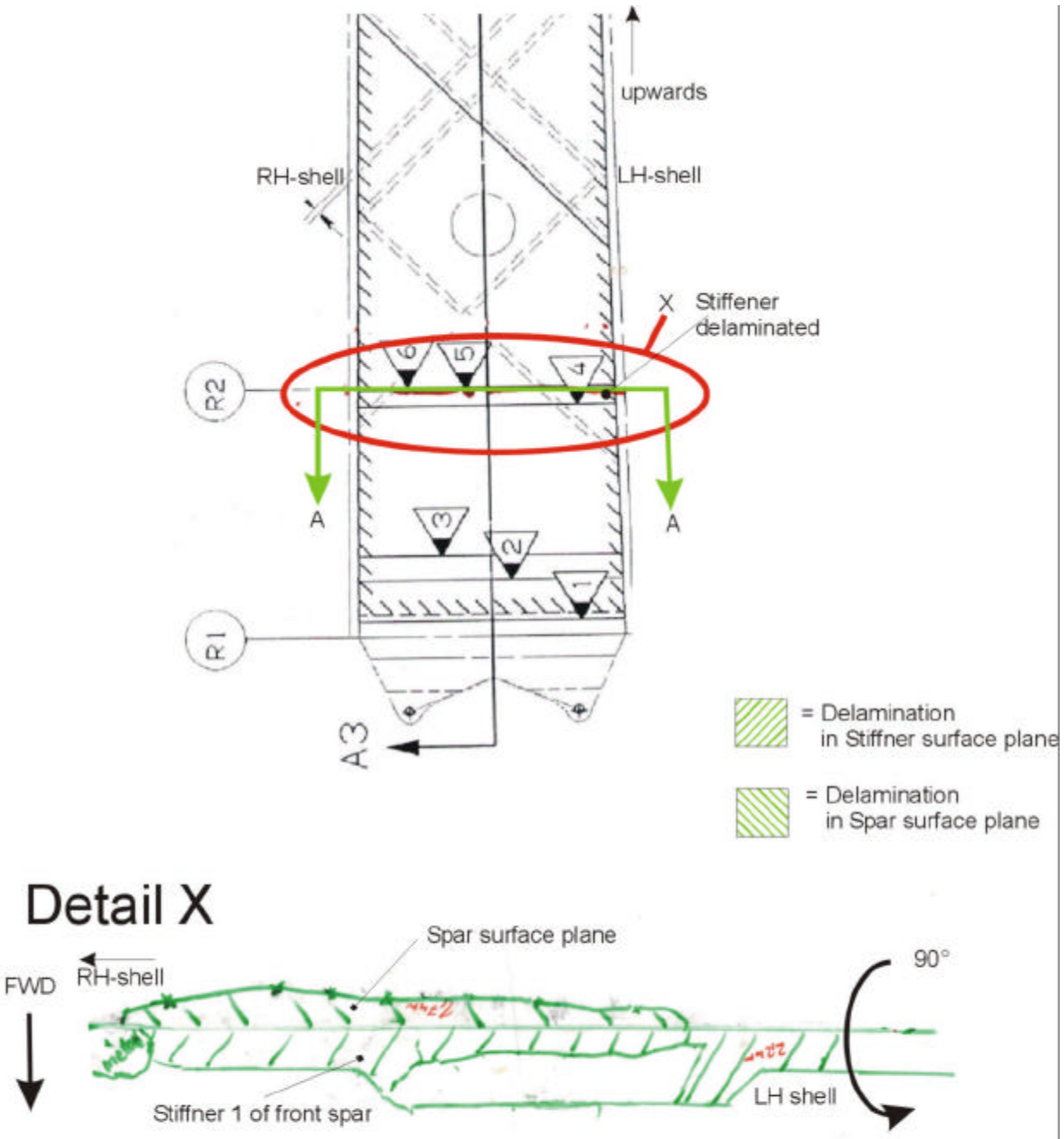
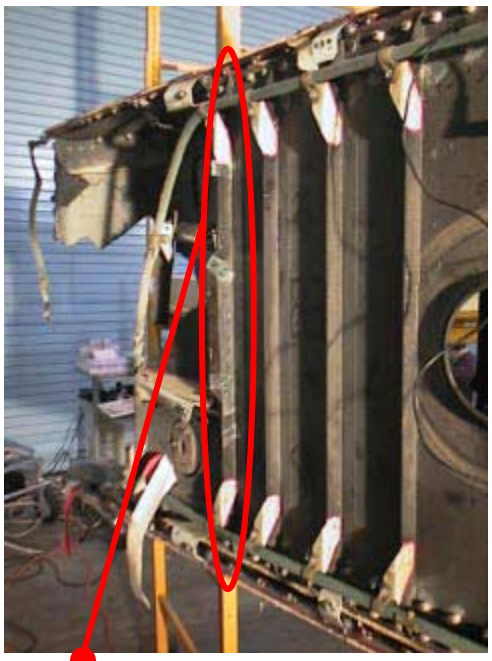
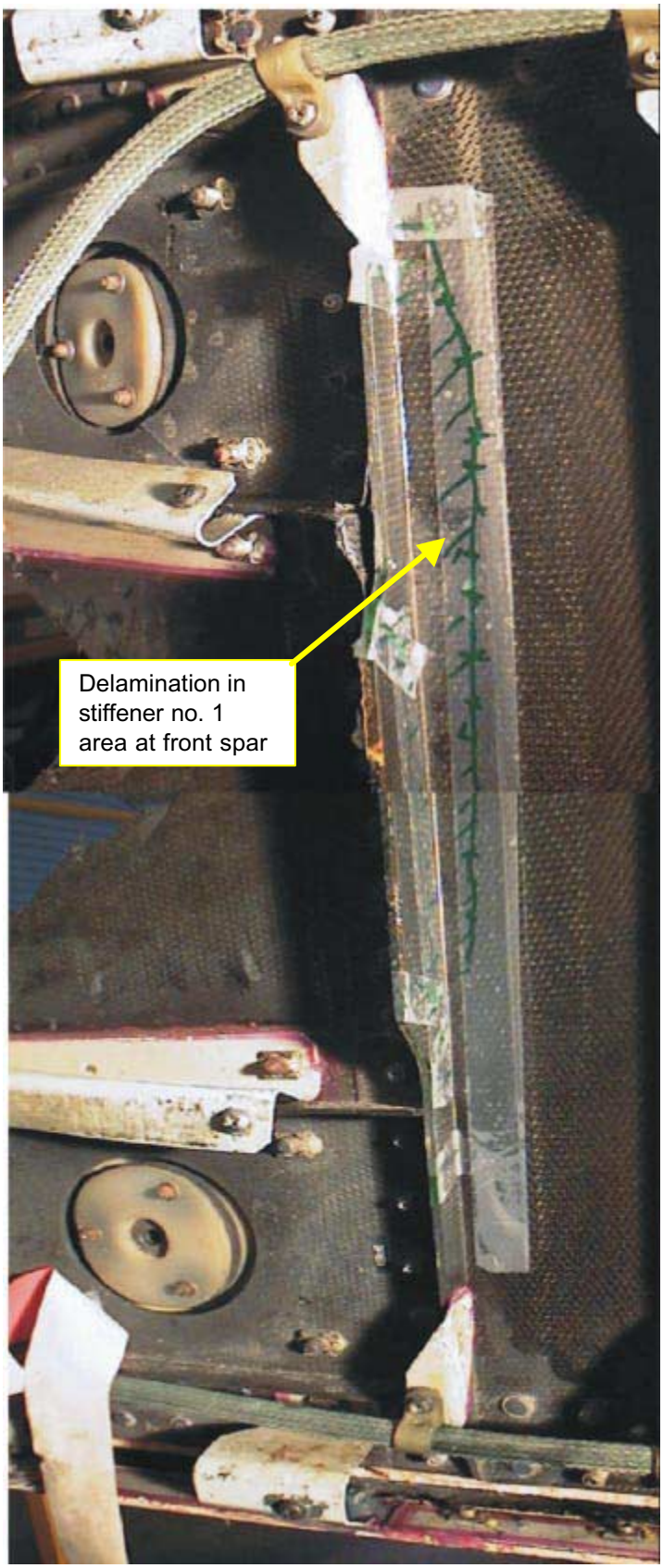



FIG. 04: Test results of front spar ; stiffener no. 1




See also Fig. 04

Photo no. 01: Delamination at front spar; stiffener no. 1

(b2) Center spar & Rear Spar ( radial force reinforcement lugs)

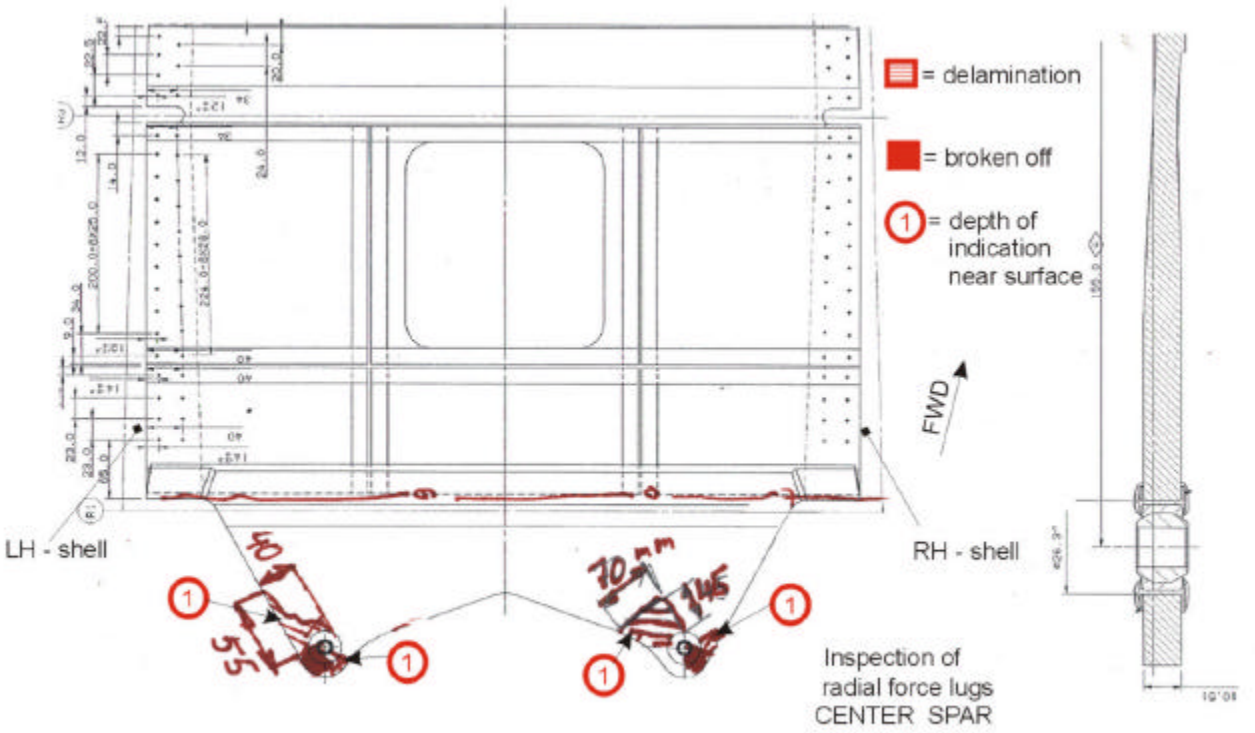



FIG. 05: Test results of center spar radial force lugs

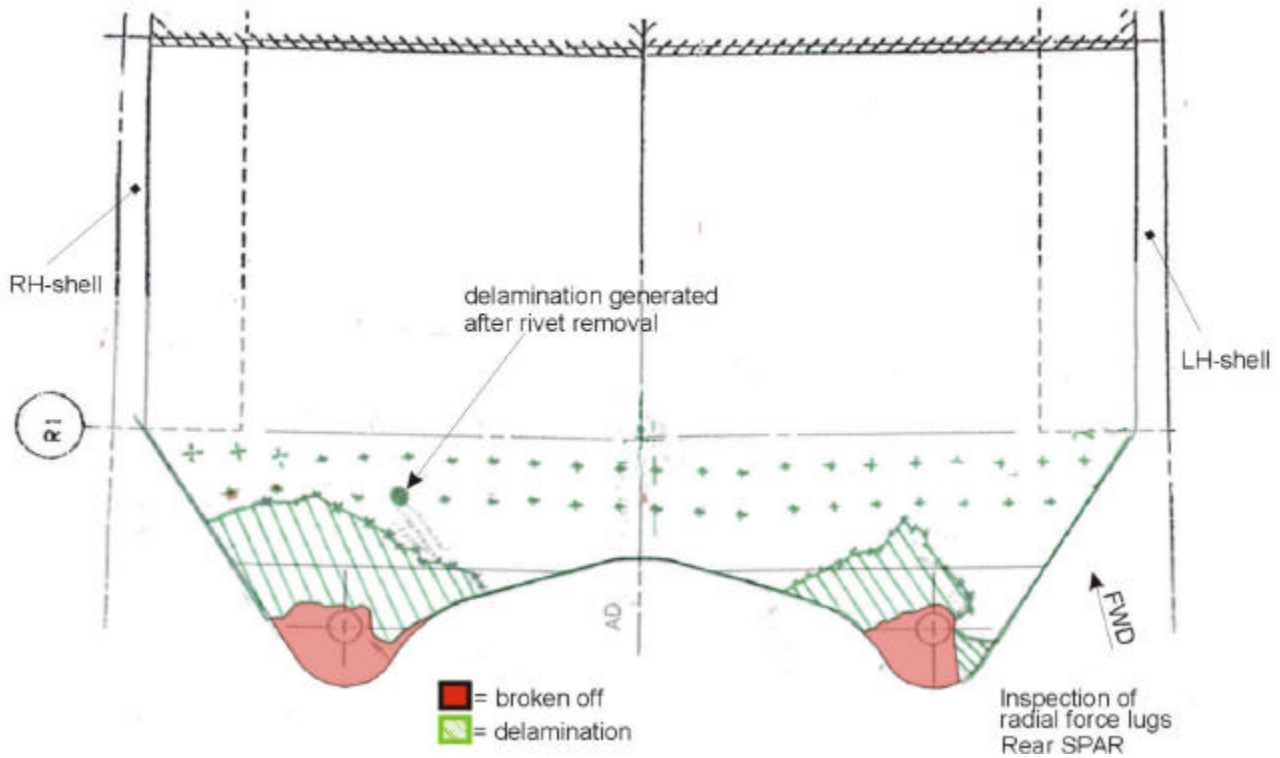



Fig.06: Test results of rear spar (radial force lugs)

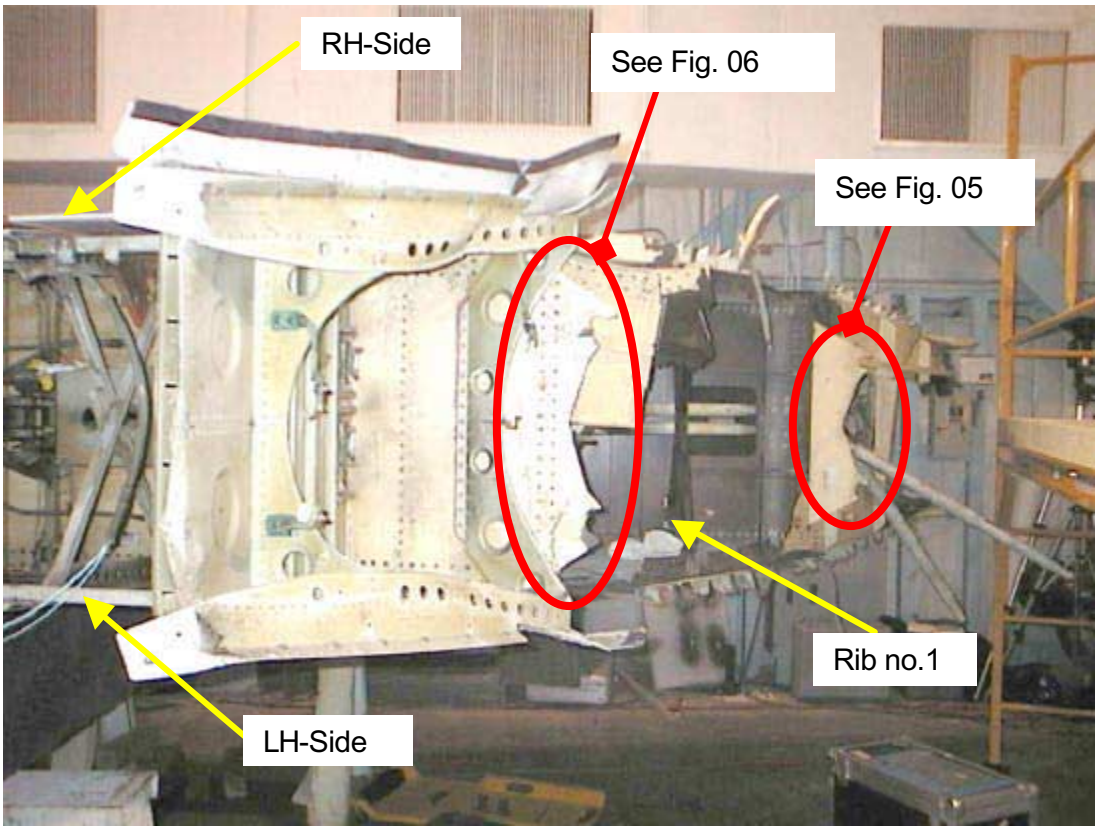



Photo No. 2: Inspection area Rib no. 1 and radial force lugs (see also Fig. No. 5 & 6)

( c) Composite Hinges Connection (see also Fig.no.7 )

On RH-side and LH-side within the hinge connection the areas in shell have been inspected completely in a distance of ± 200mm from hinge center line.
Based on still partly attached rear fairing on left hand side the inspection of these covered areas could not be performed. All other rear fairing attachment areas were inspected .

Test result: **NO DELAMINATIONS** in the inspected areas.

(d2) UT-results from rest of rib no. 1 between center spar and front spar (refer to Fig.08 and documentation photos).

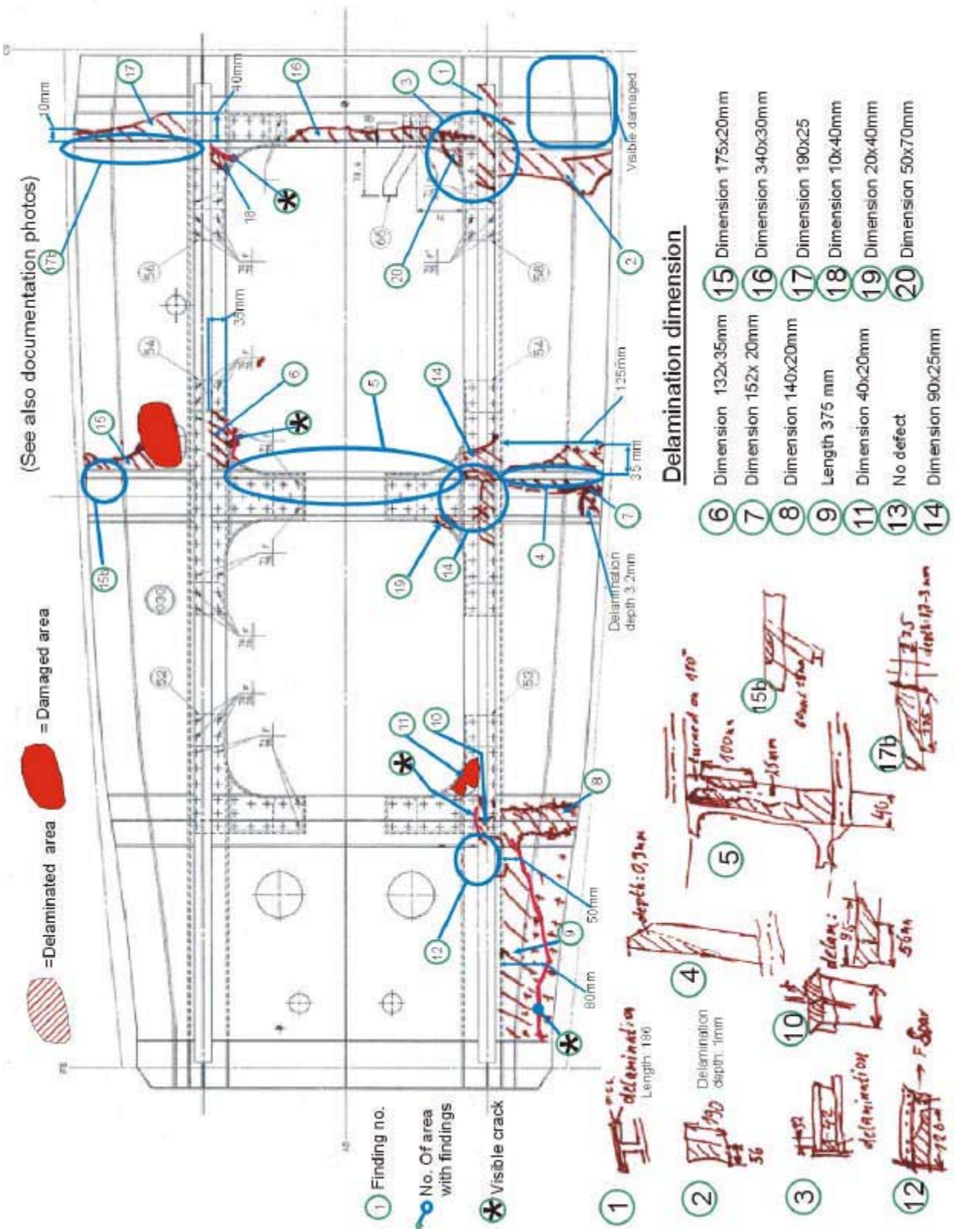



FIG.08: Delamination areas; damages in the area of rib no. 1 between center spar and front spar

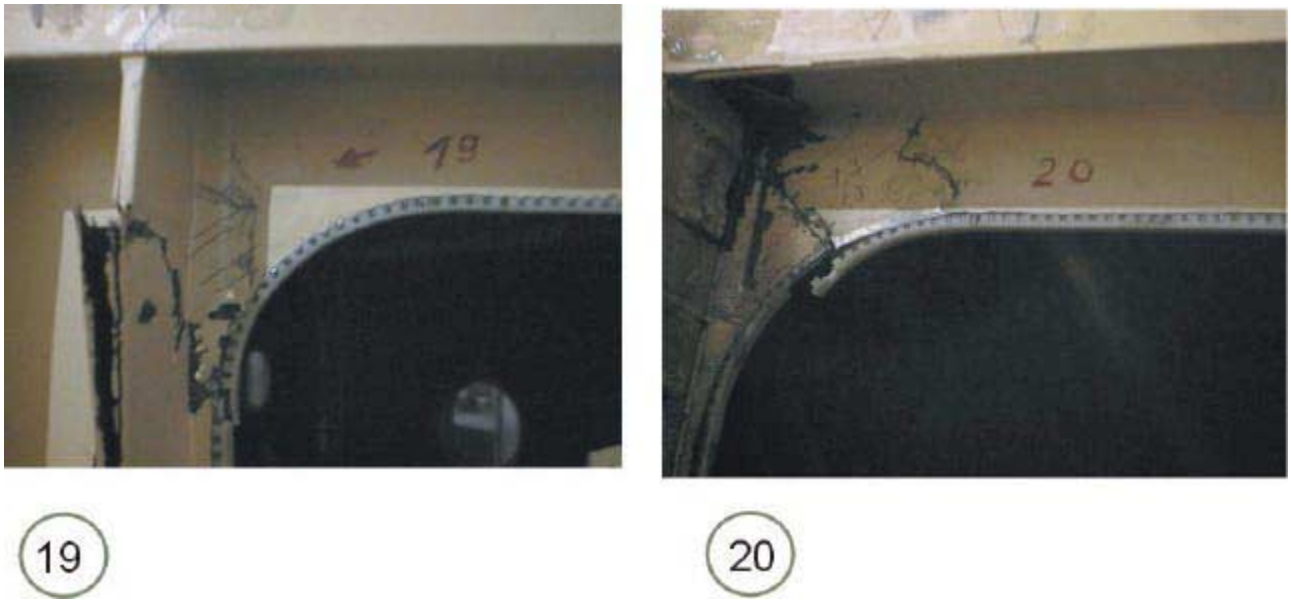



Fig.12: Photo documentaion of Findings 19-20 between center spar and front spar

(d3) Special investigation and test results on separated Center Lug /RH

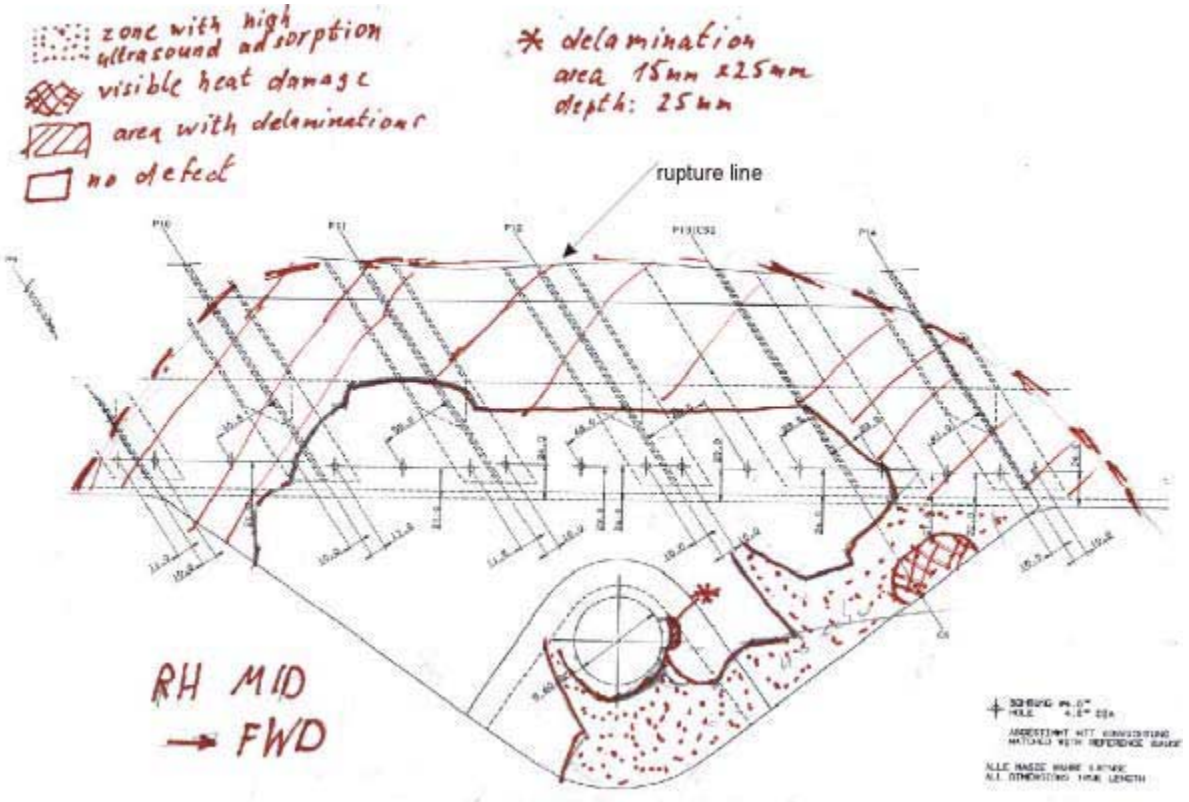
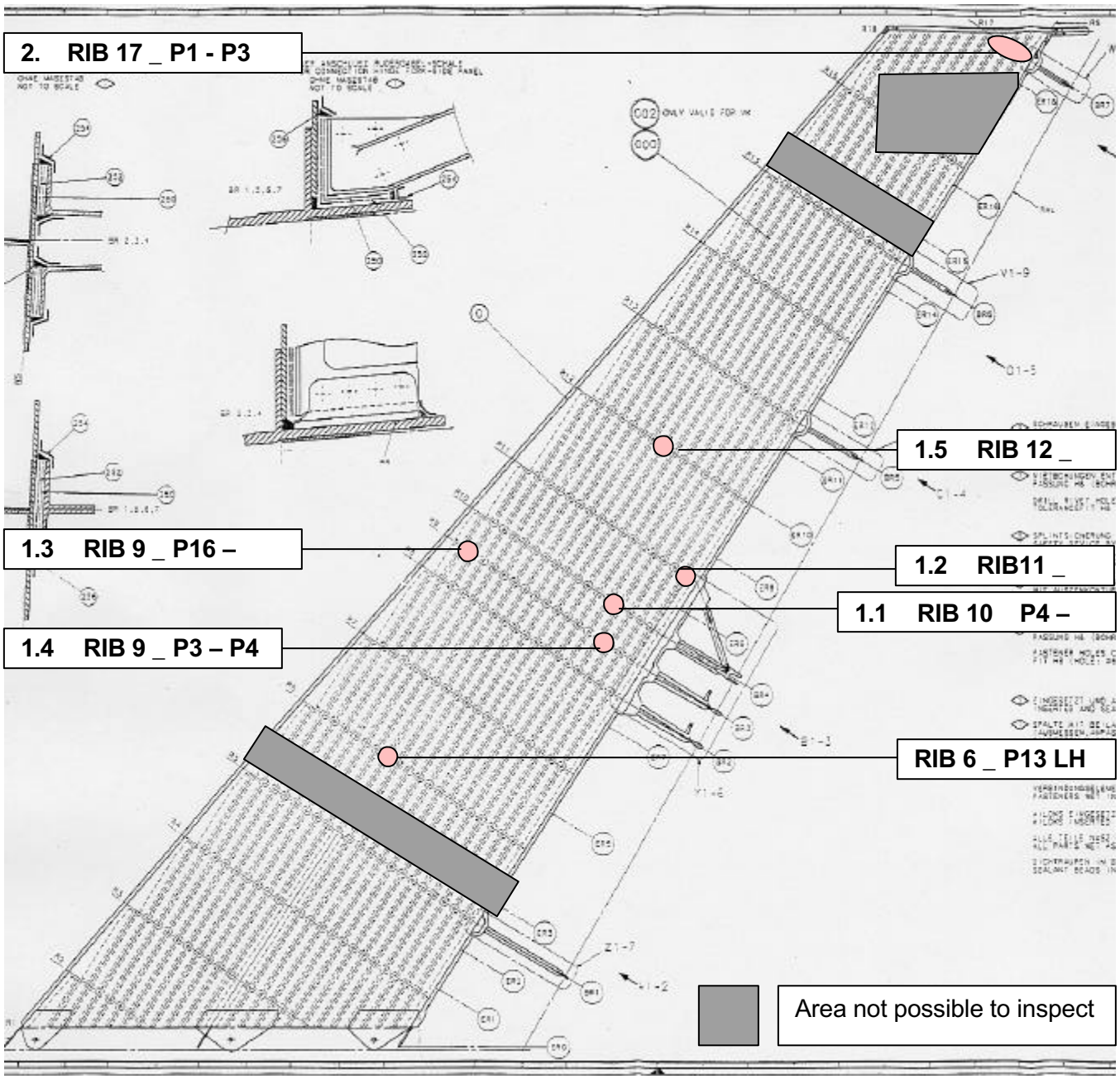



Fig. 13: Test results of UT-inspection at separated center lug / RH

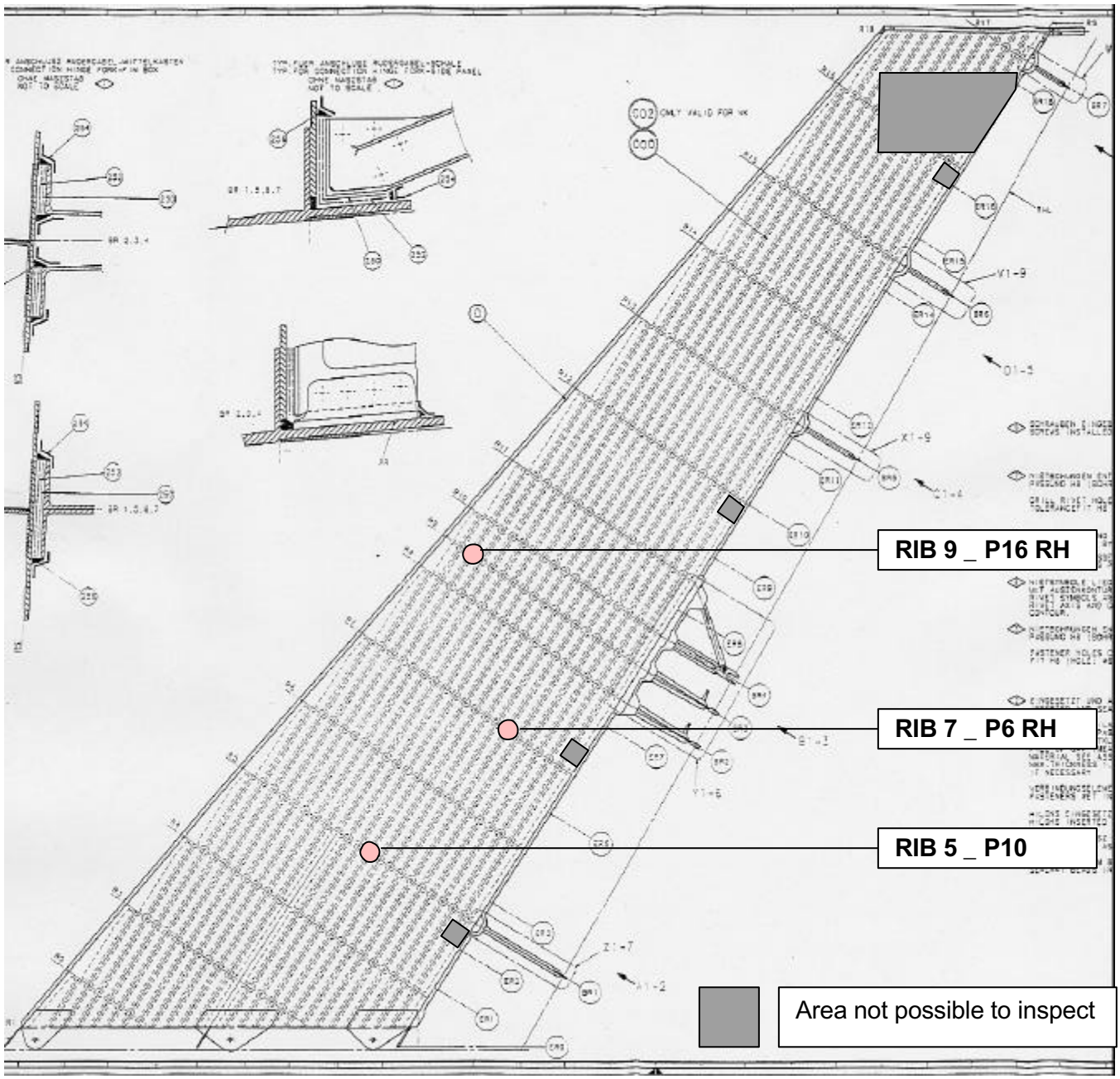
## Indication vertical stabilizer A300-600 MSN420 LH




**NOTE: The above illustrated drawing does not confirm in all details exactly with the construction level of Airbus MSN 420 (e.g. different rudder bearing forks).**
**The rudder shell illustration itself confirms with construction level of Airbus A300-600; MSN 420**
**The relevant NDT-result locations are given in the correct structure positions and are named by the correct STGR/RIB co-ordinates numbering.**

**NOTE: All above documented indications are below the size to be registered in accordance with the quality requirements (see also the following detail sketches).**

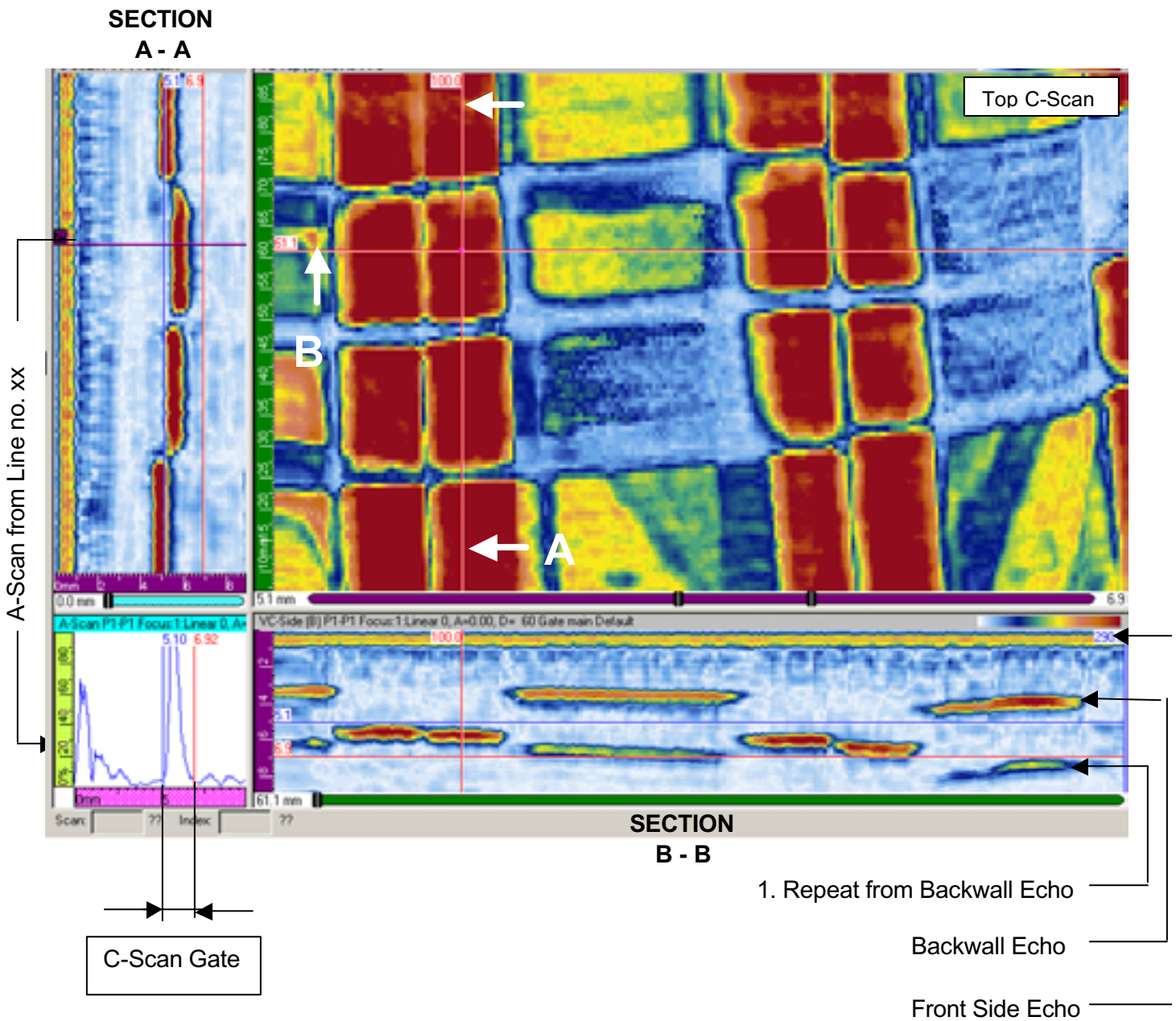
## Indication vertical stabilizer A300-600 MSN420 RH




**NOTE: The above illustrated drawing does not confirm in all details exactly with the construction level of Airbus MSN 420 (e.g. different rudder bearing forks).**
**The rudder shell illustration itself confirms with construction level of Airbus A300-600; MSN 420**
**The relevant NDT-result locations are given in the correct structure positions and are named by the correct STGR/RIB co-ordinates numbering.**

**NOTE: All above documented indications are below the size to be registered in accordance with the quality requirements (see also the following detail sketches).**

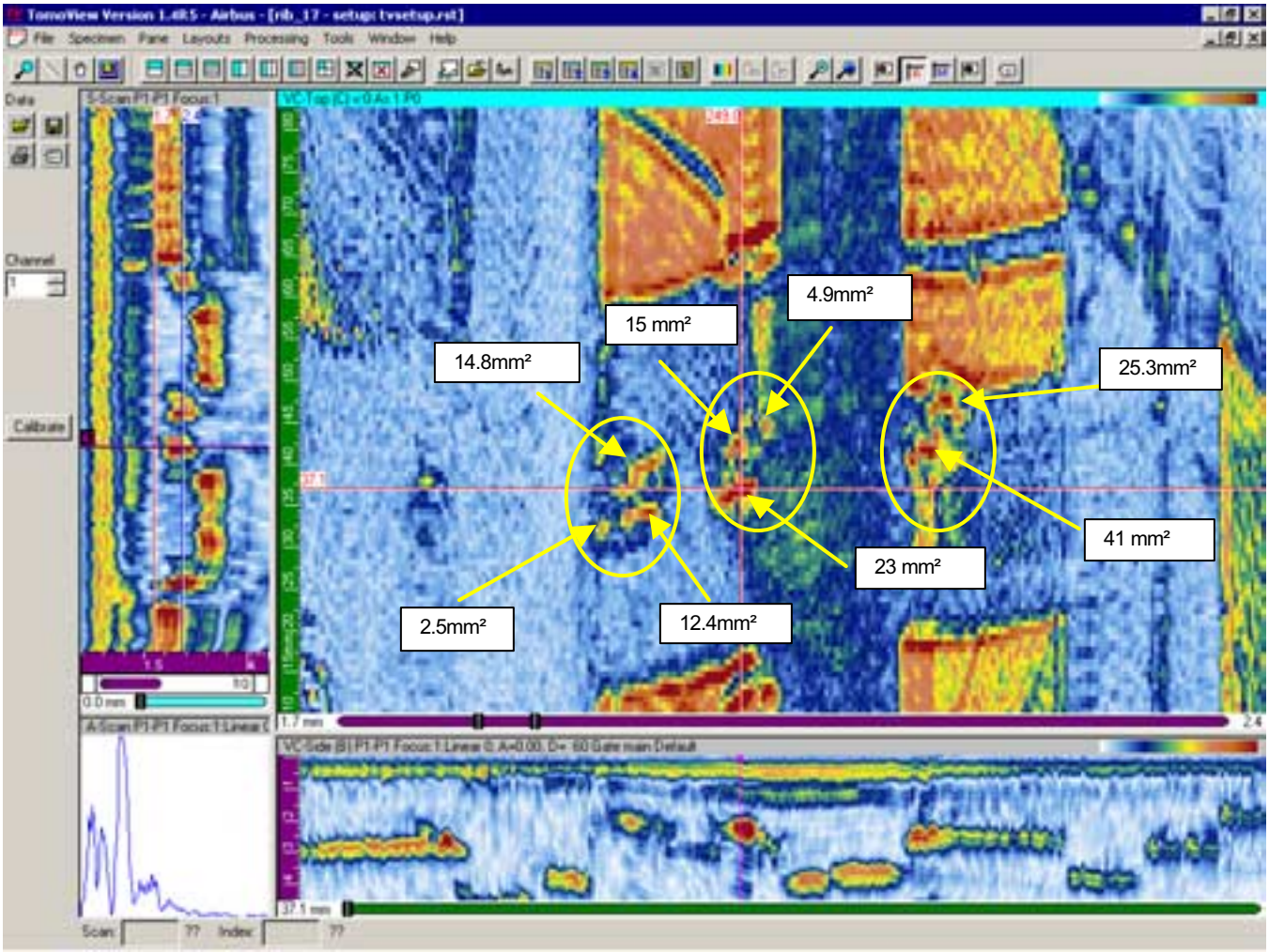
## Example for an area without indication




# EXAMPLE

* S-Scan: Sectorial Scan (The ability to scan a complete sector of the volume without any probe movement

## RIB 17 _ P1 - P3 LH




**NOTE: The above illustrated area belongs to the quality requirement zone D, which means that a max. extension of de-lamination of 250mm² is permissible.**

**NOTE: All above documented indications are below the size to be registered in accordance with the quality requirements.**