DOCKET NO. SA-516

EXHIBIT NO. 20B

NATIONAL TRANSPORTATION SAFETY BOARD
WASHINGTON, D.C.

FIRE AND EXPLOSION GROUP FACTUAL REPORT
Appendix II
(Sooting/Fracture Diagrams)
(36 pages)

TWA FLIGHT 800 ACCIDENT INVESTIGATION

FIRE AND EXPLOSION

APPENDIX II

Sooting/Fracture Diagrams

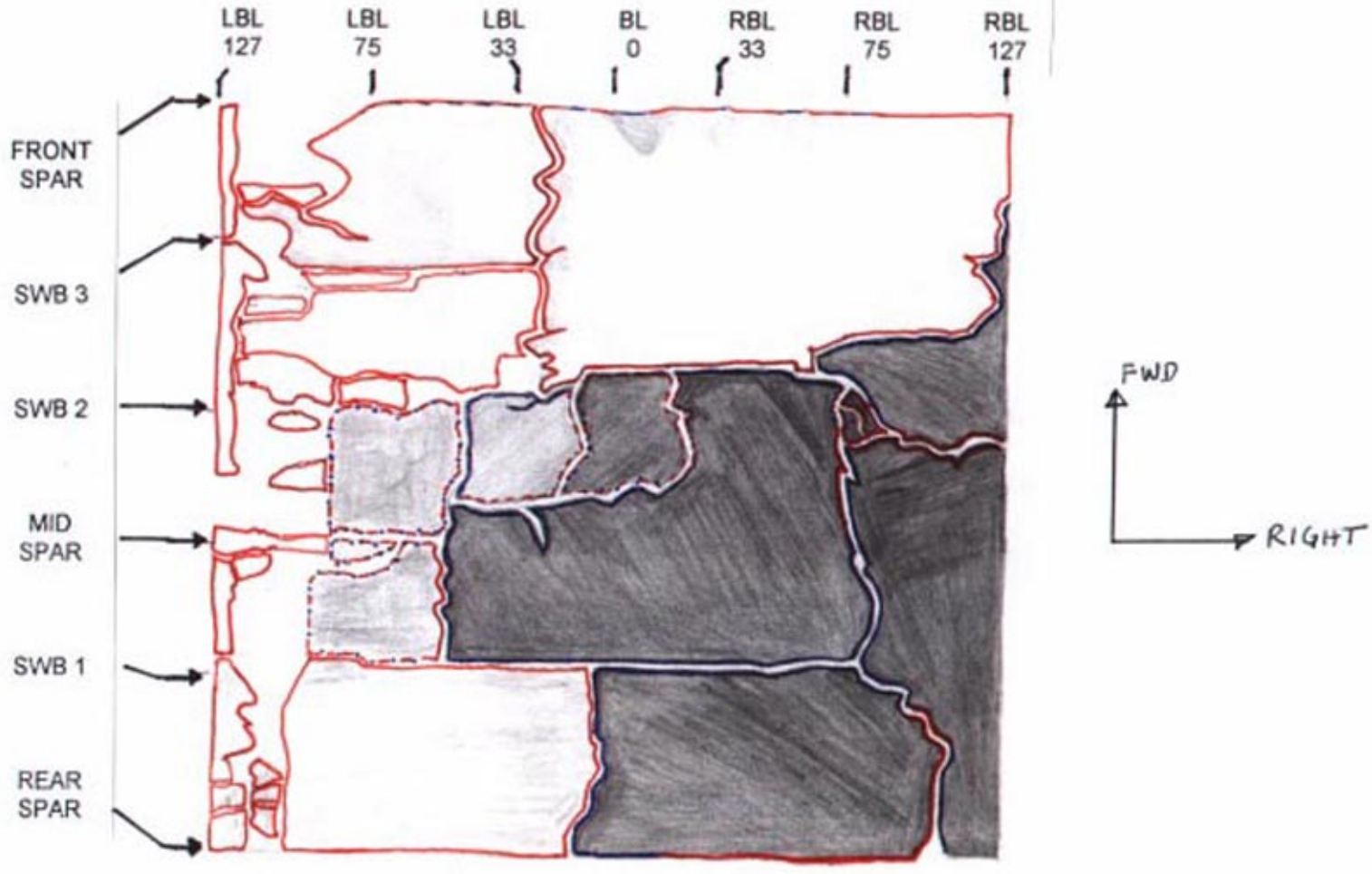
APPENDIX II
SOOTING/FRACTURE DIAGRAMS

TABLE OF CONTENTS

Diagram #	Title
1	Upper Surface of the Upper Skin
2	Lower Surface of the Upper Skin
3	Upper Surface of the Lower Skin
4	Lower Surface of the Lower Skin
4.1	Stringer Soot Demarcation Map
5	Forward Surface of the Front Spar
6	Aft Surface of the Front Spar
7	Forward Surface of Spanwise Beam #3
8	Aft Surface of Spanwise Beam #3
9	Forward Surface of Spanwise Beam #2
10	Aft Surface of Spanwise Beam #2
11	Forward Surface of the Mid Spar
12	Aft Surface of the Mid Spar
13	Forward Surface of Spanwise Beam #1
14	Aft Surface of Spanwise Beam #1
15	Forward Surface of the Rear Spar
16	Aft Surface of the Rear Spar
17	Left Surface of the BL O Rib
18	Right Surface of the BL O Rib
19	Outboard Surface of the Right Hand Side-of-Bodv Rib
20	Inboard Surface of the Right Hand Side-of-Body Rib
21	Outboard Surface of the Left Hand Side-of-Body Rib
22	Inboard Surface of the Left Hand Side-of-Body Rib
23	External Surface of the Upper and Lower Right Wing Skins
24	Internal Surface of the Upper and Lower Right Wins Skins
25	External Surface of the Upper and Lower Left Wing Skins
26	Internal Surface of the Upper and Lower left Wing Skins
27	Fuel Tank Vent System
28	Right Wing Vent Stringer
29	Seat Fire Damage
30	Right Wing Punctures
31	Fuselage Sooting Patterns

CENTER WING TANK SOOTING PATTERN DIAGRAM

UPPER SKIN - UPPER SURFACE



FRACTURES:

CLEAN

SOOTED

SURFACES:

CLEAN

HEAVILY SOOTED

Diagram 1.

CENTER WING TANK SOOTING PATTERN DIAGRAM

UPPER SKIN - LOWER SURFACE

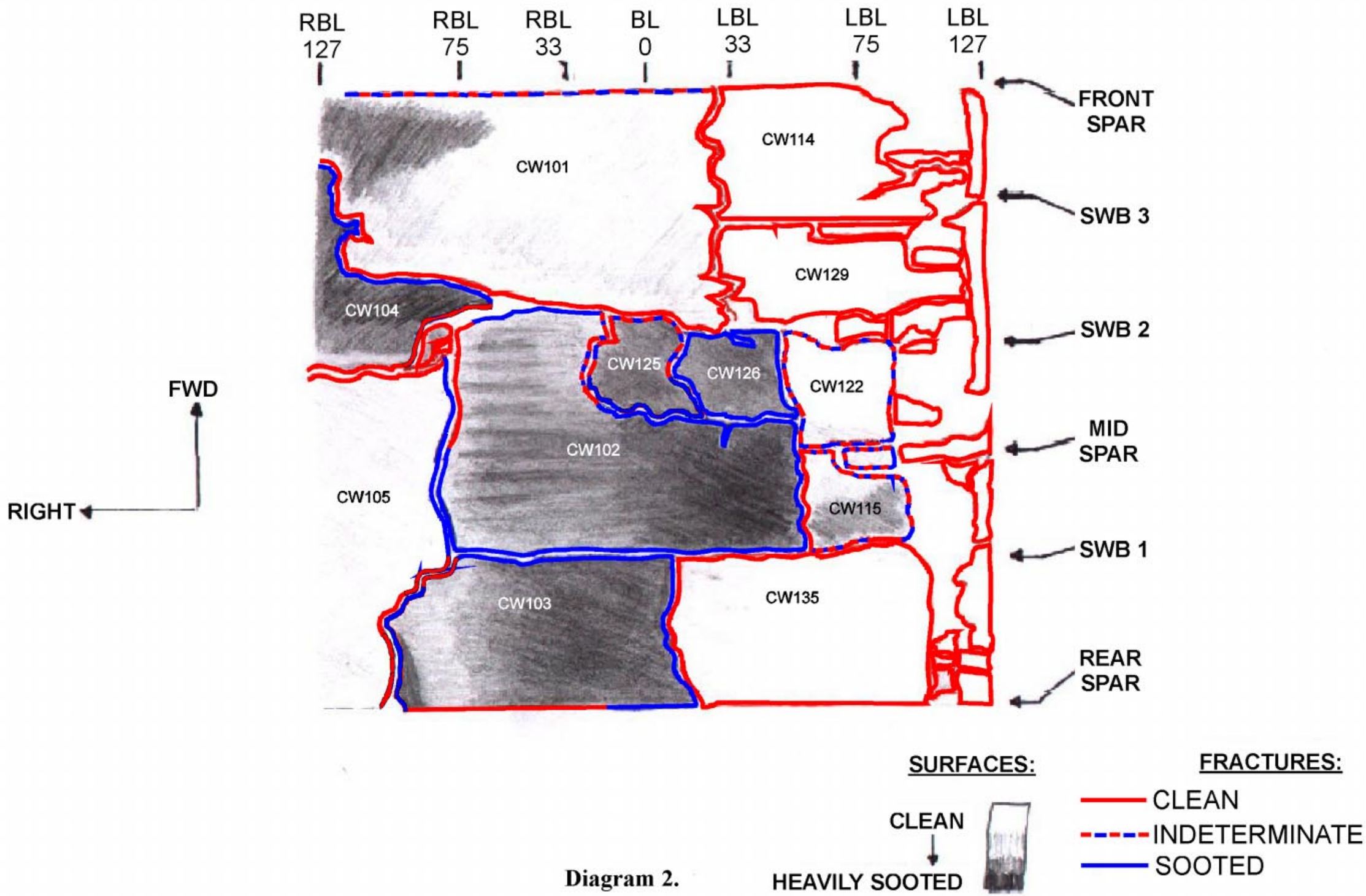
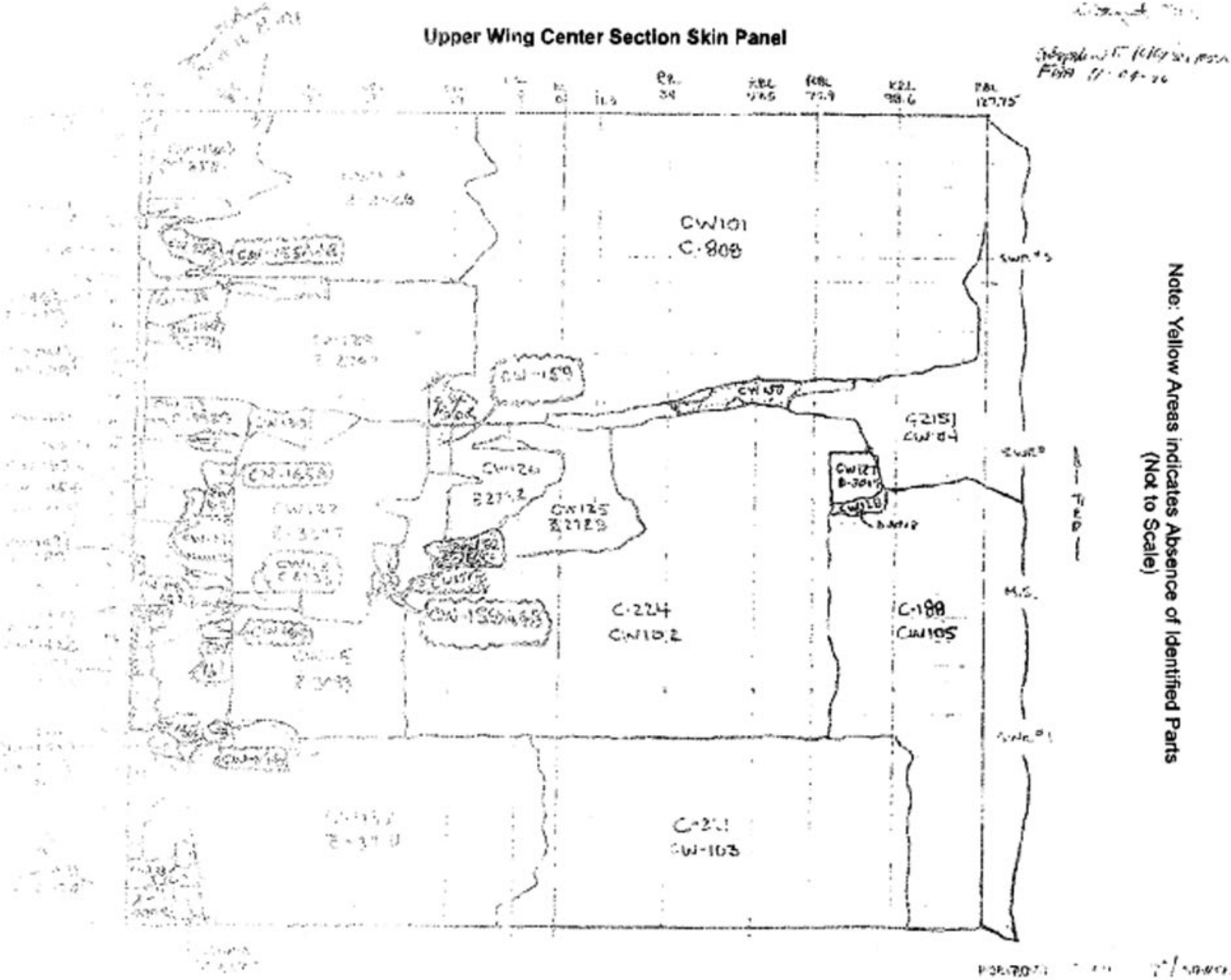


Diagram 2.

Upper Wing Center Section Skin Panel



Note: Yellow Areas indicates Absence of Identified Parts
(Not to Scale)

CENTER WING TANK SOOTING PATTERN DIAGRAM

LOWER SKIN - UPPER SURFACE

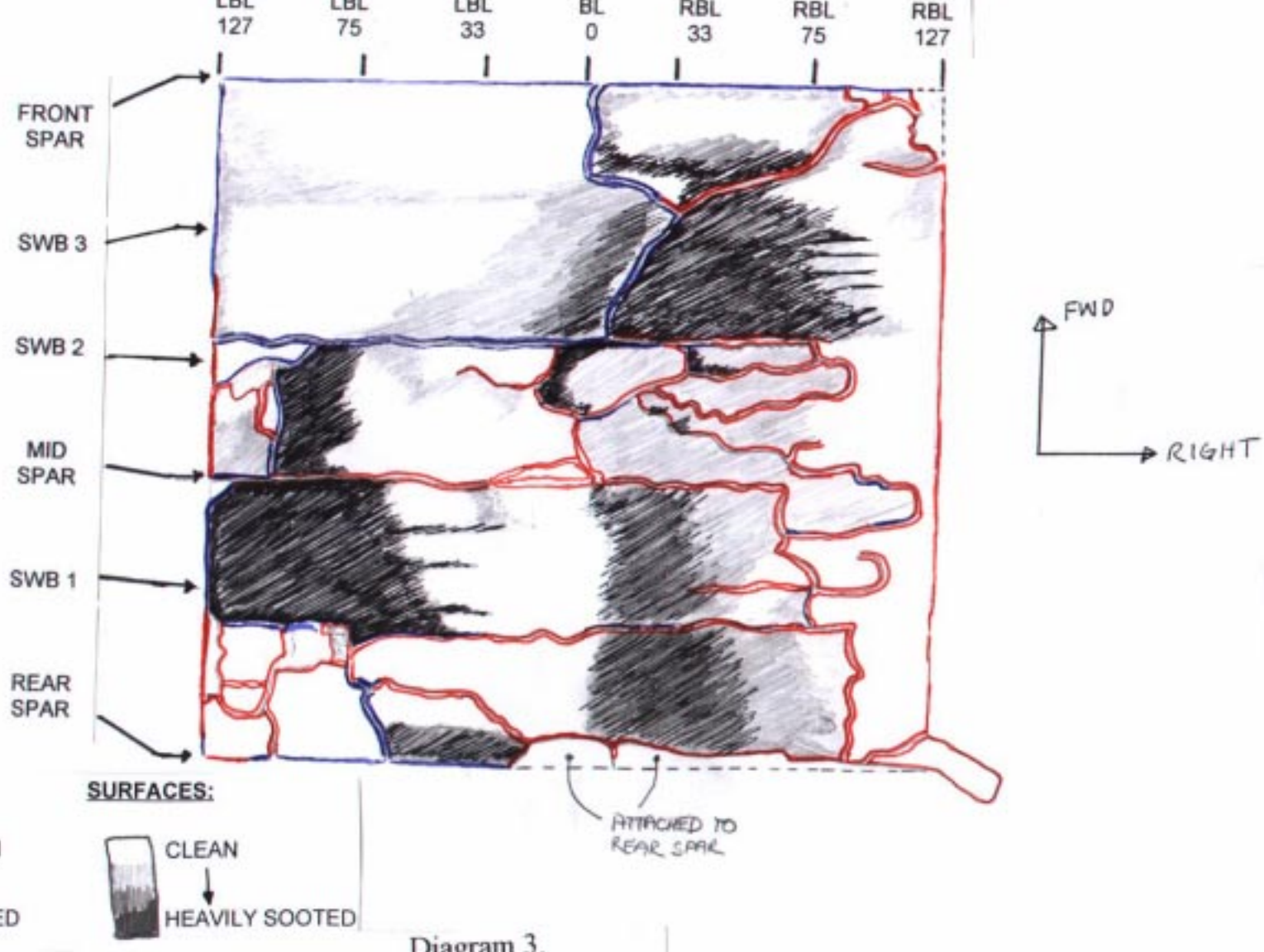


Diagram 3.

CENTER WING TANK SOOTING PATTERN DIAGRAM

LOWER SKIN - LOWER SURFACE

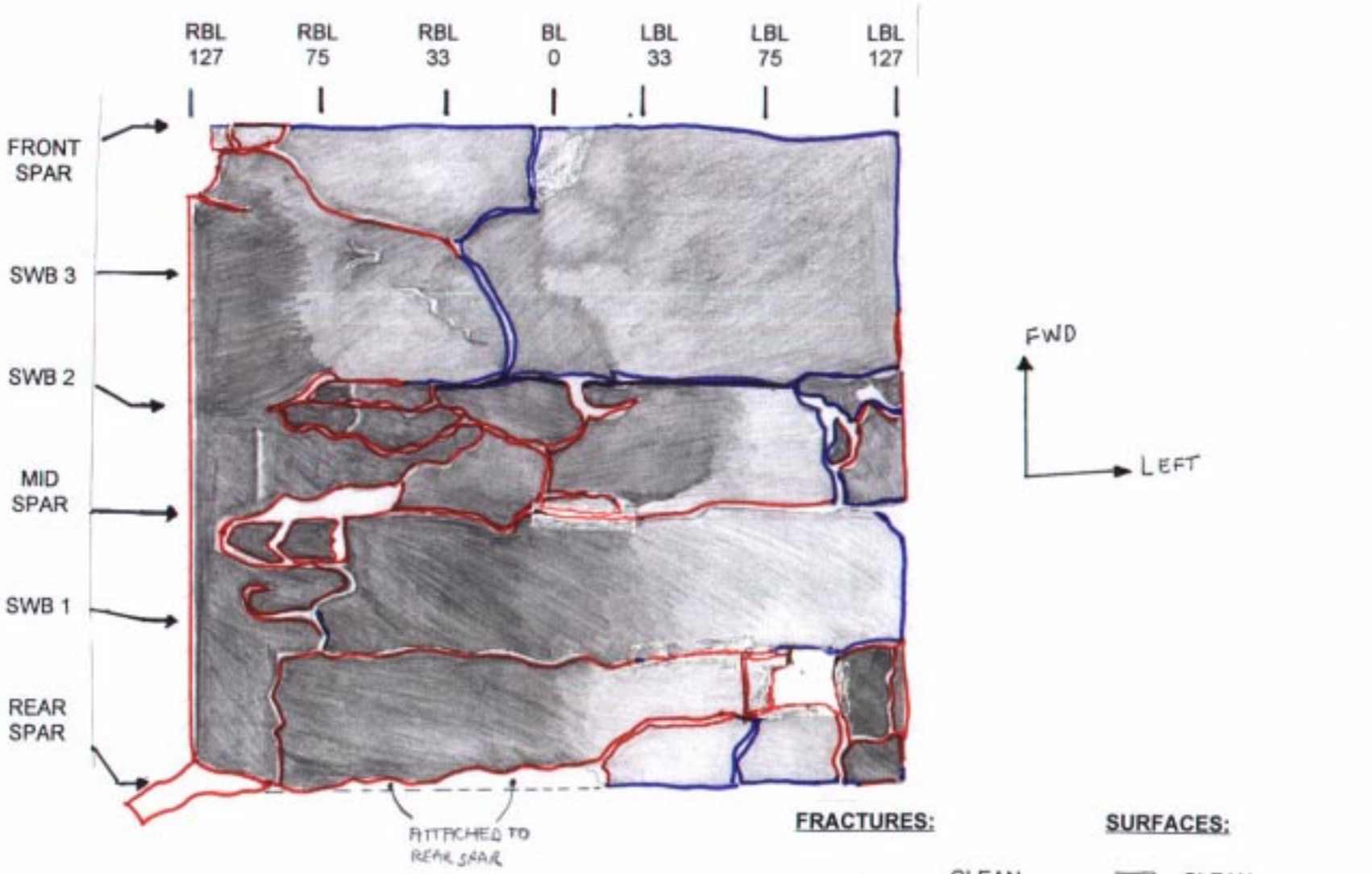
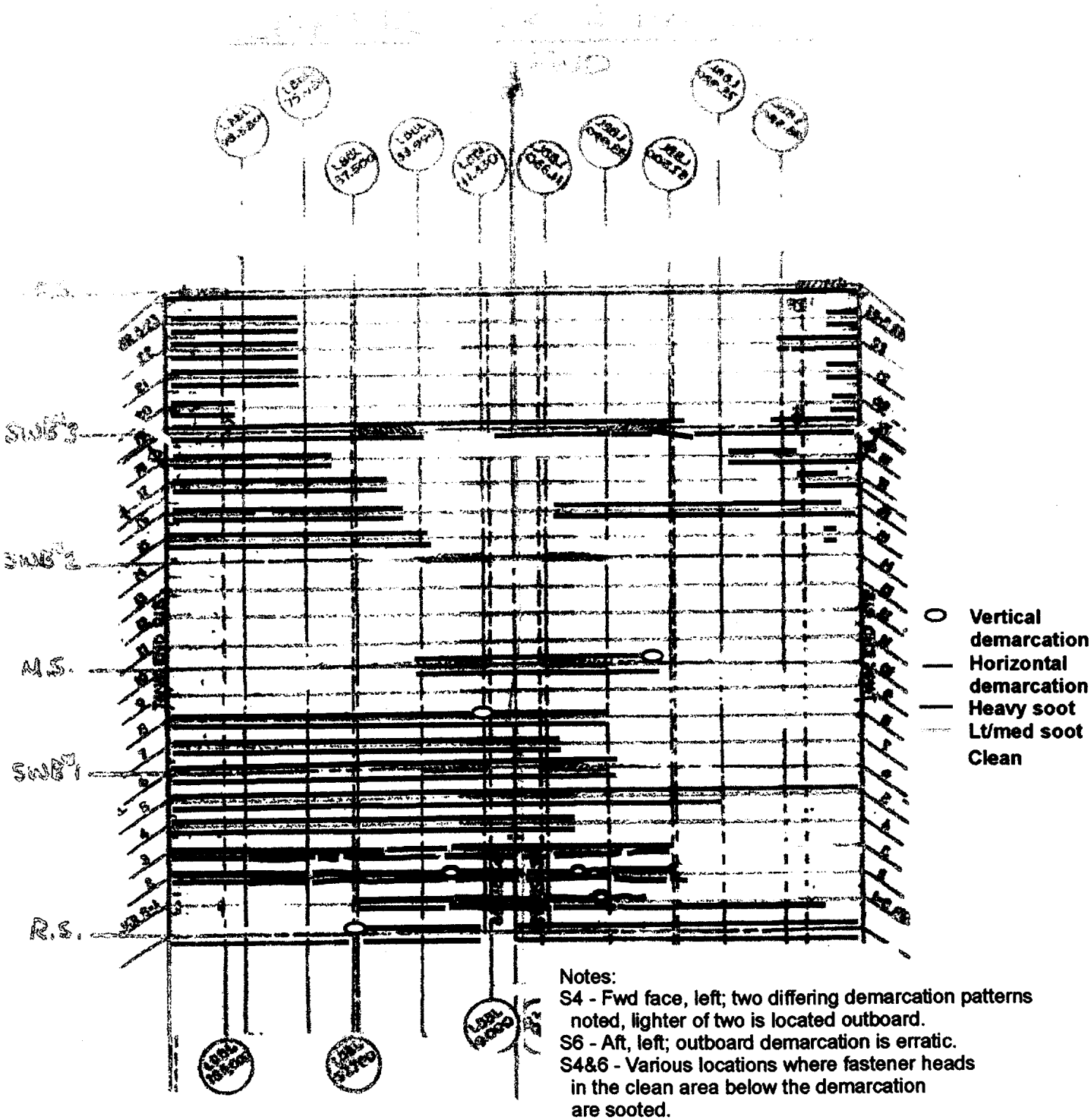


Diagram 4.

Diagram 4.1 Stringer Soot Demarcation Map



Notes:
S4 - Fwd face, left; two differing demarcation patterns noted, lighter of two is located outboard.
S6 - Aft, left; outboard demarcation is erratic.
S4&6 - Various locations where fastener heads in the clean area below the demarcation are sooted.
S5 - Fwd face, the lower surface of the upper flange heavily sooted; demarcation not readily observed. Approximately BL-0 to RBL9.
Upper skin, S1, 3, 9, 16, & 20 - Areas on these stringers have shown demarcation patterns also. These locations have not been documented to the detail on this sheet.

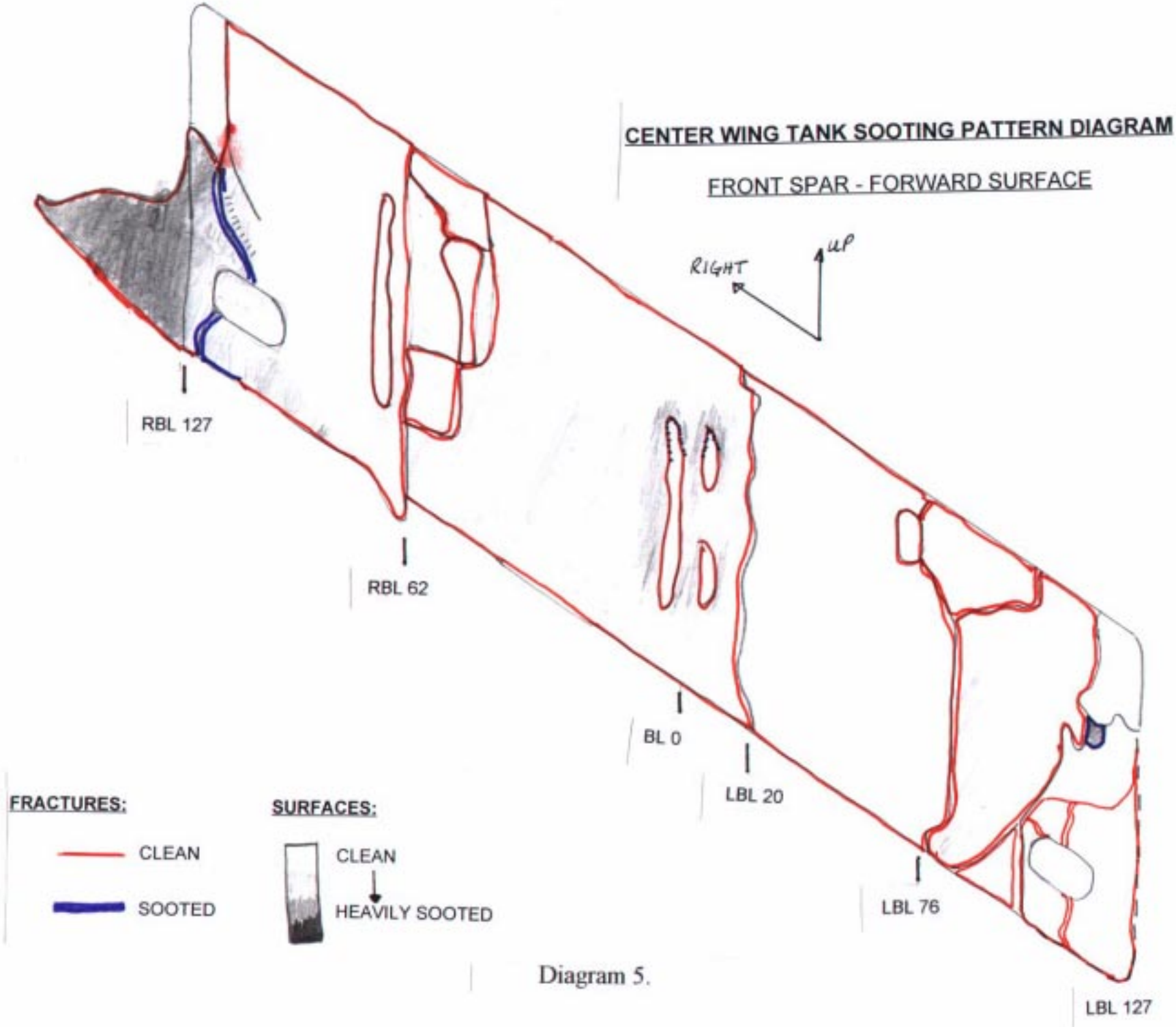

CENTER WING TANK SOOTING PATTERN DIAGRAM
FRONT SPAR - FORWARD SURFACE
RIGHT
UP
RBL 127
RBL 62
BL 0
LBL 20
LBL 76
LBL 127
FRACTURES:
CLEAN
SOOTED
SURFACES:
CLEAN
HEAVILY SOOTED

Diagram 5.

CENTER WING TANK SOOTING PATTERN DIAGRAM

FRONT SPAR - AFT SURFACE

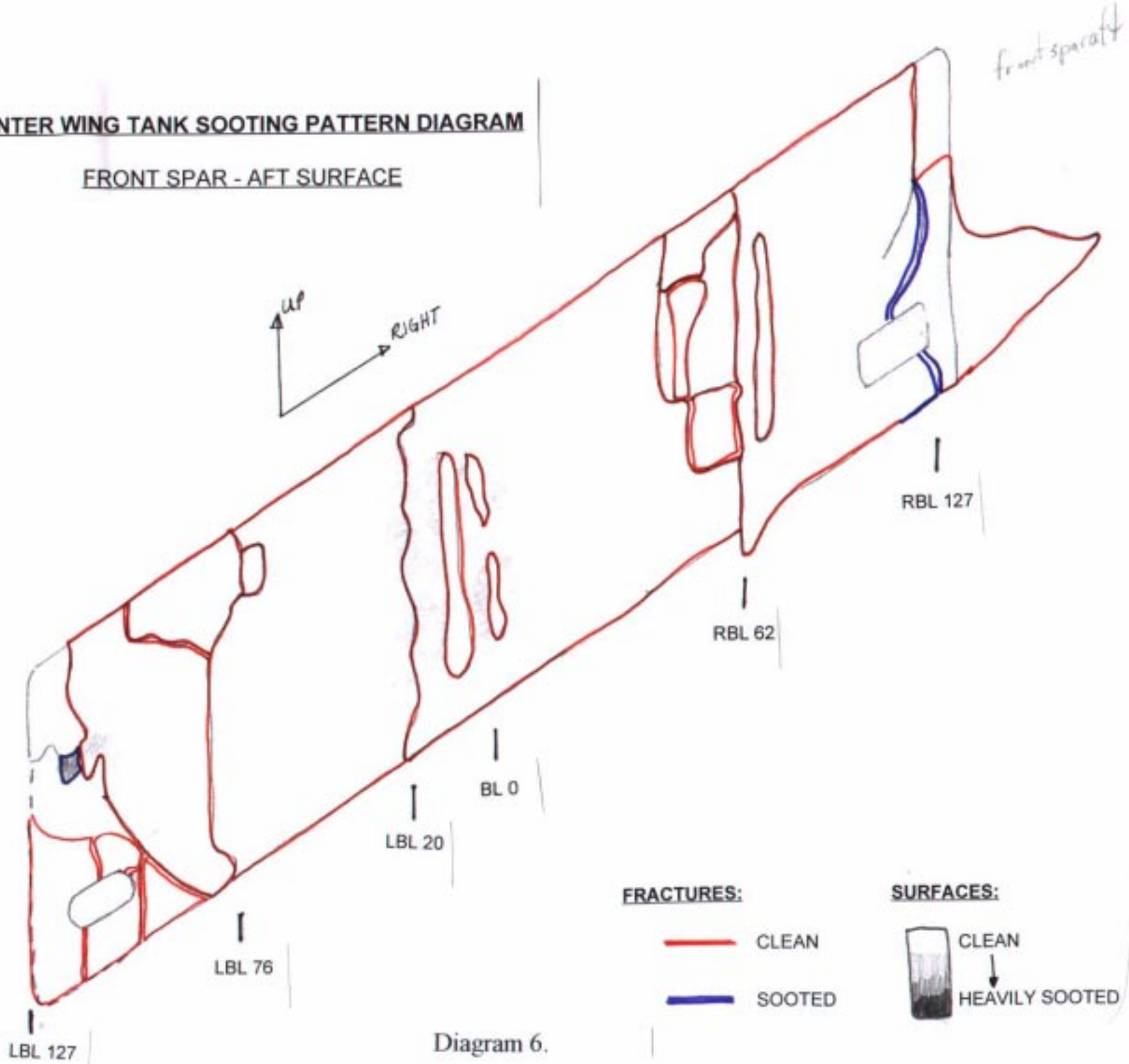


Diagram 6.

CENTER WING TANK SOOTING PATTERN DIAGRAM

SPANWISE BEAM #3 - FORWARD SURFACE

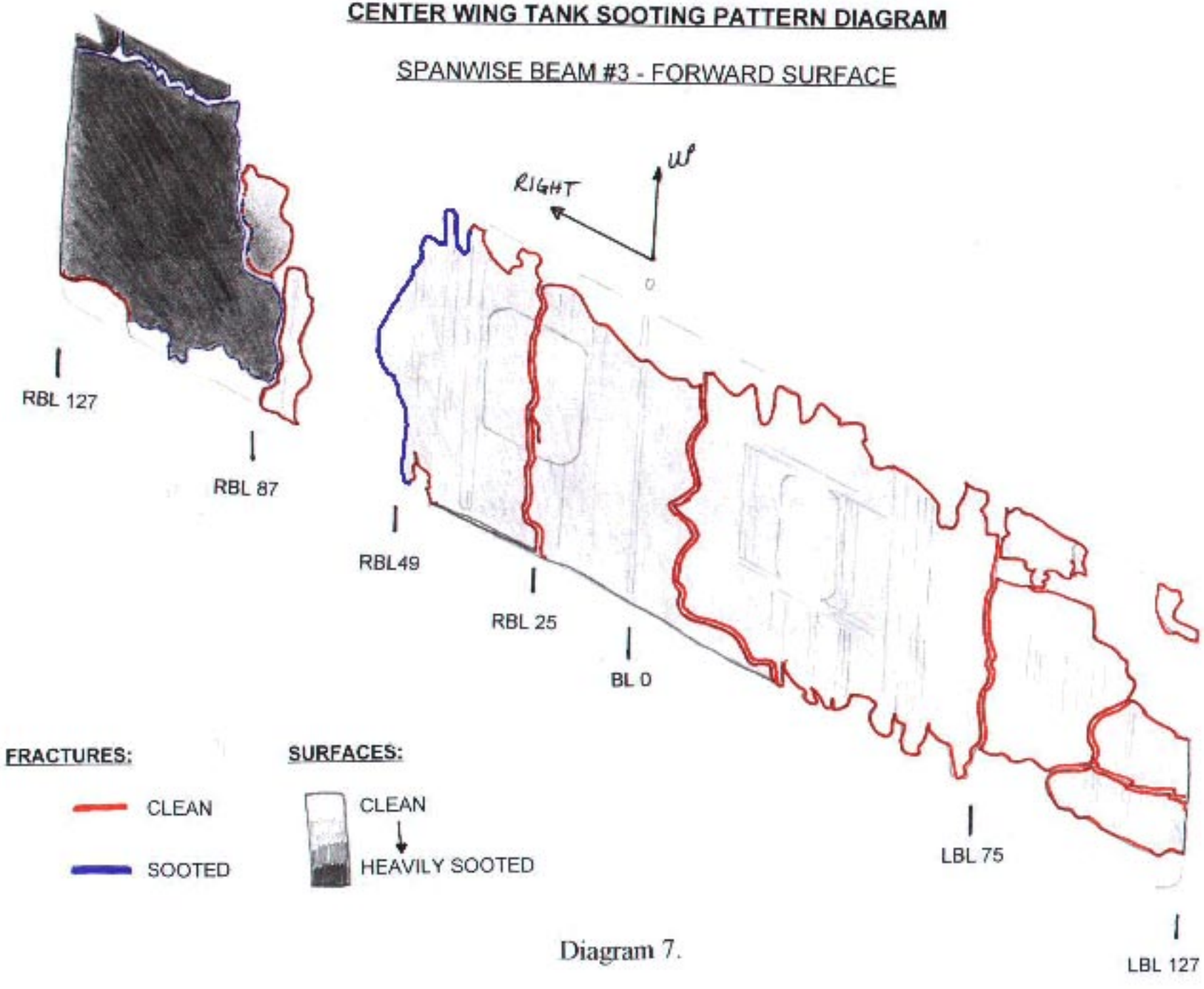


Diagram 7.

CENTER WING TANK SOOTING PATTERN DIAGRAM

SPANWISE BEAM #3 - AFT SURFACE

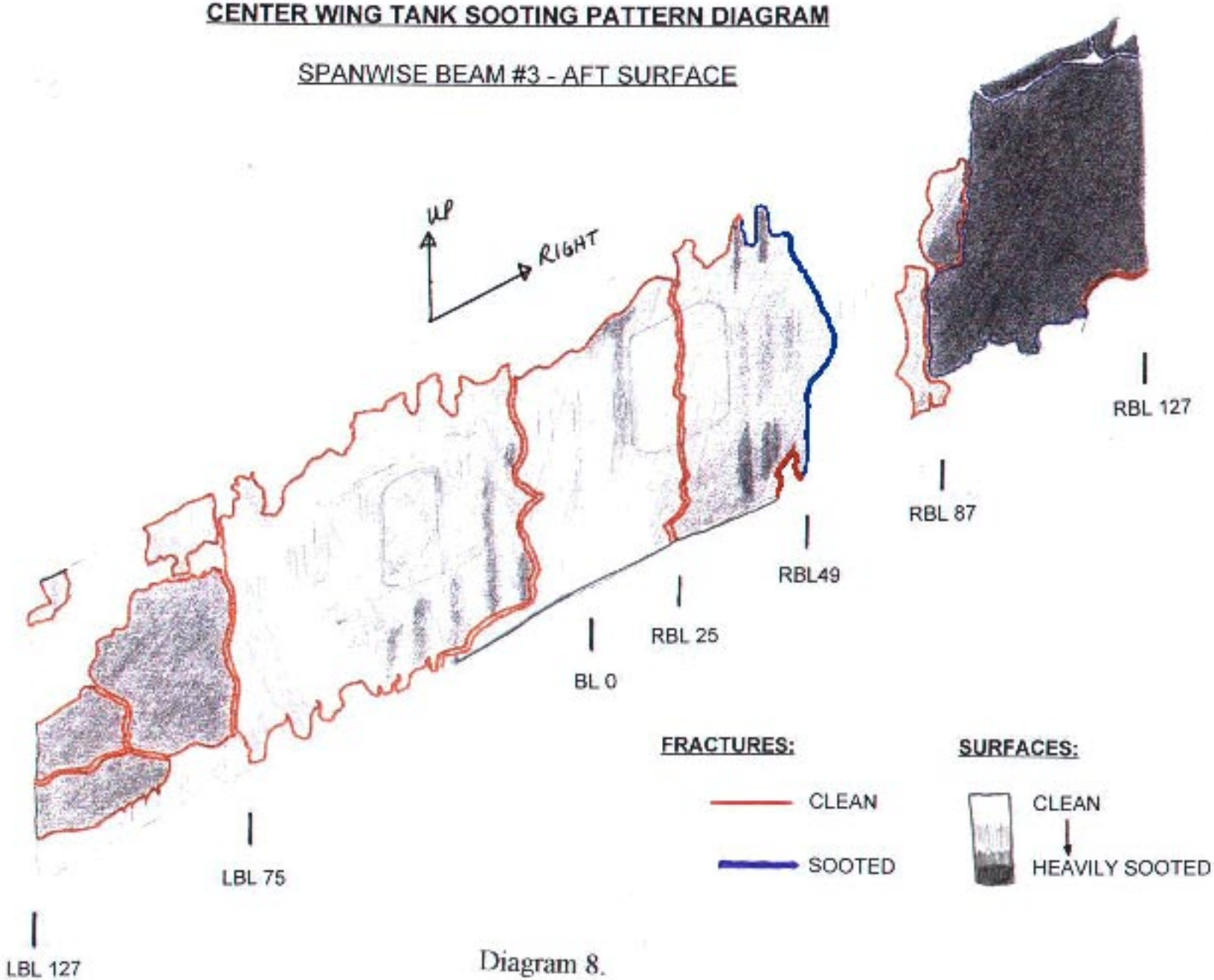


Diagram 8.

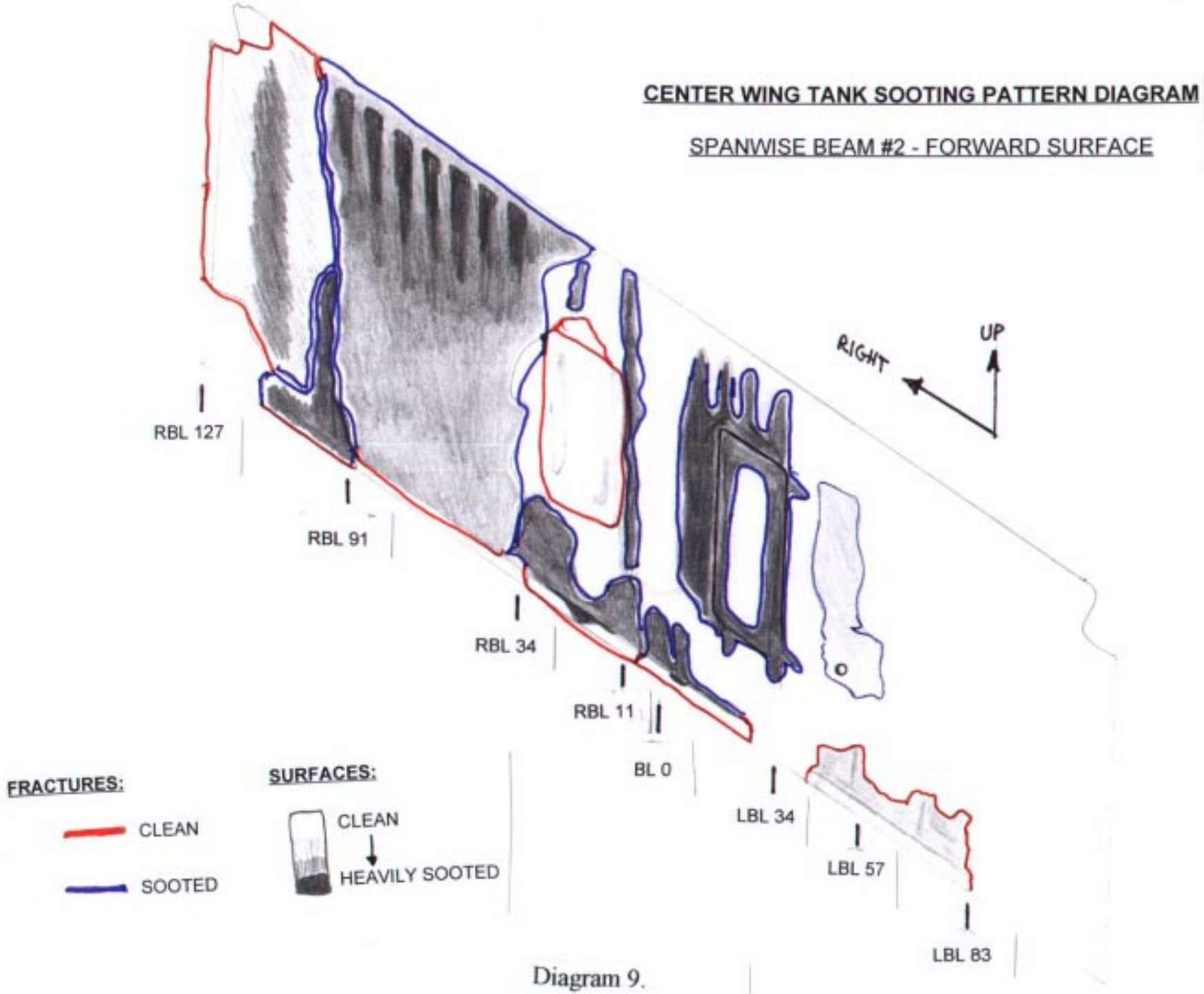

CENTER WING TANK SOOTING PATTERN DIAGRAM
SPANWISE BEAM #2 - FORWARD SURFACE
RIGHT
UP
RBL 127
RBL 91
RBL 34
RBL 11
BL 0
LBL 34
LBL 57
LBL 83
FRACTURES:
CLEAN
SOOTED
SURFACES:
CLEAN
HEAVILY SOOTED

Diagram 9.

CENTER WING TANK SOOTING PATTERN DIAGRAM

SPANWISE BEAM #2 - AFT SURFACE

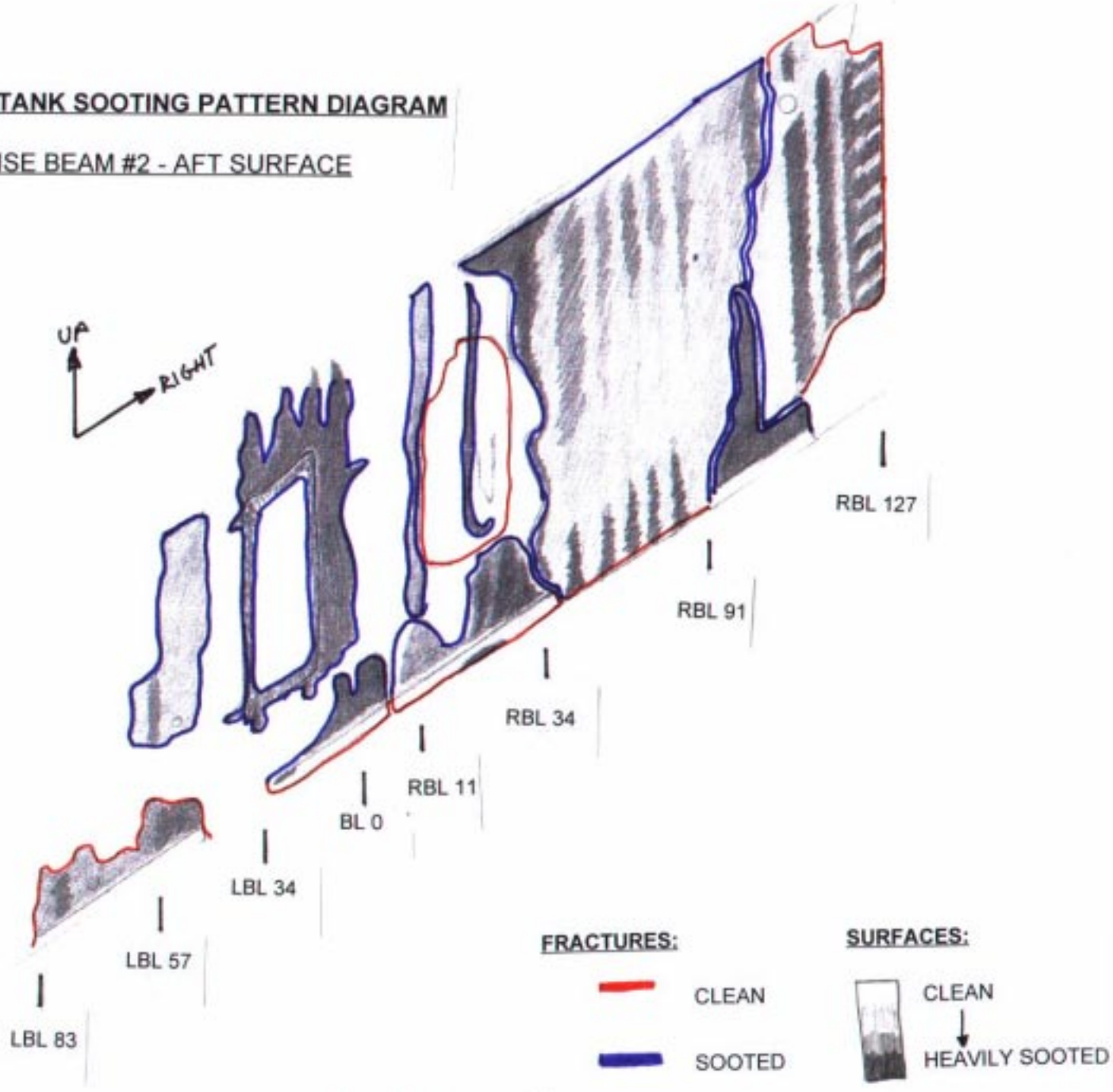


Diagram 10.

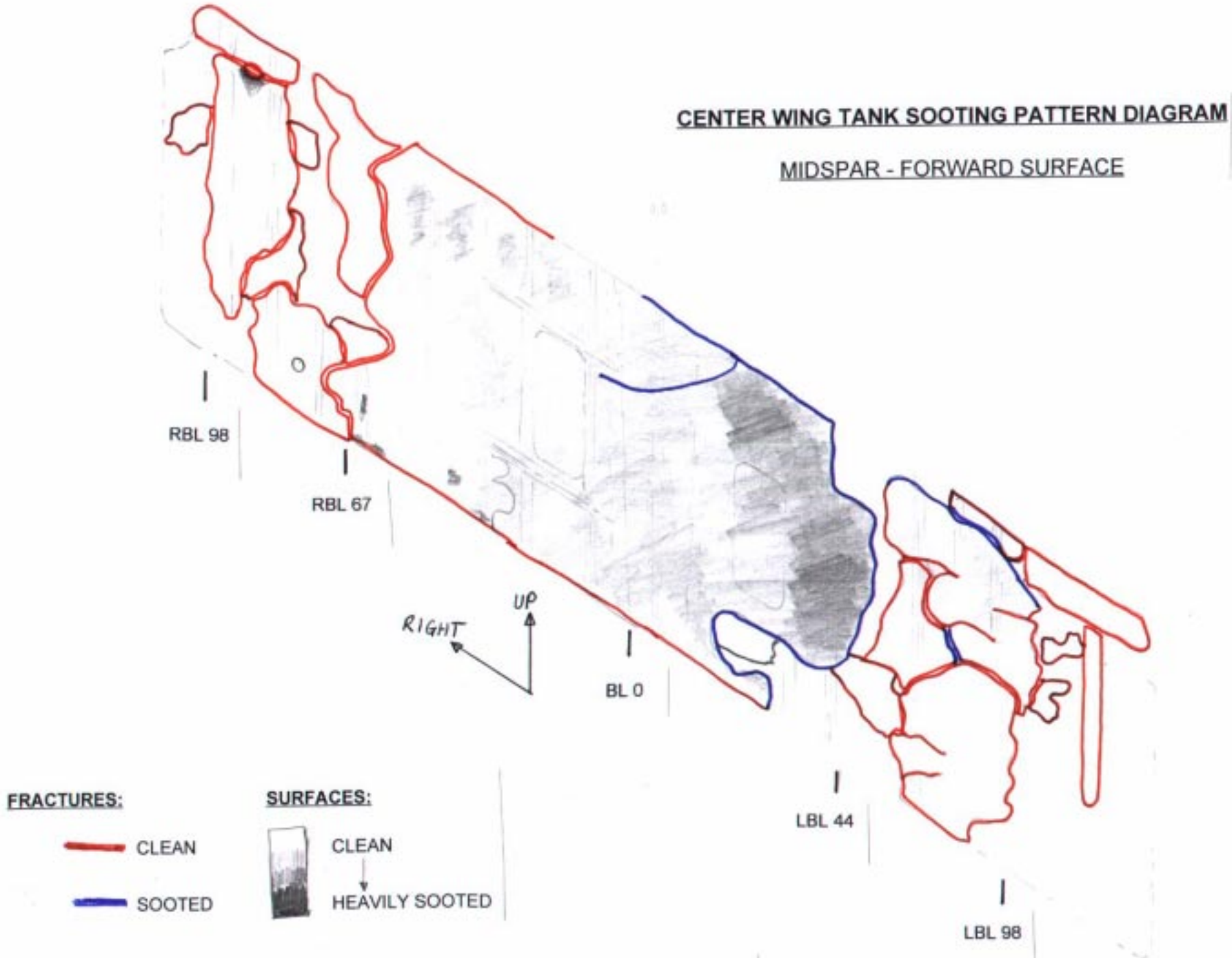

CENTER WING TANK SOOTING PATTERN DIAGRAM
MIDSPAR - FORWARD SURFACE
RBL 98
RBL 67
RIGHT
UP
BL 0
LBL 44
LBL 98
FRACTURES:
CLEAN
SOOTED
SURFACES:
CLEAN
HEAVILY SOOTED

Diagram 11.

CENTER WING TANK SOOTING PATTERN DIAGRAM

MIDSPAR - AFT SURFACE

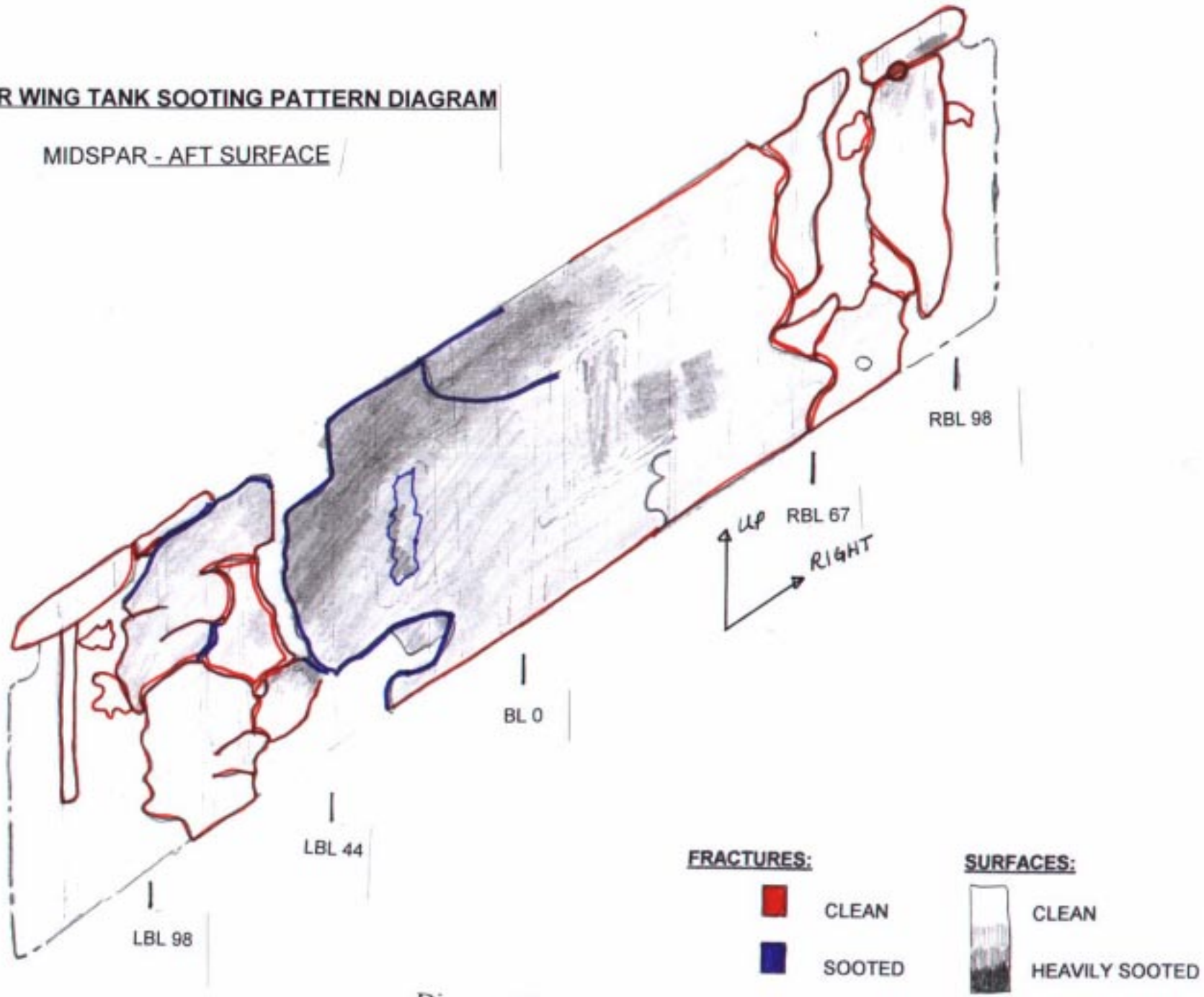


Diagram 12.

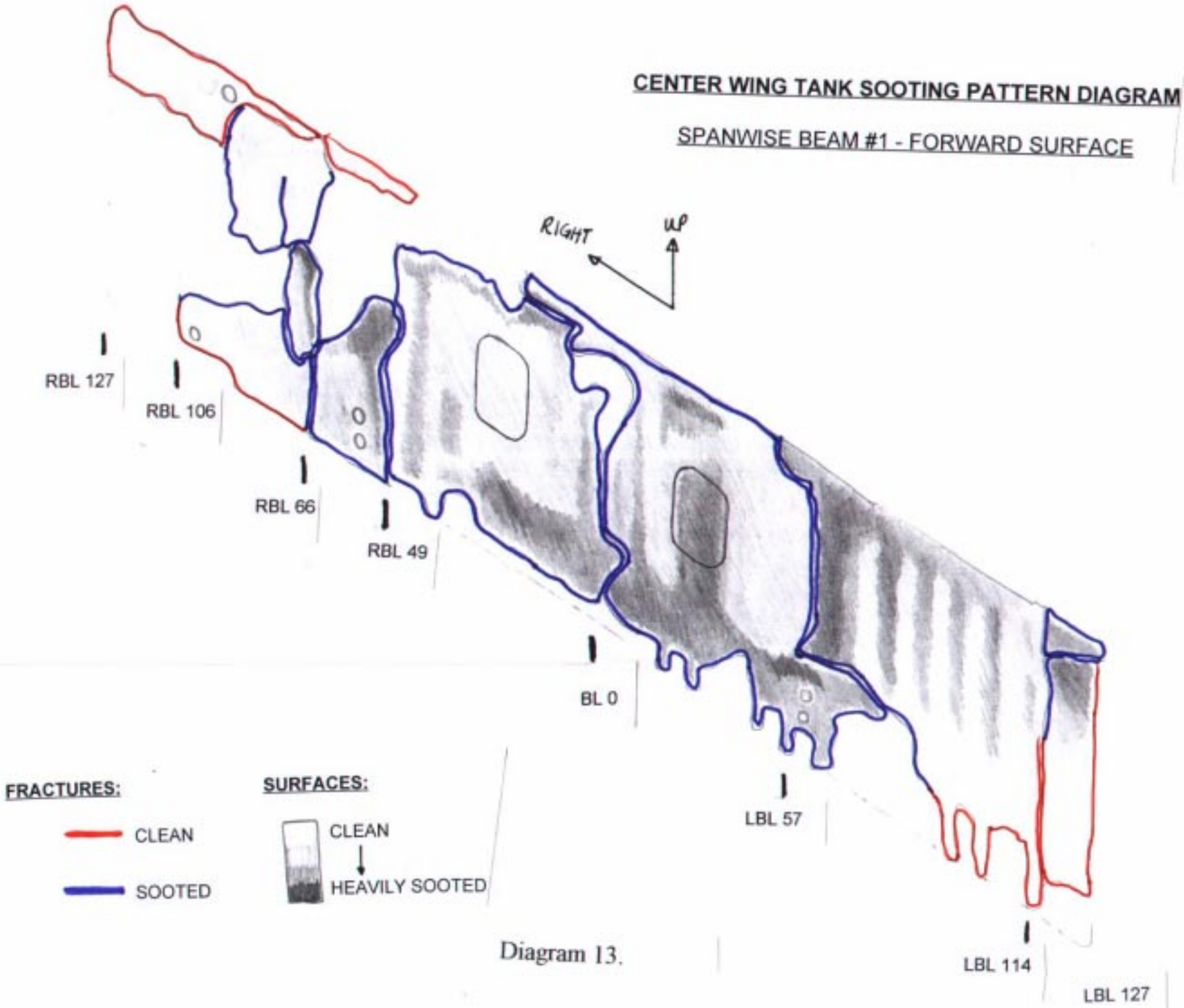

CENTER WING TANK SOOTING PATTERN DIAGRAM
SPANWISE BEAM #1 - FORWARD SURFACE
RIGHT
UP
RBL 127
RBL 106
RBL 66
RBL 49
BL 0
LBL 57
LBL 114
LBL 127
FRACTURES:
CLEAN
SOOTED
SURFACES:
CLEAN
HEAVILY SOOTED

Diagram 13.

CENTER WING TANK SOOTING PATTERN DIAGRAM

SPANWISE BEAM #1 - AFT SURFACE

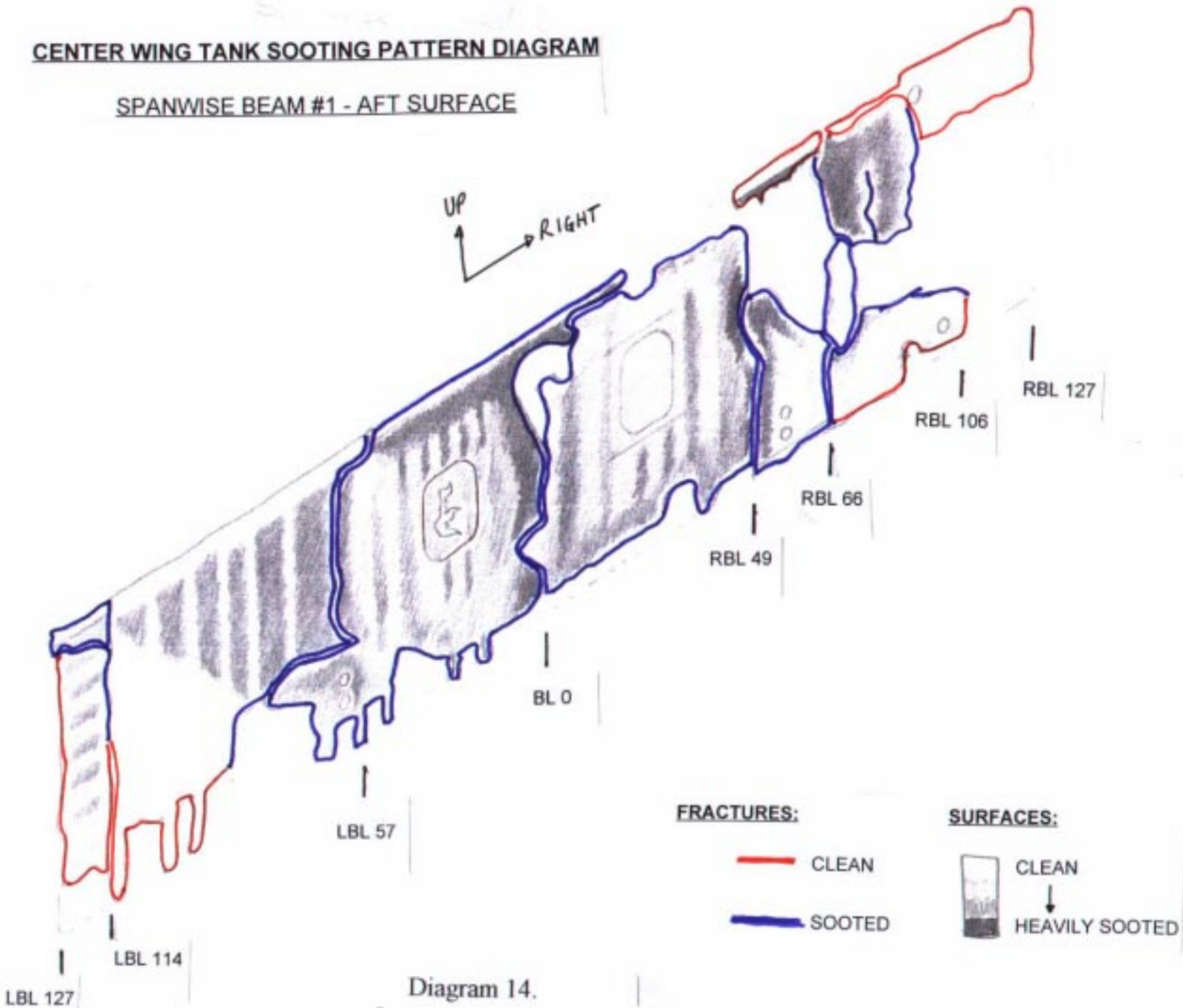


Diagram 14.

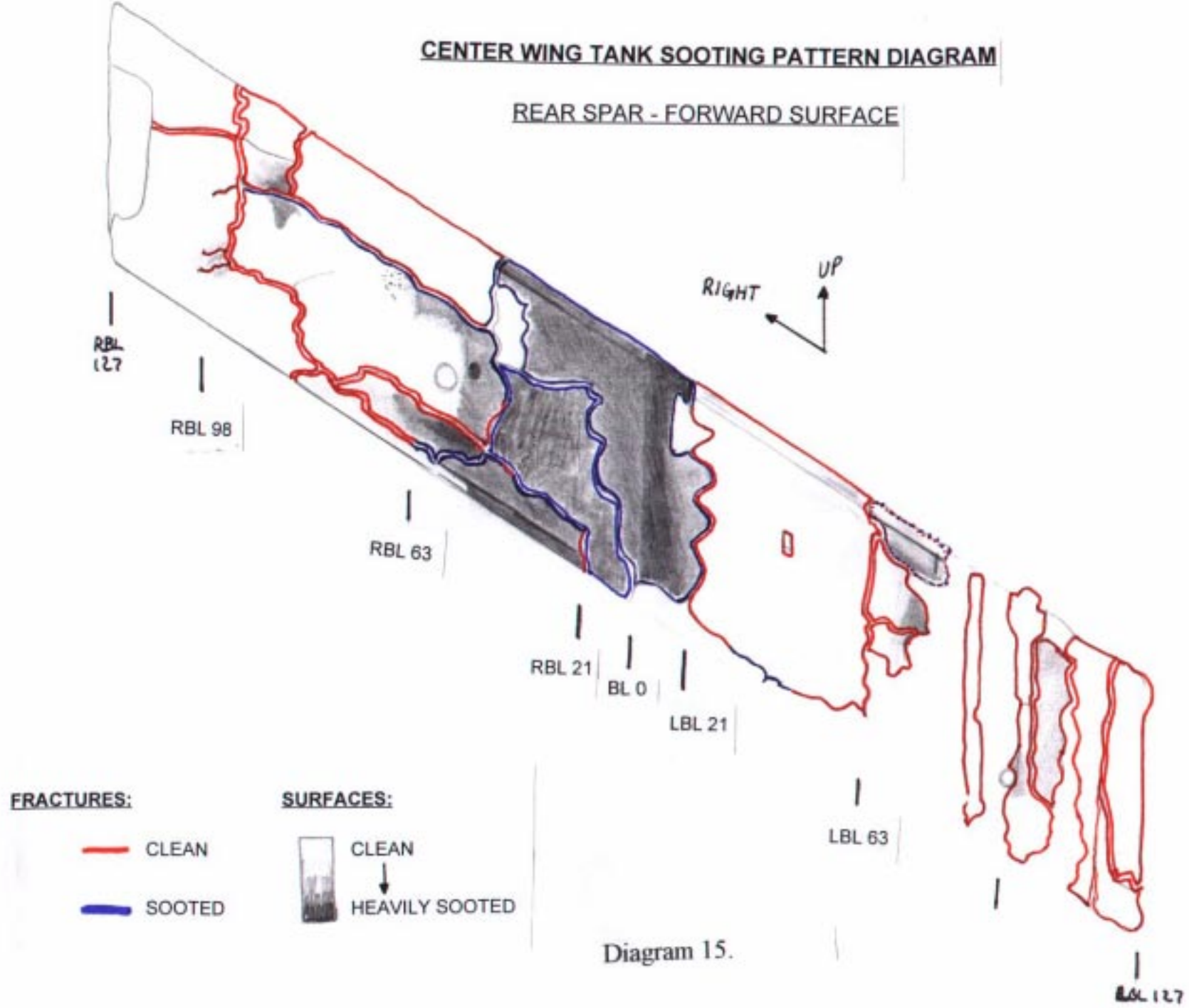

CENTER WING TANK SOOTING PATTERN DIAGRAM
REAR SPAR - FORWARD SURFACE
RIGHT
UP
RBL 127
RBL 98
RBL 63
RBL 21
BL 0
LBL 21
LBL 63
LBL 127
FRACTURES:
CLEAN
SOOTED
SURFACES:
CLEAN
HEAVILY SOOTED

Diagram 15.

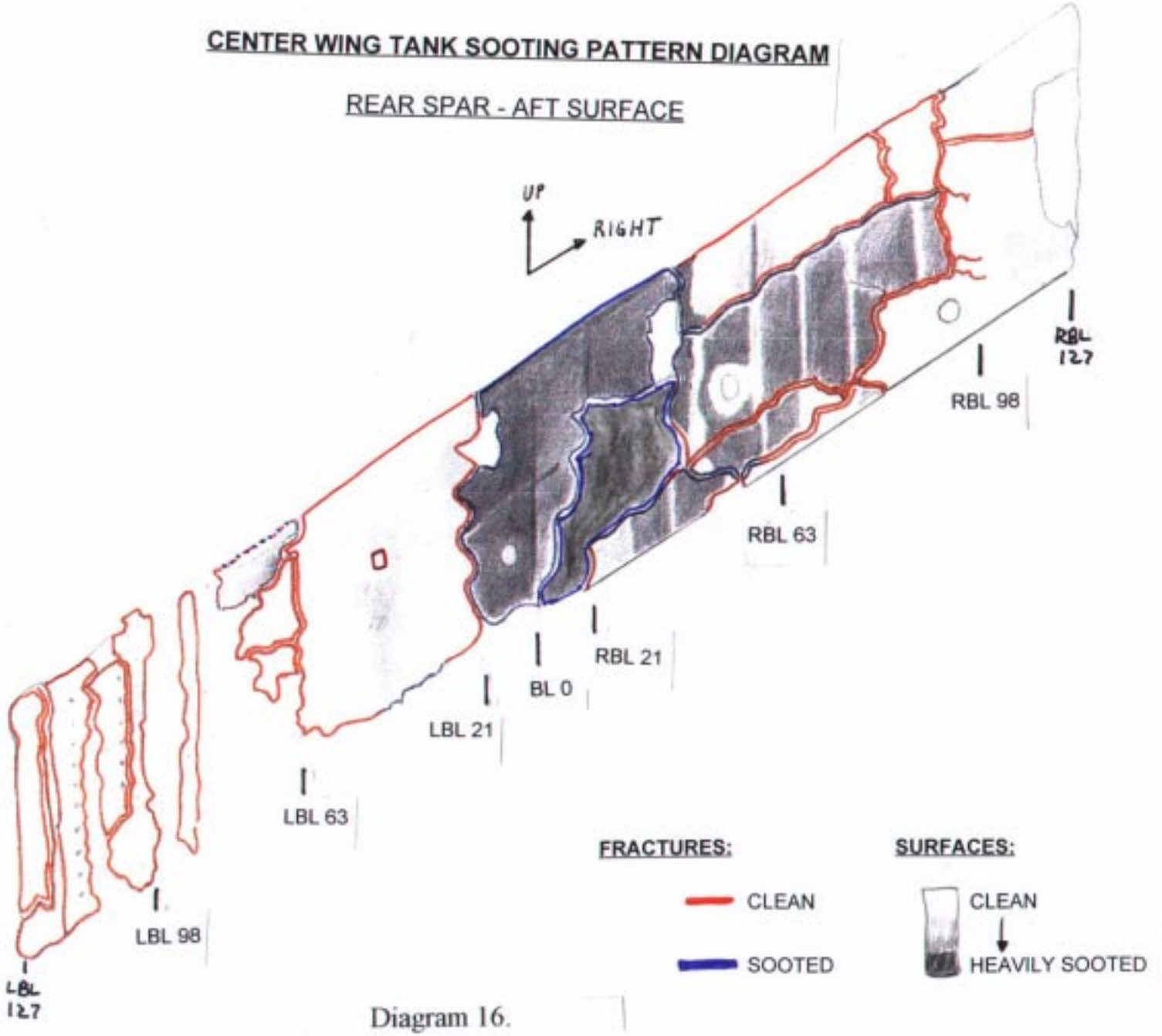
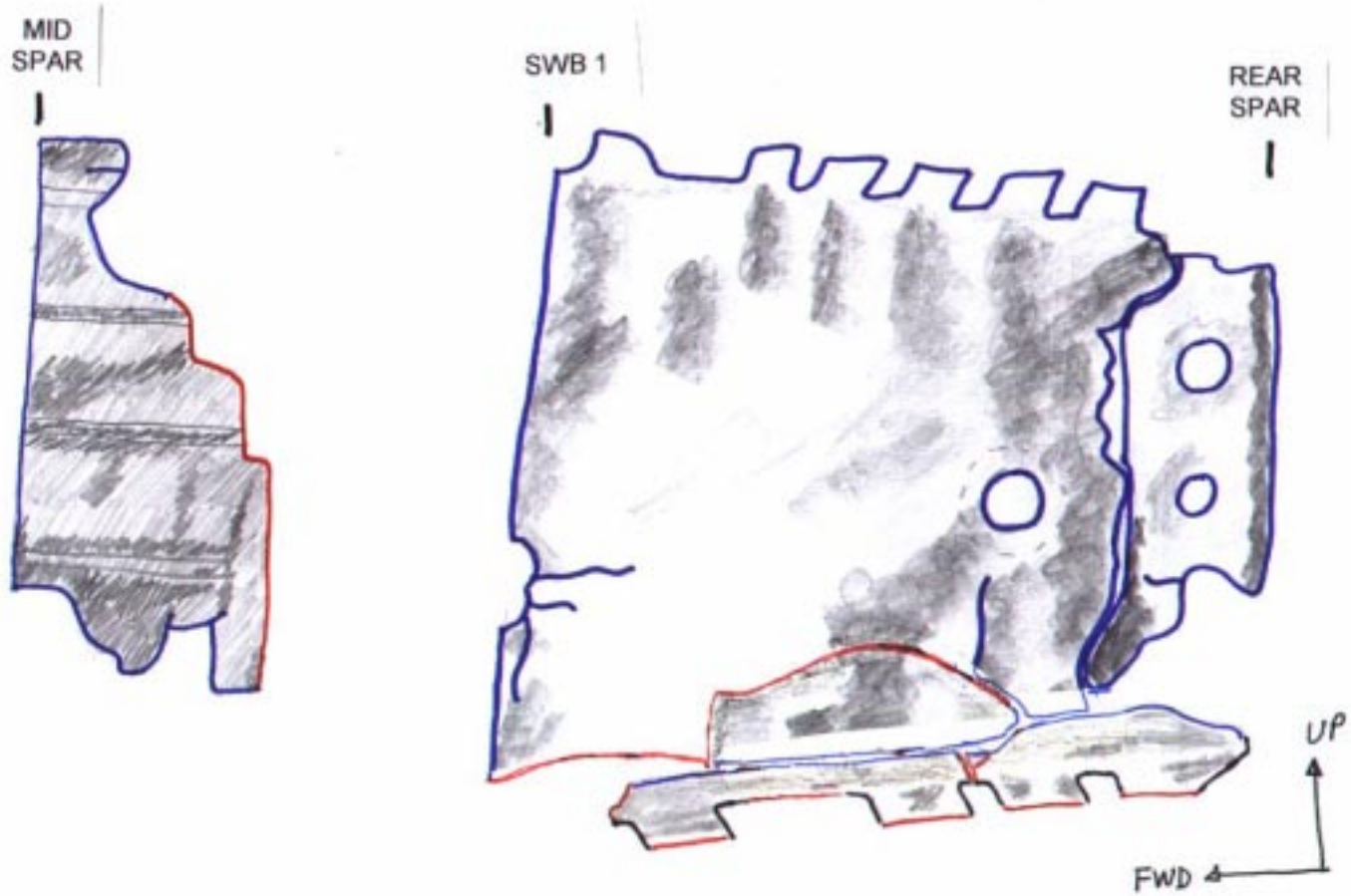

CENTER WING TANK SOOTING PATTERN DIAGRAM
REAR SPAR - AFT SURFACE
UP
RIGHT
RBL 127
RBL 98
RBL 63
RBL 21
BL 0
LBL 21
LBL 63
LBL 98
LBL 127
FRACTURES:
CLEAN
SOOTED
SURFACES:
CLEAN
HEAVILY SOOTED

Diagram 16.

CENTER WING TANK SOOTING PATTERN DIAGRAM

BL 0 RIB - LEFT SURFACE



FRACTURES:

CLEAN

SOOTED

SURFACES:

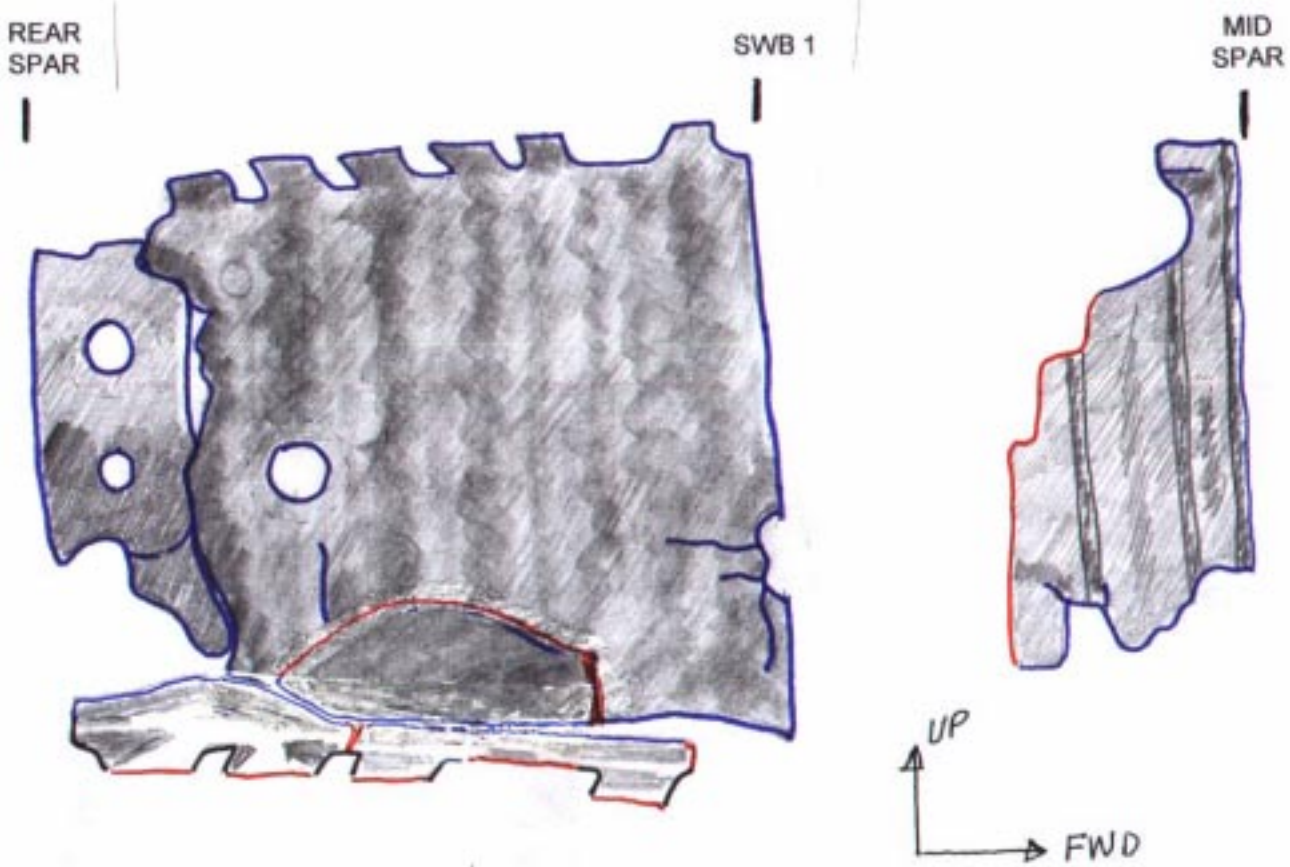
CLEAN

HEAVILY SOOTED

Diagram 17.

CENTER WING TANK SOOTING PATTERN DIAGRAM

BL 0 RIB - RIGHT SURFACE



FRACTURES:

- CLEAN
- SOOTED

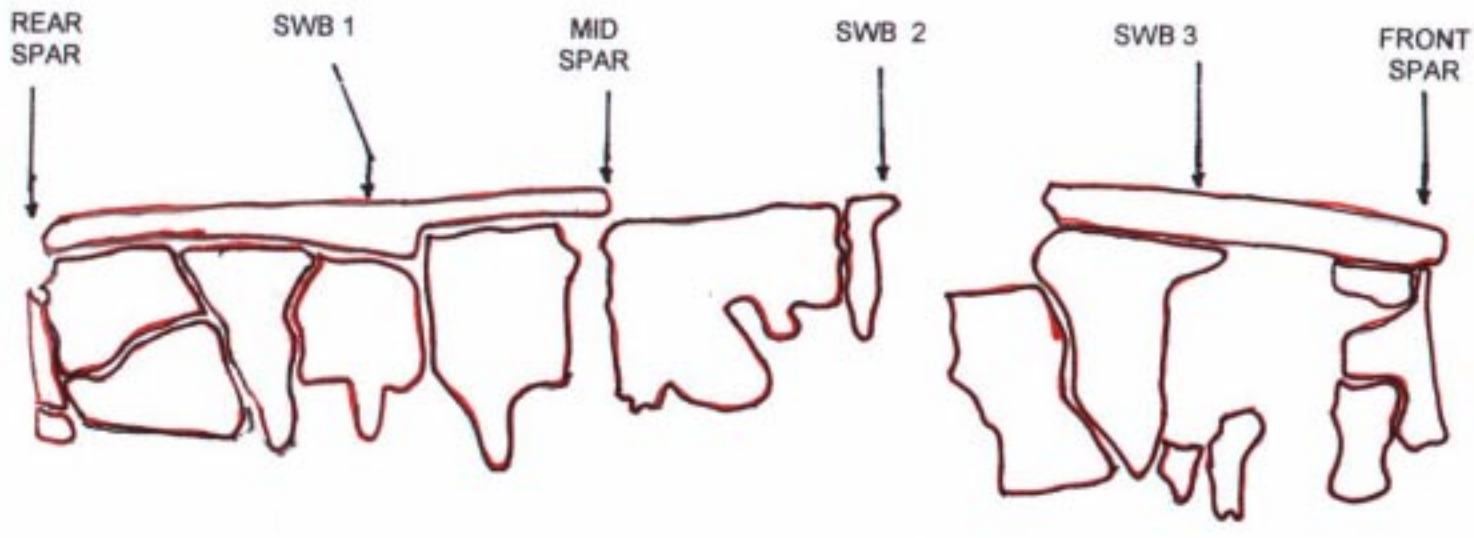
SURFACES:

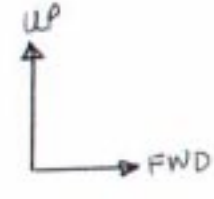
CLEAN
↓
HEAVILY SOOTED

Diagram 18.

CENTER WING TANK SOOTING PATTERN DIAGRAM

RIGHTHAND SIDE OF BODY RIB - OUTBOARD SURFACE





FRACTURES:

CLEAN

SOOTED

SURFACES:

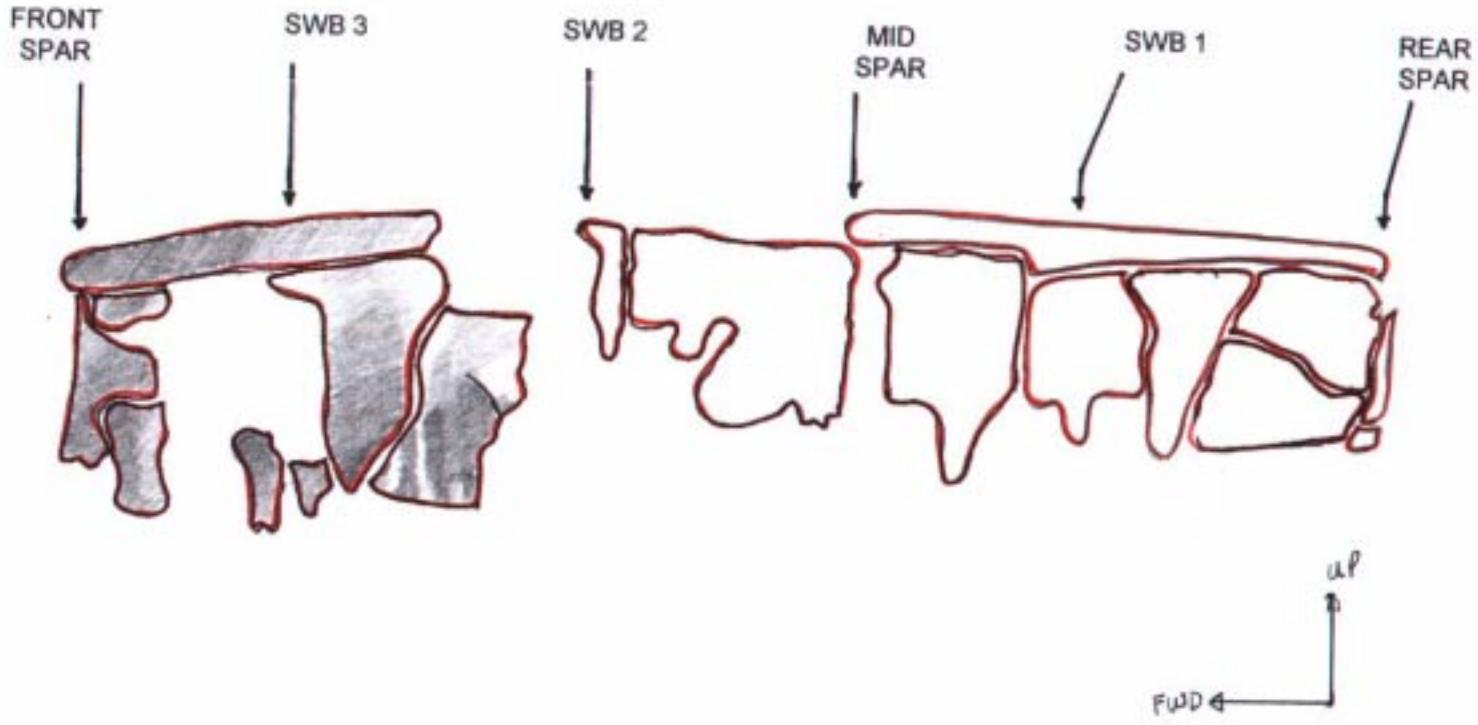
CLEAN

HEAVILY SOOTED

Diagram 19.

CENTER WING TANK SOOTING PATTERN DIAGRAM

RIGHTHAND SIDE OF BODY RIB - INBOARD SURFACE



FRACTURES:

CLEAN

SOOTED

SURFACES:

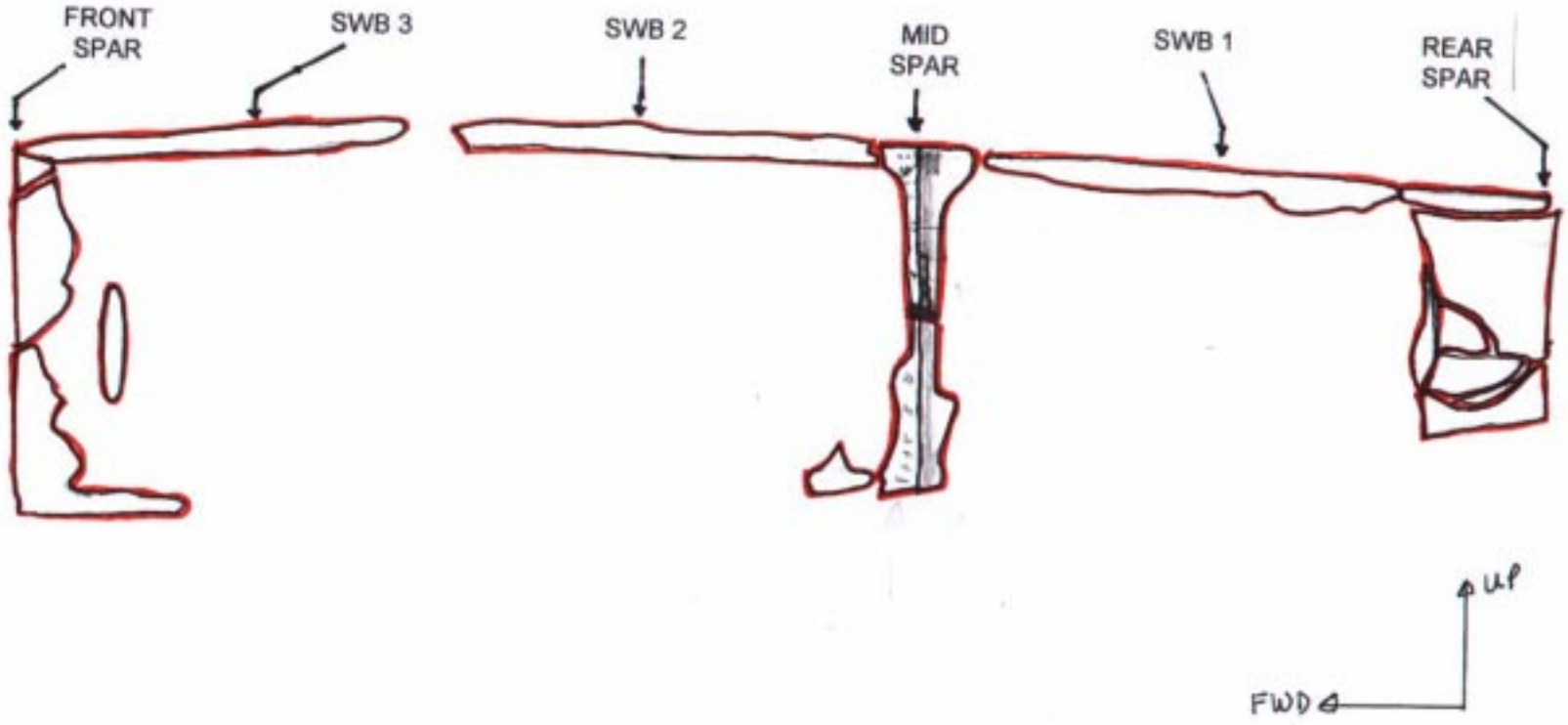
CLEAN

HEAVILY SOOTED

Diagram 20.

CENTER WING TANK SOOTING PATTERN DIAGRAM

LEFTHAND SIDE OF BODY RIB - OUTBOARD SURFACE



FRACTURES:

CLEAN

SOOTED

SURFACES:

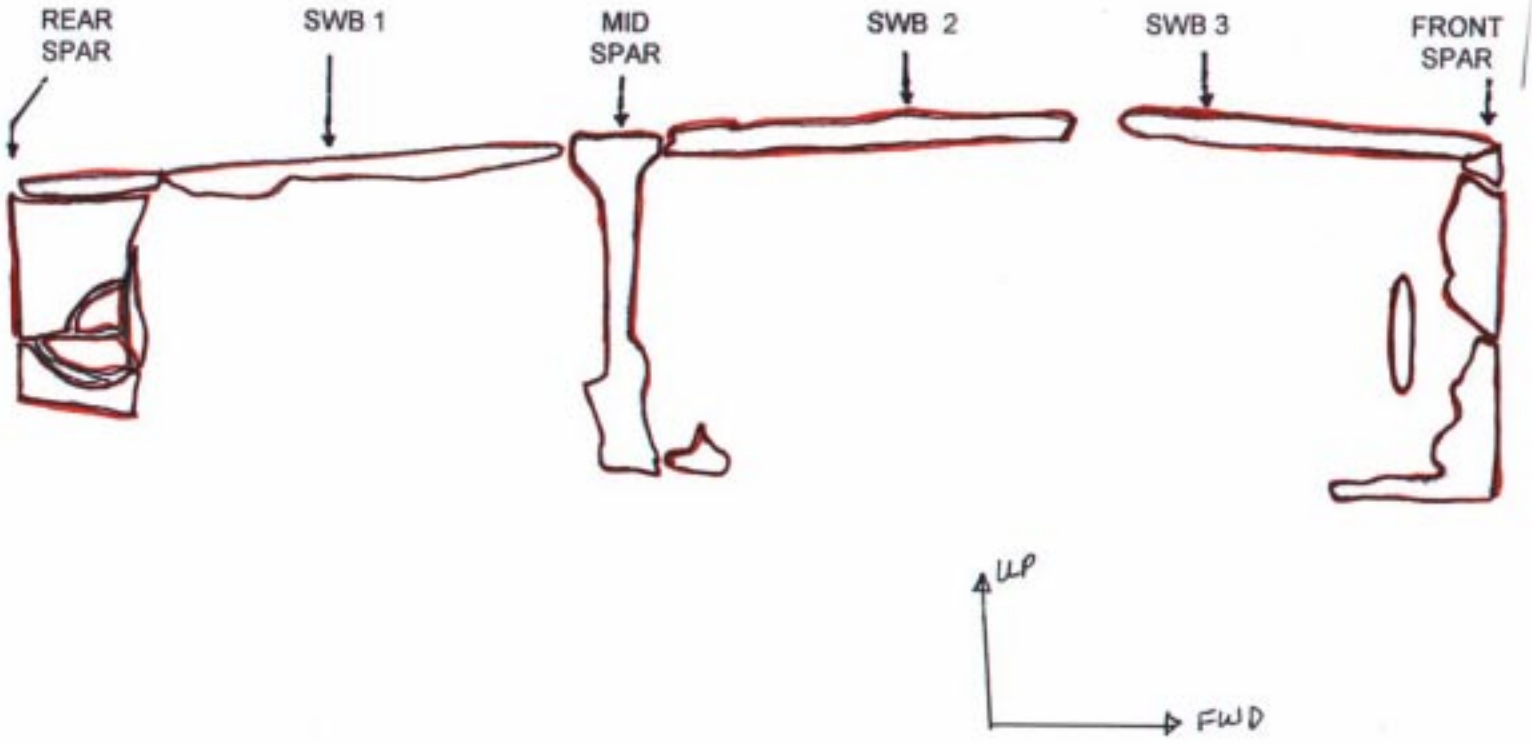
CLEAN

HEAVILY SOOTED

Diagram 21.

CENTER WING TANK SOOTING PATTERN DIAGRAM

LEFTHAND SIDE OF BODY RIB - INBOARD SURFACE



FRACTURES:

CLEAN

SOOTED

SURFACES:

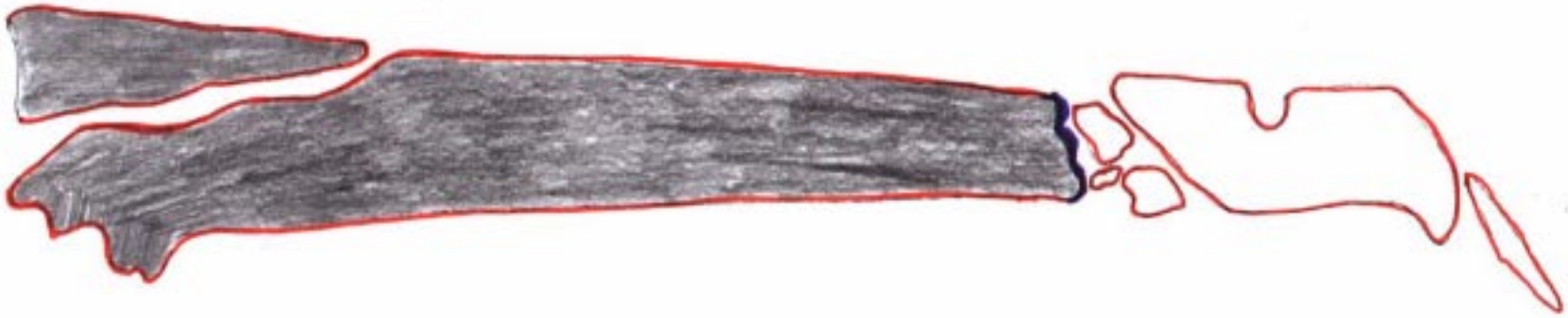
CLEAN

HEAVILY SOOTED

Diagram 22.

RIGHT WING SOOTING PATTERN DIAGRAM

UPPER SKIN - EXTERNAL SURFACE



FRACTURES:

CLEAN

SOOTED

SURFACES:

CLEAN

HEAVILY SOOTED

LOWER SKIN - EXTERNAL SURFACE

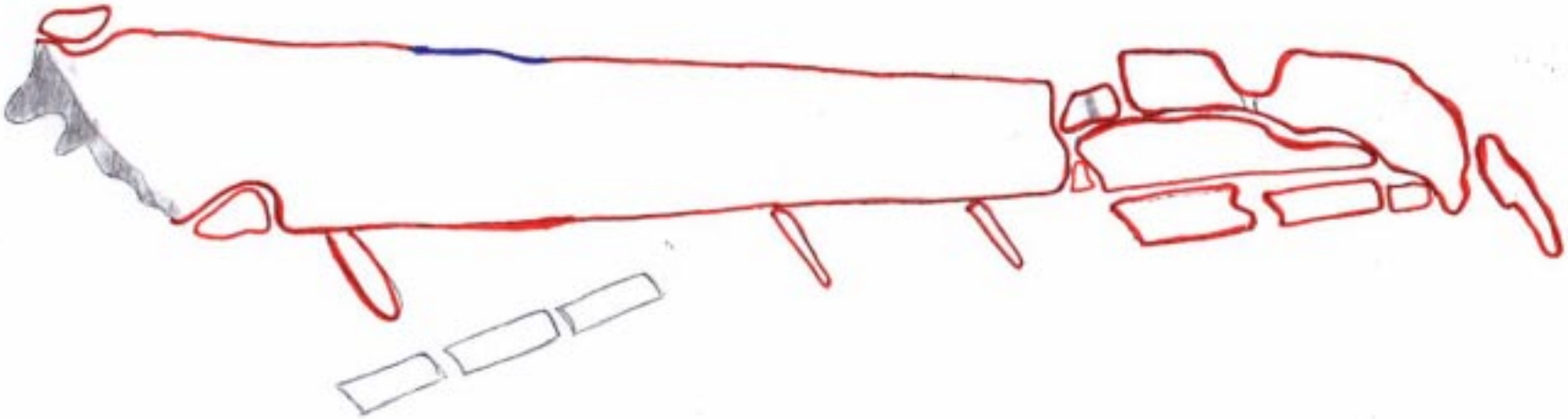
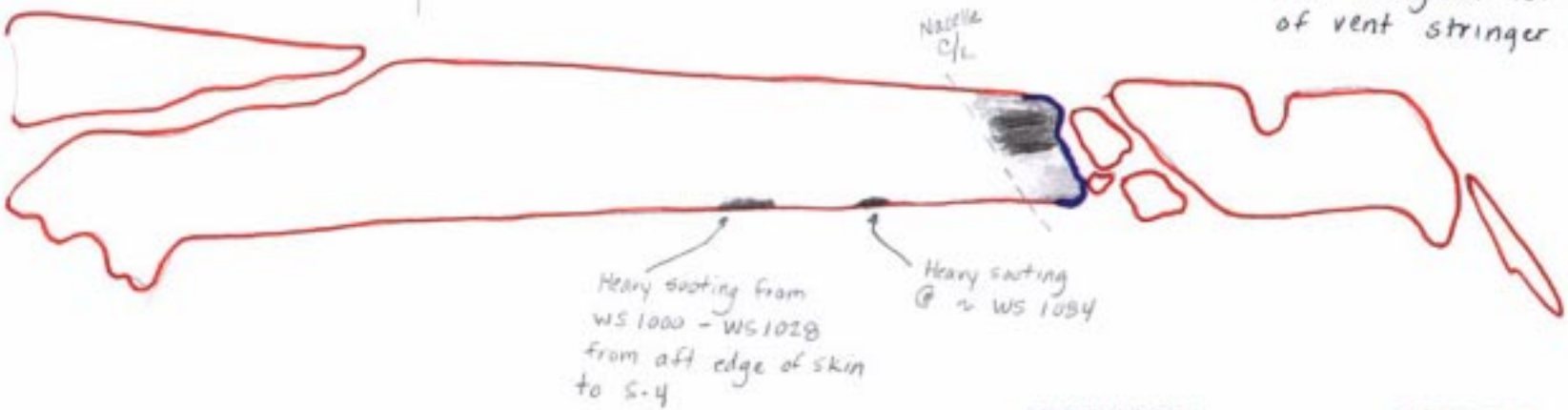


Diagram 23.

RIGHT WING SOOTING PATTERN DIAGRAM

UPPER SKIN - INTERNAL SURFACE

NOTE: See Vent Stringer soot diagram for details of vent stringer sooting.



FRACTURES:

- CLEAN
- SOOTED

SURFACES:

- CLEAN
- HEAVILY SOOTED

LOWER SKIN - INTERNAL SURFACE

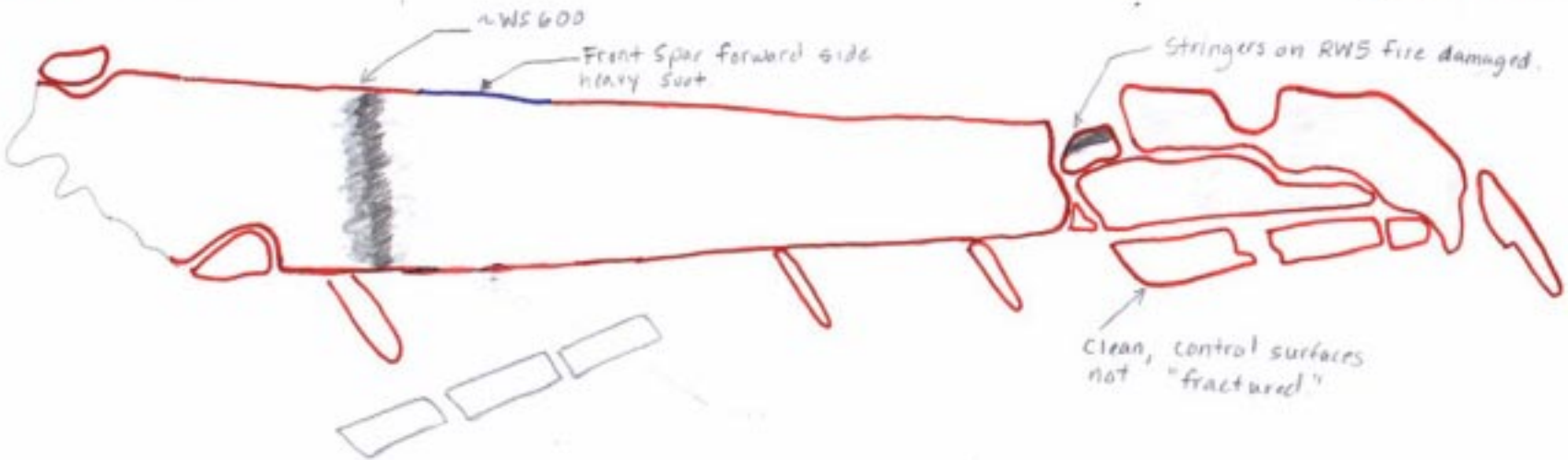


Diagram 24.

LEFT WING SOOTING PATTERN DIAGRAM

UPPER SKIN - EXTERNAL SURFACE

NOTE: Many small pieces of the upper skin are not shown on the diagram.

NOTE: With the exception of the piece noted, the external surface of the upper skin is clean. The control surfaces do show sooting and fire damage to the composite parts.

FRACTURES:

- CLEAN
- SOOTED

SURFACES:

- CLEAN
- HEAVILY SOOTED

LOWER SKIN - EXTERNAL SURFACE

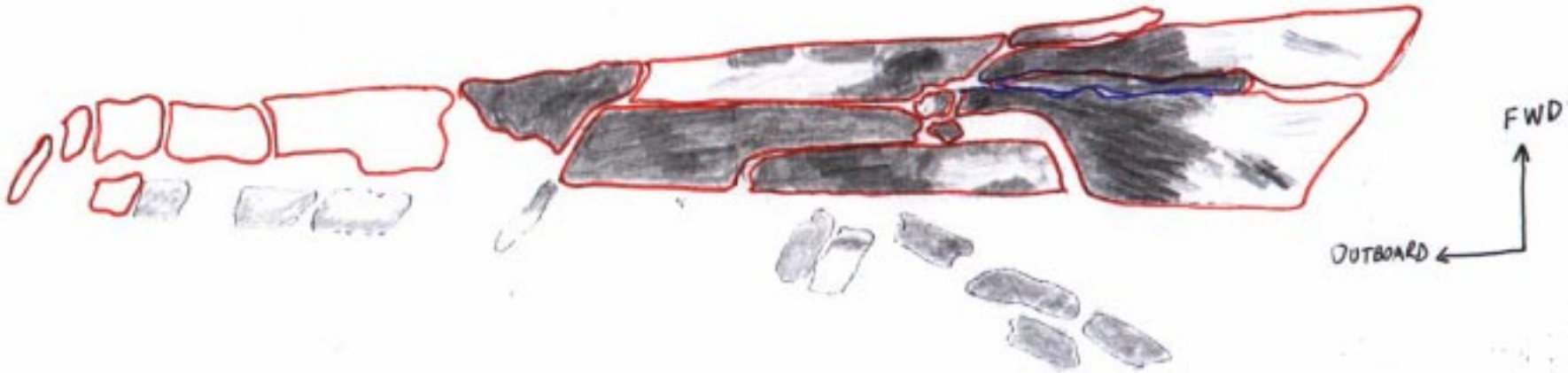
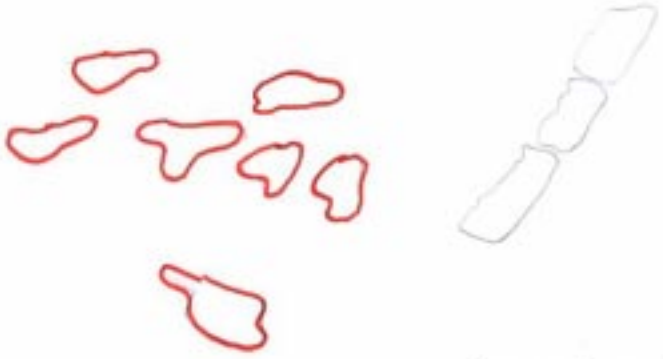


Diagram 25.

LEFT WING SOOTING PATTERN DIAGRAM

UPPER SKIN - INTERNAL SURFACE

NOTE: Many small pieces of the upper skin are not shown on the diagram.



NOTE: With the exception of the piece noted, the internal surface of the upper skin is clean. The control surfaces do show sooting and fire damage to the composite parts.

NOTE: SEE vent stringer soot diagram for details of vent stringer sooting.

FRACTURES:

- CLEAN
- SOOTED

SURFACES:

- CLEAN
- HEAVILY SOOTED

LOWER SKIN - INTERNAL SURFACE

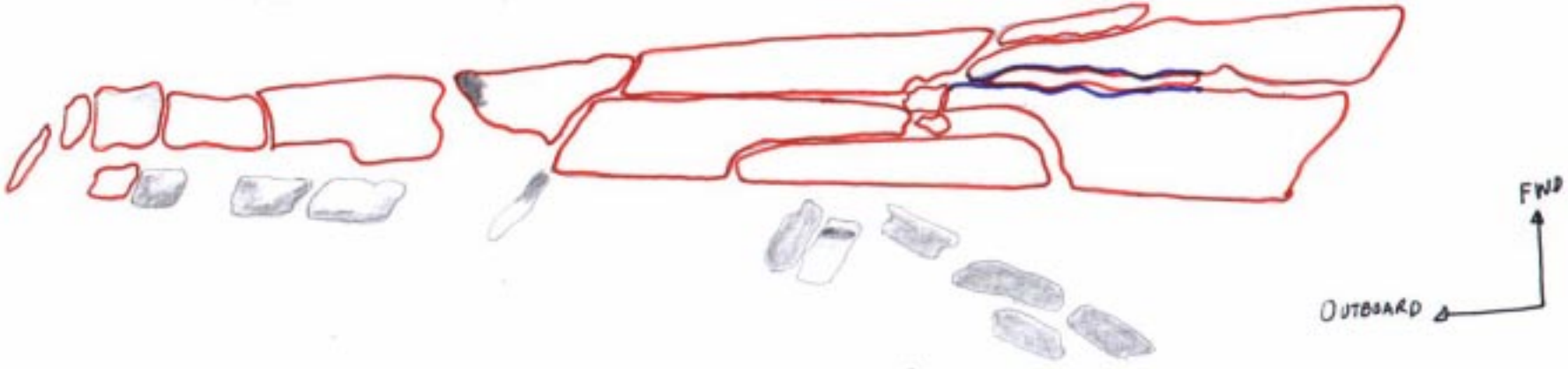
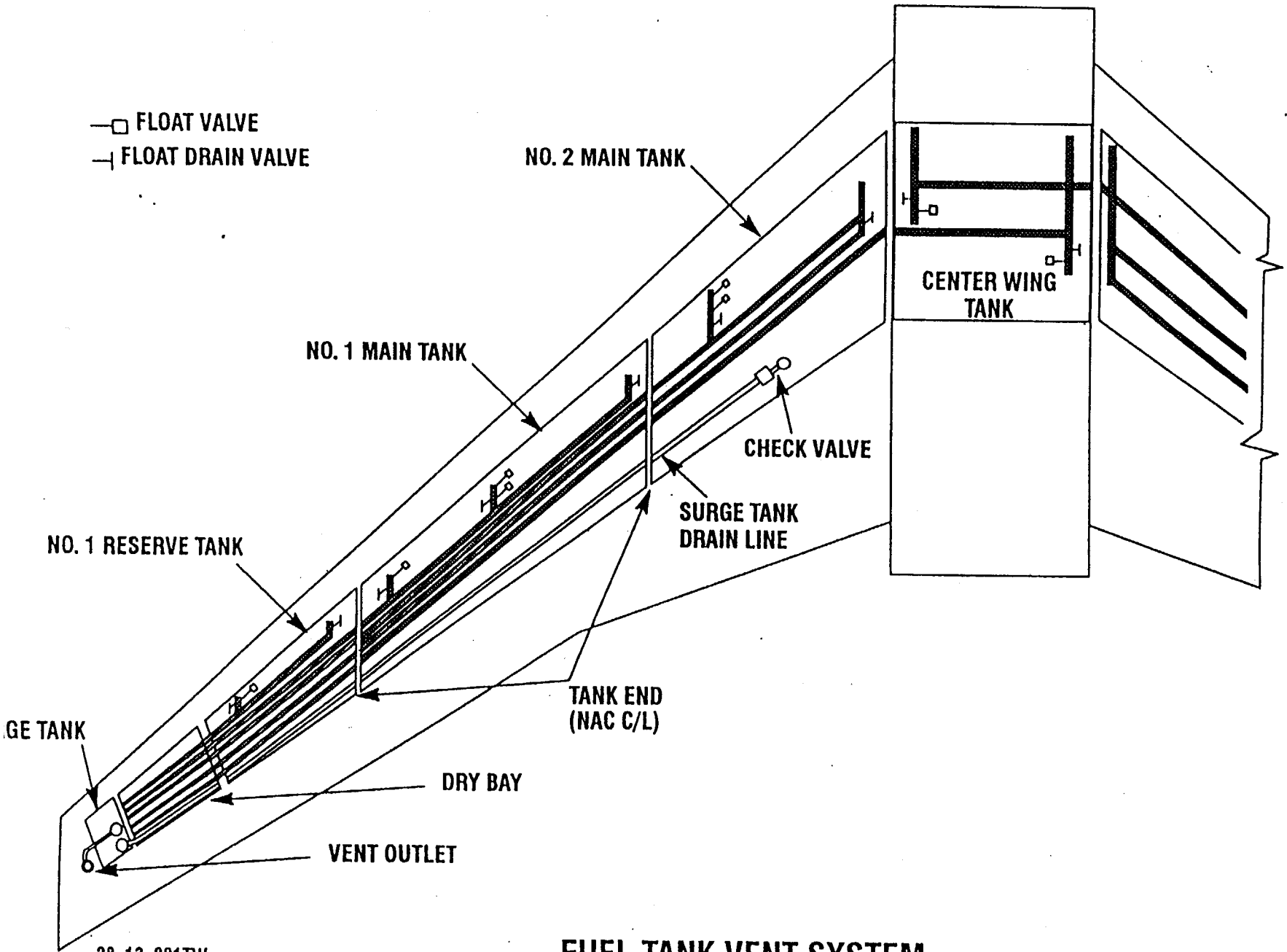


Diagram 26.

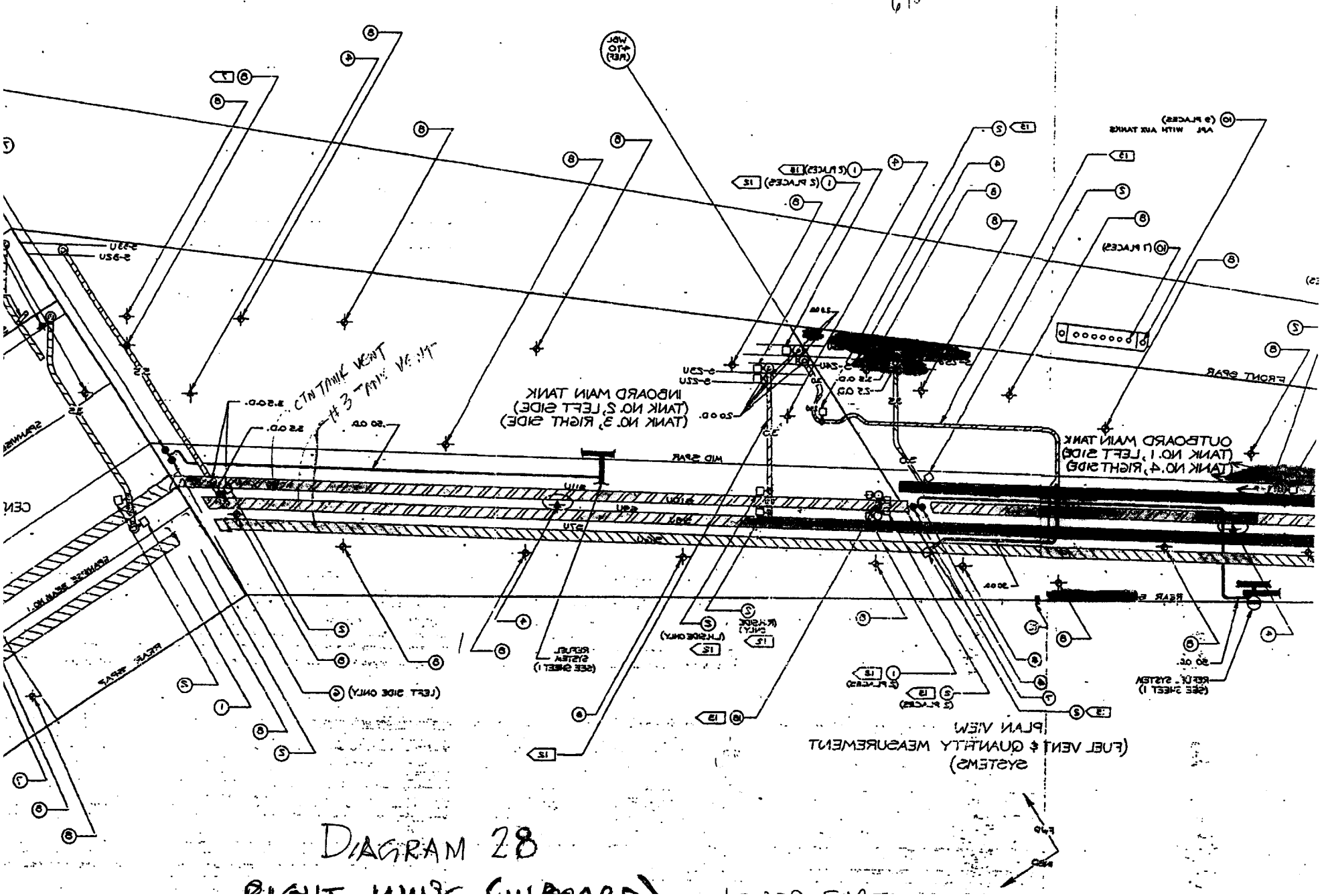
DIAGRAM 27



28-13-001TW

FUEL TANK VENT SYSTEM

747 ALL
10/88


PLAN VIEW
(FUEL VENT & QUANTITY MEASUREMENT SYSTEMS)
OUTBOARD MAIN TANK
(TANK NO. 1, LEFT SIDE)
(TANK NO. 4, RIGHT SIDE)
INBOARD MAIN TANK
(TANK NO. 2, LEFT SIDE)
(TANK NO. 3, RIGHT SIDE)
FRONT SPAR
MID SPAR
REAR SPAR
(LEFT SIDE ONLY)
(RIGHT SIDE ONLY)
(LEFT SIDE ONLY)
FUEL SYSTEM (SEE SHEET 1)
FUEL SYSTEM (SEE SHEET 1)
(9 PLACES)
(7 PLACES)
(2 PLACES)
(2 PLACES)
(2

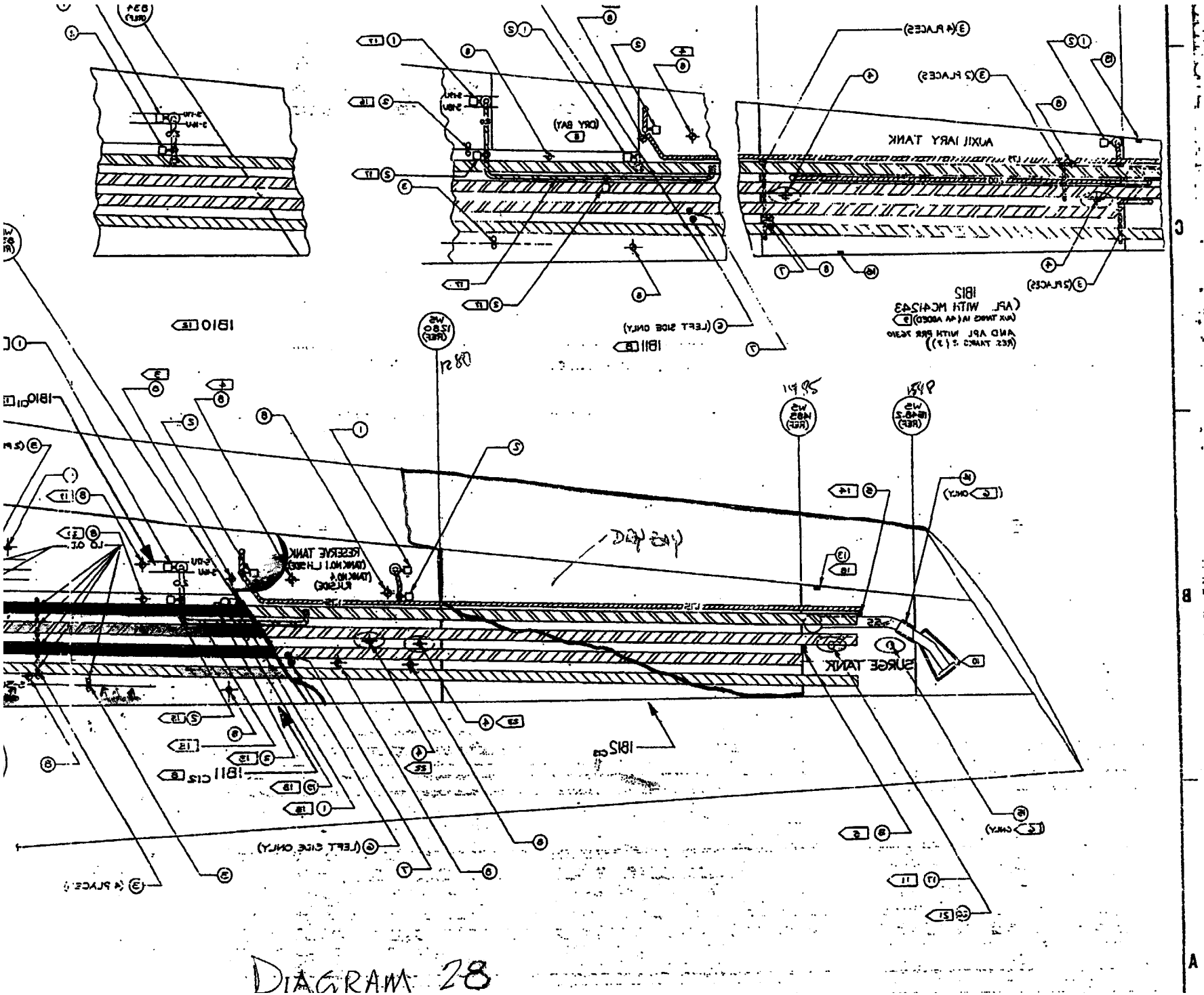

AUXILIARY TANK
SURGE TANK
RESERVE TANK
(DRY BAY)
(LEFT SIDE ONLY)
(4 PLACES)
(2 PLACES)
1810
1811
1812
1280
1495
1548
C
B
A

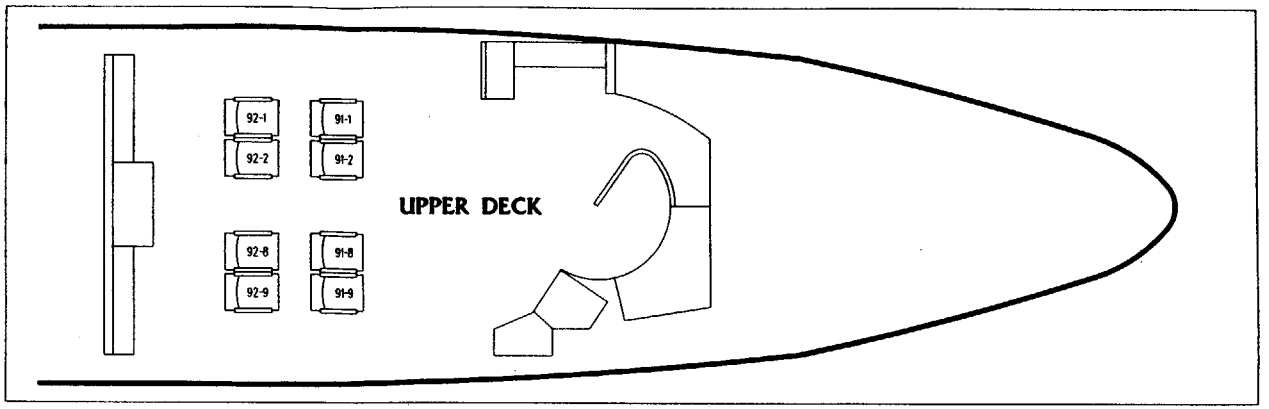
DIAGRAM 28

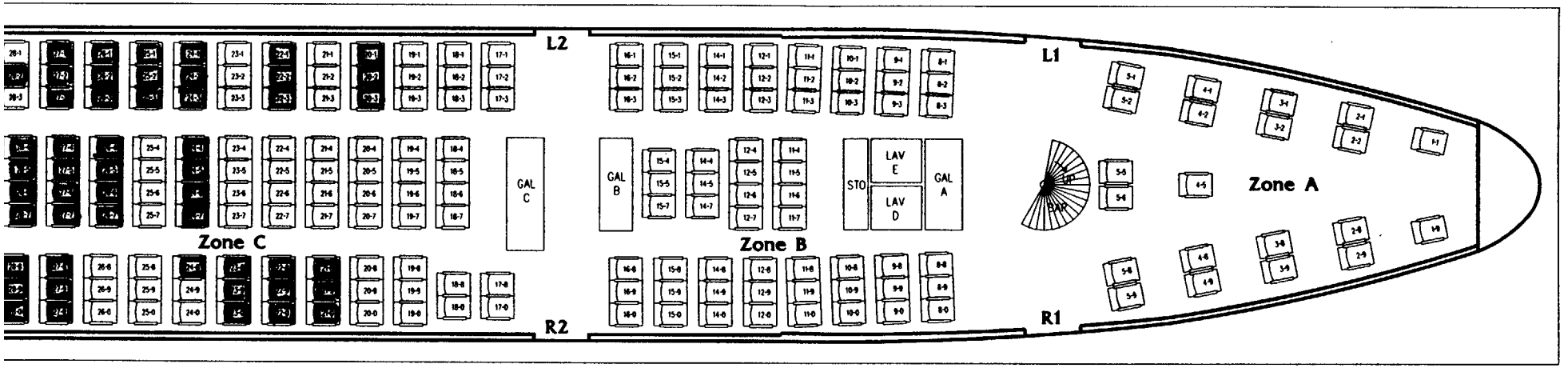
Seat Damage
Center Wing Tank Area
Data gathered by Fire and Explosion Group

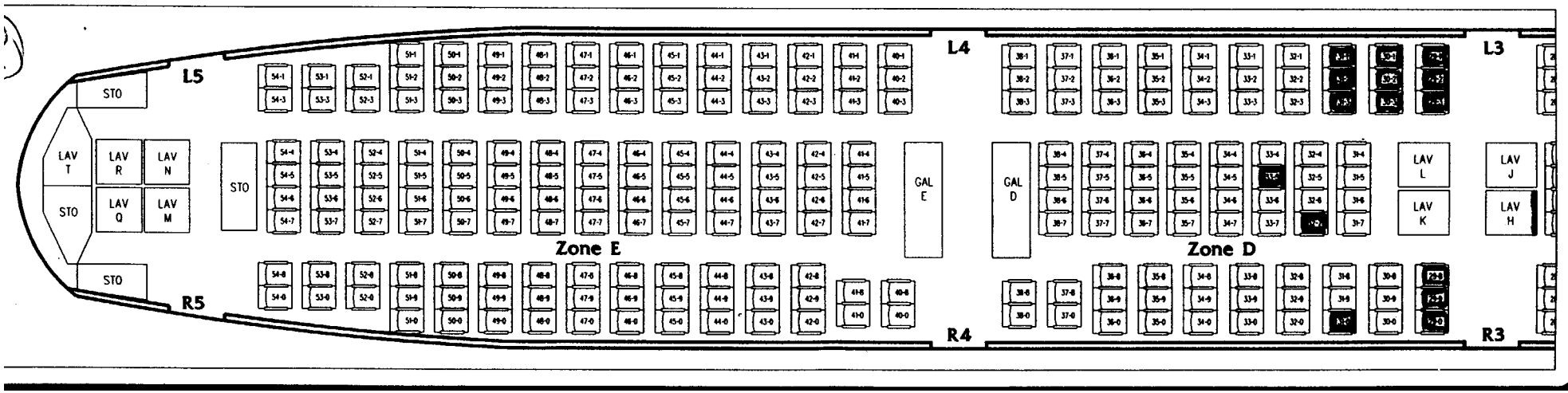
Diagram 29

Fire Damage and/or Soot [redacted]

Not Recovered/Identified [redacted]

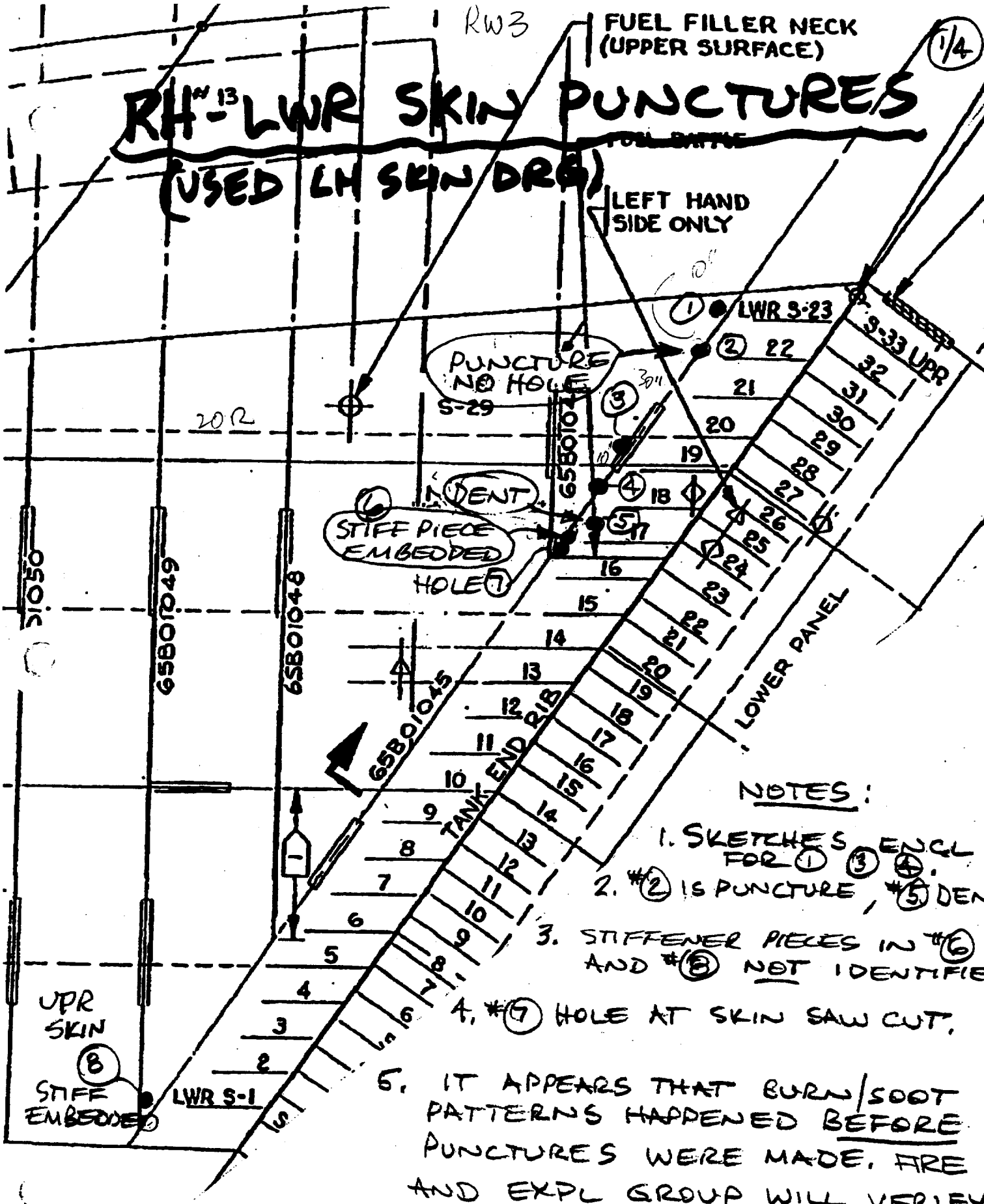






RH W-13 LWR SKIN PUNCTURES

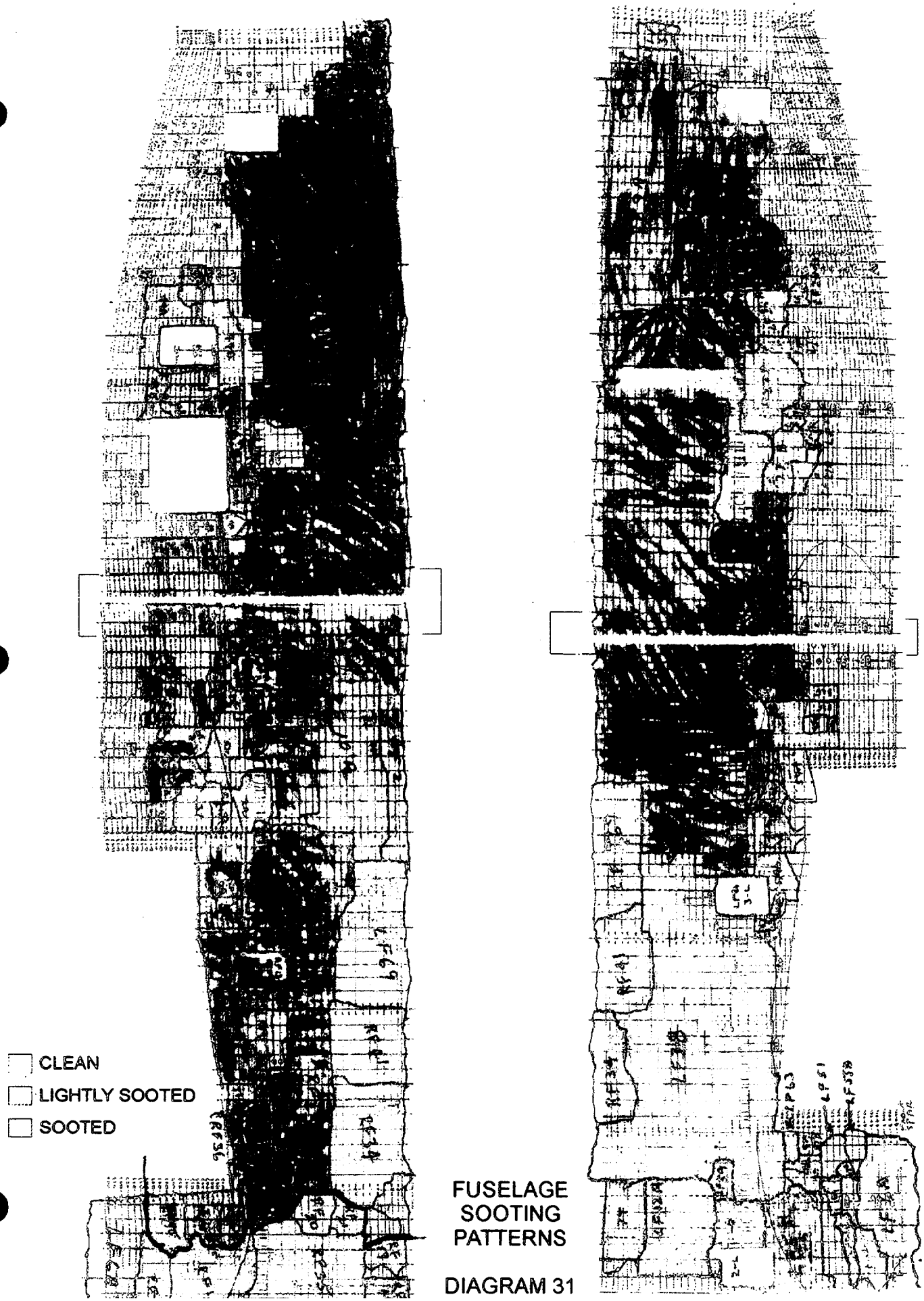
(USED LH SKIN DRG)



NOTES:

1. SKETCHES ENCL FOR 1 3 4.
2. #2 IS PUNCTURE, #5 DEN
3. STIFFENER PIECES IN #6 AND #8 NOT IDENTIFIE
4. #7 HOLE AT SKIN SAW CUT.
5. IT APPEARS THAT BURN/SOOT PATTERNS HAPPENED BEFORE PUNCTURES WERE MADE. FIRE AND EXPL GROUP WILL VERIFY.

A. REIMER 10/16/96



FUSELAGE SOOTING PATTERNS

DIAGRAM 31