

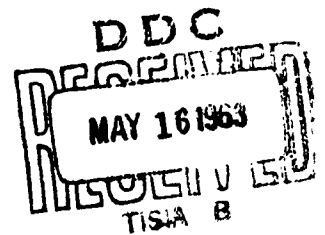
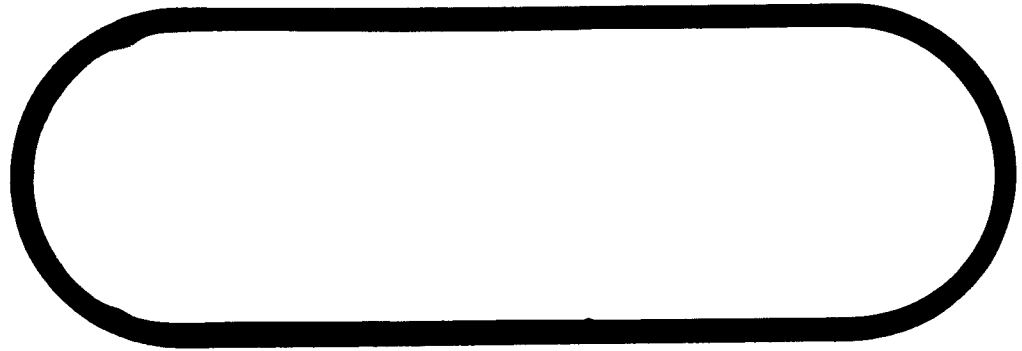
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**BOEING**



**SEATTLE, WASHINGTON**

THE **BOEING** COMPANY

CODE IDENT NO. 81205

NUMBER D2-13946-2

TITLE FLIGHT ARTICLE MASS PROPERTIES REPORT FOR MINUTEMAN  
WING II COMPONENTS FOR MISSILE 646 (GTM-020) (U)

MODEL NO. WS-133A CONTRACT NO. AFD4(694)-46

ISSUE NO. 12 ISSUED TO Astia

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### SUMMARY

This report contains mass property summaries of the Boeing components for missile 646 which is scheduled to be assembled at Air Force Plant 77 as GTM-020. Therefore, the data contained in this report reflect a modified Wing II missile incorporating the changes scheduled for GTM-020.

1.0 INTRODUCTION

1.1 REFERENCES

- 1.1.1 BSD Exhibit 62-45, "Mass Properties Control Data for WS-133A", Dated 3 August 1962.
- 1.1.2 CCN 258 (BSD-63MEN-2597) to AFO4(647)-580, Dated 5 October 1962.
- 1.1.3 Boeing Document D2-13943, "Flight Article Mass Properties Report for CTLI Installations."
- 1.1.4 Boeing Document D2-13944-501, "Flight Article Mass Properties Report for Missile 501 Components."
- 1.1.5 Boeing Document D2-13956-1 "Statistical Means and Dispersions for the Mass Properties of Boeing Components for the Wing II Operational Minuteman Missile - March 1, 1963."
- 1.1.6 Boeing CCP 856, "Wing II GTM-020 for STP III usage."

1.2 COMPONENT SERIAL NUMBERS

The major components for this missile (interstages, aft skirt, and base heat deflectors) are all serial number 0000193 except for the aft skirt which is 0000191. Average mass properties are reported for the remaining components.

1.3 DISCUSSION

This weight report for the Boeing components for missile 646 is presented in accordance with Section 3.1.1 of BSD Exhibit 62-45 (reference 1.1.1) as authorized by CCN 258 (reference 1.1.2). Since missile 646 is scheduled to be assembled at Air Force Plant 77 as GTM-020, the data contained in this report reflect a modified Wing II missile incorporating the changes scheduled for GTM-020. These changes are set forth in Boeing CCP 856 (reference 1.1.6) and are summarized as follows:

- (1) The 2-3 interstage and the aft skirt are reworked.
- (2) Special cables are added to allow a repetitive countdown capability.
- (3) Ordnance assemblies for joint severance are removed but safe and arm devices are retained.
- (4) Insulation components, fasteners and joints, are not used.
- (5) A jumper cable extending between the instrumentation section and the guidance section is provided.

These changes are incorporated into the summary check lists on page 11 through 17.

The data presented in this report consist of (1) a sectional summary of the total Boeing Weight responsibility, (2) summary check lists by missile section, (3) a list of applicable Engineering Change Proposals, and (4) weighing records and inventory lists for the interstages and the aft skirt. The weight and balance data summarized on page 10 consist of actual mass properties for interstages, aft skirt,\* and base heat deflectors and mean mass properties for the remaining items. The latest Wing II means and dispersions report (reference 1.1.5) contains sample data for derivation of the means.

This report will be revised to incorporate the actual data obtained during assembly of this missile at Air Force Plant 77.

#### 1.4 CTLI PROVISIONS

The only CTLI provisions incorporated into this report are those components which are installed on every operational missile. The mass properties data for CTLI components which will be added at Vandenberg Air Force Base are reported in reference 1.1.3.

#### 1.5 WEIGHING PROCEDURES

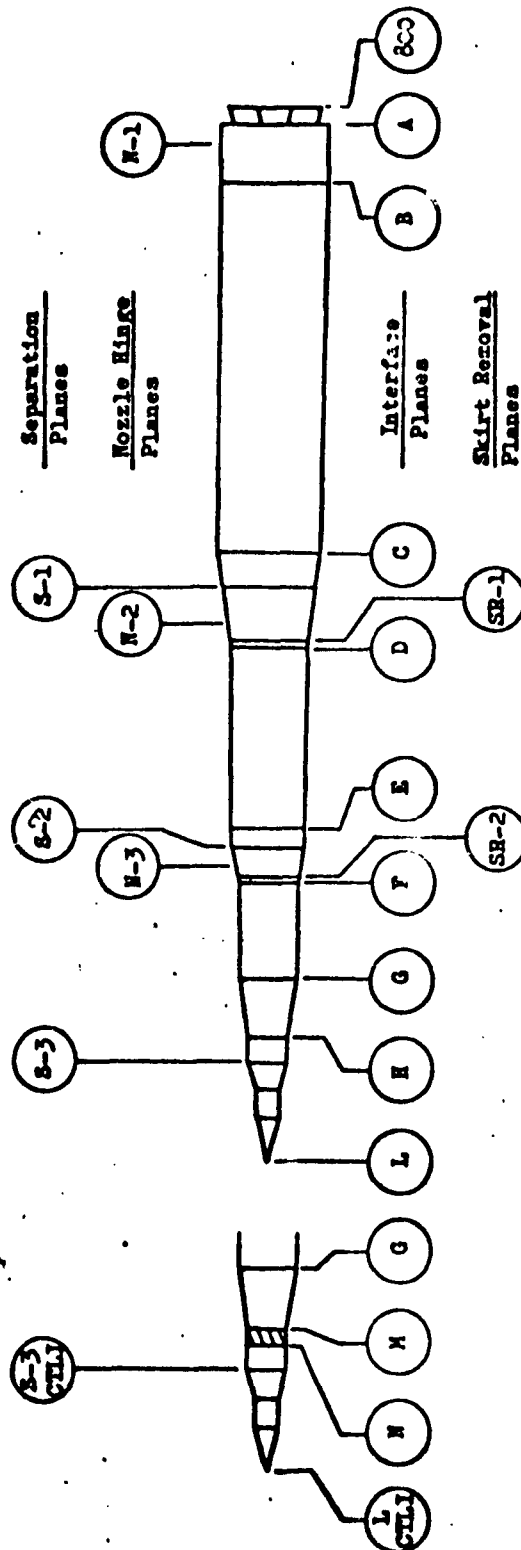
A description of the weighing procedures and an accuracy statement will be found in reference 1.1.4.

#### 1.6 ENGINEERING CHANGE PROPOSAL (ECP) SUMMARY

See page 18 for a list of the ECP's incorporated on the Boeing components covered by this report. The ECP's listed are those not covered by the latest revision to "Model Specification for Guided Missile Main Assemblages, S-133-1000-0-1," Dated 25 October 1962.

\* Since actual data on the GTM-020 skirt will not be available until the time of missile assembly, the mass properties of the skirt for GTM-021 are included in place of the GTM-020 skirt. The data will be revised to reflect the correct configuration at a later date.

# 2.0 WING II OPERATIONAL AND CTLI MISSILE STATION DIAGRAM



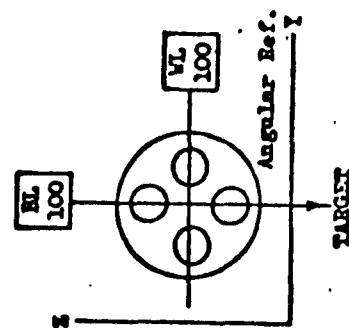
▷ These Missile Stations become 50,000 when converted to Boeing Section Stations.

| SEPARATION PLANES    | MISSILE STA | INTERFACE PLANES | MISSILE STA |
|----------------------|-------------|------------------|-------------|
| S-1                  | 501.66      | A                | 784.24      |
| S-2                  | 342.93      | B                | 748.24      |
| S-3                  | 210.55      | C                | 525.60      |
| S-3 CTLI             | 200.53      | D                | 466.52      |
|                      |             | E                | 357.58      |
| SKIRT REMOVAL PLANES |             | F                | 319.23      |
| SR-1                 | 166.97      | G                | 257.45      |
| SR-2                 | 319.74      | H                | 225.95      |
|                      |             | L                | 129.48      |
| NOZZLE HINGE PLANES  |             |                  |             |
| N-1                  | 770.03      | M                | 225.95      |
| N-2                  | 177.32      | N                | 215.95      |
| N-3                  | 327.33      | L CTLI           | 119.49      |

Reference

STL Release 9862.6-513

(17 December 1962)



| 3.0 MISSILE NO. GIM-020<br>WEIGHT AND BALANCE SUMMARY<br>MAJOR COMPONENTS S/N 0000193** |      |                  |      |                            |                         | REPORT NO. _____<br>DATE _____ |       |       |                                                   |       |
|-----------------------------------------------------------------------------------------|------|------------------|------|----------------------------|-------------------------|--------------------------------|-------|-------|---------------------------------------------------|-------|
| LINE                                                                                    | SEC. | DESCRIPTION      | DATA | EXPENDED<br>WEIGHT<br>(LB) | TOTAL<br>WEIGHT<br>(LB) | CENTER OF GRAVITY              |       |       | INERTIA<br>SLUG FT <sup>2</sup> x10 <sup>-3</sup> |       |
|                                                                                         |      |                  |      |                            |                         | LONG. °                        | LAT.  | VERT. | ROLL                                              | PITCH |
| 1                                                                                       | 41   | RV Spacer        |      |                            |                         |                                |       |       |                                                   |       |
| 2                                                                                       |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 3                                                                                       |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 4                                                                                       | 39   | CTLI Section     |      |                            |                         |                                |       |       |                                                   |       |
| 5                                                                                       |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 6                                                                                       |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 7                                                                                       | 42   | G&C Section      |      |                            | 1.02                    | 80.9                           | 100.0 | 100.0 | 0                                                 | 0     |
| 8                                                                                       |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 9                                                                                       |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 10                                                                                      | 44   | 3rd Stage Engine |      |                            | 17.11                   | 99.6                           | 106.2 | 110.9 | 0                                                 | .003  |
| 11                                                                                      |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 12                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 13                                                                                      |      |                  | Base |                            |                         |                                |       |       |                                                   |       |
| 14                                                                                      | 45   | Interstage 2-3   |      |                            | 113.43                  | 59.9                           | 100.6 | 101.7 | .009                                              | .006  |
| 15                                                                                      |      | (Fwd)            | Silo |                            |                         |                                |       |       |                                                   |       |
| 16                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 17                                                                                      |      |                  | Base |                            |                         |                                |       |       |                                                   |       |
| 18                                                                                      |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 19                                                                                      |      | Jettisoned       | Aero |                            |                         |                                |       |       |                                                   |       |
| 20                                                                                      |      | Portion          | Base |                            |                         |                                |       |       |                                                   |       |
| 21                                                                                      |      |                  | Jett |                            |                         |                                |       |       |                                                   |       |
| 22                                                                                      | 45   | Interstage 2-3   |      |                            | 61.57                   | 80.7                           | 99.3  | 101.4 | .006                                              | .004  |
| 23                                                                                      |      | (Aft)            | Silo |                            |                         |                                |       |       |                                                   |       |
| 24                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 25                                                                                      | 46   | 2nd Stage Engine |      |                            | 30.81                   | 147.5                          | 105.6 | 109.8 | .001                                              | .018  |
| 26                                                                                      |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 27                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 28                                                                                      |      |                  | Base |                            |                         |                                |       |       |                                                   |       |
| 29                                                                                      | 47   | Interstage 1-2   |      |                            | 240.72                  | 67.1                           | 99.9  | 101.6 | .032                                              | .022  |
| 30                                                                                      |      | (Fwd)            | Silo |                            |                         |                                |       |       |                                                   |       |
| 31                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 32                                                                                      |      |                  | Base |                            |                         |                                |       |       |                                                   |       |
| 33                                                                                      |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 34                                                                                      |      | Jettisoned       | Aero |                            |                         |                                |       |       |                                                   |       |
| 35                                                                                      |      | Portion          | Base |                            |                         |                                |       |       |                                                   |       |
| 36                                                                                      |      |                  | Jett |                            |                         |                                |       |       |                                                   |       |
| 37                                                                                      | 47   | Interstage 1-2   |      |                            | 127.41                  | 97.0                           | 100.8 | 99.7  | .024                                              | .014  |
| 38                                                                                      |      | (Aft)            | Silo |                            |                         |                                |       |       |                                                   |       |
| 39                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 40                                                                                      | 48   | 1st Stage Engine |      |                            | 59.24                   | 230.9                          | 109.5 | 116.1 | .003                                              | .104  |
| 41                                                                                      |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 42                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 43                                                                                      |      |                  | Base |                            |                         |                                |       |       |                                                   |       |
| 44                                                                                      | 49   | Skirt            |      |                            | 284.9                   | 68.4                           | 100.7 | 101.2 | .064                                              | .039  |
| 45                                                                                      |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 46                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 47                                                                                      |      |                  | Base |                            |                         |                                |       |       |                                                   |       |
| 48                                                                                      |      | MISSILE          |      |                            | 936.21                  |                                |       |       |                                                   |       |
| 49                                                                                      |      |                  | Silo |                            |                         |                                |       |       |                                                   |       |
| 50                                                                                      |      |                  | Aero |                            |                         |                                |       |       |                                                   |       |
| 51                                                                                      |      |                  | Base |                            |                         |                                |       |       |                                                   |       |
| 52                                                                                      |      |                  | Jett |                            |                         |                                |       |       |                                                   |       |

\* Boeing Section Stations (See Missile Station Diagram)  
2-5550-0-58  
\*\* Art Skirt S/N 0000191

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[illegible]

**Excludes BS 5-62 added at Plant 77**

**Excludes HHS 5-62 added at Plant 77**

**Excludes BMS 5-62 added at Plant 77**

| CHECK LIST NO. |                                       | MISSILE WEIGHING CHECK LIST                                             |        |       |       |        |   |  |  |  |  | RECORD OF CHECKING (DATE) |  |  |  |
|----------------|---------------------------------------|-------------------------------------------------------------------------|--------|-------|-------|--------|---|--|--|--|--|---------------------------|--|--|--|
| DATE           |                                       | MODEL <u>WB-133</u> FINAL ASSEMBLY DRAWING NO. <u>21-53220-3</u>        |        |       |       |        |   |  |  |  |  | MISSILE                   |  |  |  |
|                |                                       | SECTION <u>47</u> MISSILE NO. <u>07M-020</u>                            |        |       |       |        |   |  |  |  |  | COMPONENT                 |  |  |  |
|                |                                       | MISSILE COMPONENT <u>1-2 INTERSTAGE</u> COMPONENT PART NO. <u>Noted</u> |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | DESCRIPTION                                                             |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | PART NO.                                                                |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | WEIGHT                                                                  |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | X ARM                                                                   |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | Y ARM                                                                   |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | Z ARM                                                                   |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | BASIC WEIGHT                                                            |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | AS WEIGHED                                                              |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | SHIPMENT                                                                |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | REMOTE SITE                                                             |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | AS RECEIVED                                                             |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | REMOTE SITE                                                             |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | AS WEIGHED                                                              |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | REMOTE SITE                                                             |        |       |       |        |   |  |  |  |  |                           |  |  |  |
|                |                                       | LAUNCH                                                                  |        |       |       |        |   |  |  |  |  |                           |  |  |  |
| 7a             | Body Section (S/N 0000193)            | 25-30109-4                                                              | 342.70 | 77.91 | 99.54 | 100.28 | x |  |  |  |  |                           |  |  |  |
| 7b             | Interstage Installation               | 25-36478-1                                                              | 2.52   | 79.4  | 99.9  | 100.3  | x |  |  |  |  |                           |  |  |  |
| 7c             | Conduit Support Set                   | 25-36381-1                                                              | 2.37   | 88.7  | 115.6 | 127.1  | x |  |  |  |  |                           |  |  |  |
| 7d             | Instl-Frd R/W Cap                     | 25-36046-2                                                              | .09    | 53.5  | 110.2 | 119.5  | x |  |  |  |  |                           |  |  |  |
| 7e             | Instl-Aft R/W Cap                     | 25-36046-1                                                              | .09    | 105.8 | 116.2 | 128.0  | x |  |  |  |  |                           |  |  |  |
| 7f             | Support Comp-Elec Cable               | 25-27523-5                                                              | 2.30   | 59.6  | 112.6 | 118.1  | x |  |  |  |  |                           |  |  |  |
| 7g             | Instl-Elec Cable Support              | 25-27524-6                                                              | .40    | 83.7  | 109.1 | 114.7  | x |  |  |  |  |                           |  |  |  |
| 7h             | Bracket Comp-Cable Disconnect         | 25-27234-3                                                              | 10.10  | 66.9  | 114.1 | 114.1  | x |  |  |  |  |                           |  |  |  |
| 7i             | Disconnect Bracket Instl              | 25-27221-1                                                              | .23    | 70.7  | 120.2 | 120.3  | x |  |  |  |  |                           |  |  |  |
| 7j             | S&A Device                            | 10-20436-5                                                              | 2.84   | 89.4  | 92.0  | 73.0   | x |  |  |  |  |                           |  |  |  |
| 7k             | Inert S&A Instl                       | 25-32260-3                                                              | .06    | 88.2  | 92.1  | 72.4   | x |  |  |  |  |                           |  |  |  |
| 7l             | Cable Instl Repetitive Countdown      | 25-31924-1                                                              | .23    | 91.1  | 89.8  | 89.5   | x |  |  |  |  |                           |  |  |  |
| 7m             | Cable Instl Repetitive Countdown      | 25-31924-4                                                              | 2.99   | 66.9  | 110.7 | 112.0  | x |  |  |  |  |                           |  |  |  |
| 7n             | WES 5-62 Installed at Plant 77 (Ent.) |                                                                         | 1.21   | 58.9  | 109.4 | 113.3  | x |  |  |  |  |                           |  |  |  |

Excludes WES 5-62 added at Plant 77



| CHECK LIST NO.                 |                                       | 4.7 MISSILE WEIGHING CHECK LIST                                  |        | RECORD OF CHECKING (DATE) |        |
|--------------------------------|---------------------------------------|------------------------------------------------------------------|--------|---------------------------|--------|
| DATE                           |                                       | MODEL <u>W8-133</u> FINAL ASSEMBLY DRAWING NO. <u>21-53220-1</u> |        | Mo                        |        |
|                                |                                       |                                                                  |        | Day                       |        |
|                                |                                       |                                                                  |        | Yr                        |        |
| SECTION <u>49</u>              |                                       | MISSILE NO. <u>QTM-020</u>                                       |        | COMPONENT                 |        |
| MISSILE COMPONENT <u>SKIRT</u> |                                       | COMPONENT PART NO. <u>Noted</u>                                  |        | MISSILE                   |        |
| DESCRIPTION                    |                                       | PART NO.                                                         | WEIGHT | X ARM                     | Y ARM  |
| 9a                             | Skirt Assembly-Inaul (S/N 0000191)    | 25-37472-1                                                       | 275.05 | 68.66                     | 100.38 |
| 9b                             | Instl-Skirt Section                   | 25-35492-2                                                       | 1.66   | 52.8                      | 100.5  |
| 9c                             | Conduit Support Set                   | 25-36381-1                                                       | 2.54   | 57.3                      | 117.8  |
| 9d                             | Instl Raceway Cap                     | 25-36046-1                                                       | .15    | 59.3                      | 116.5  |
| 9e                             | Support Comp-Elec Cable               | 25-27523-5                                                       | 1.31   | 63.0                      | 119.6  |
| 9f                             | Instl-Elec Cable Support              | 25-27524-6                                                       | .37    | 69.1                      | 128.0  |
| 9g                             | Cable Instl Repetitive Countdown      | 25-31923-3                                                       | 2.99   | 66.5                      | 105.9  |
| 9h                             | RCS 5-62 Installed at Plant 77 (Est.) |                                                                  | .83    | 58.3                      | 102.9  |

3.0

**ENGINEERING CHANGE PROPOSAL (ECP) INCORPORATION\***  
**APPLICABLE TO WING II MISSILE 646 (GTM-020)**

The following ECP's have not been incorporated into "Model Specification, Guided Missile Main Assemblage (8-133-1000-0-1)" dated 25 October 1962. However, the mass properties of these ECP's have been incorporated into this report unless otherwise noted.

| ECP No.<br>(WS-133A-BO-) | ECP TITLE                                                                           | STAGE | WEIGHT<br>CHANGE | WEIGHT CHANGE<br>INCORPORATED<br>IN THIS REPORT |
|--------------------------|-------------------------------------------------------------------------------------|-------|------------------|-------------------------------------------------|
| 369                      | Revision to Incorporate Blast<br>Tubes in Second Stage Wing II<br>Engines           | 2     | -                | Yes                                             |
| 540                      | Potting and Bonding Deletion for<br>Vandenberg Air Force Base Missiles,<br>Phase II | 1,2,3 | -                | No**                                            |

\* Since Boeing CCP 856 (reference 1.1.6) creates GTM-020, some of the requirements of this model specification and these ECP's have been superseded by the CCP. See page 7.

\*\* ECP 540 requirements have been partially superseded by CCP 856.

2-5550-0-78

SERIAL NUMBER: 0000193

6.1.1.1 ACTUAL WEIGHT RECORD - INTERSTAGE 2-3

U/O MISSILE QTM-020

DRAWING NO. 25-36103

CHECK LIST NO. 5

REPORT NO. OPR-

MISSILE MODEL WS-133

DCN

PAGE NO.

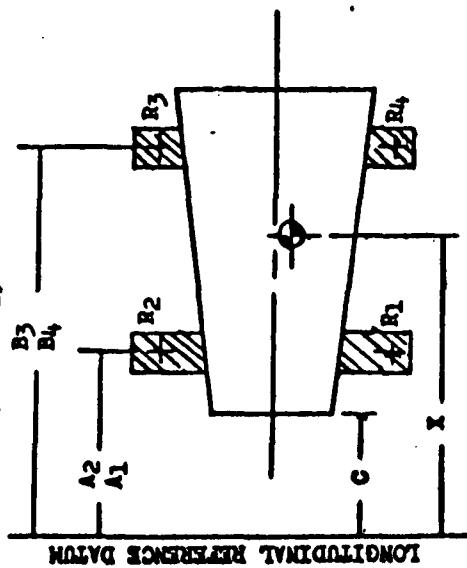
CONFIGURATION TAH

ADCN

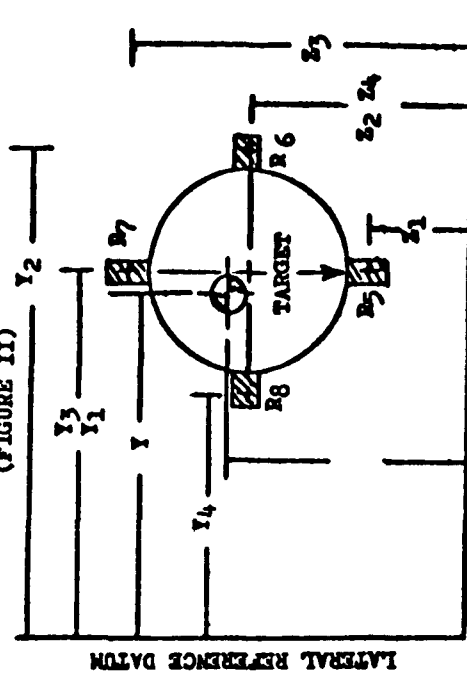
DATE

2-19-63

(FIGURE I)



(FIGURE II)



VERTICAL REFERENCE DATUM

WEIGHING DATA

| REACTION | GR. WT. | TARE   | CORR. | NET WT. | REACTION | GR. WT. | TARE   | CORR. | NET WT. |
|----------|---------|--------|-------|---------|----------|---------|--------|-------|---------|
| R1       | 100.45  | 67.70  |       | 32.75   | R5       | 60.45   | 28.25  |       | 32.20   |
| R2       | 115.40  | 68.30  |       | 47.10   | R6       | 61.10   | 36.50  |       | 44.60   |
| R3       | 98.05   | 67.10  |       | 30.95   | R7       | 66.00   | 27.95  |       | 38.05   |
| R4       | 113.65  | 68.15  |       | 45.50   | R8       | 75.20   | 33.75  |       | 41.45   |
| TOTAL    | 427.55  | 271.25 |       | 156.30  | TOTAL    | 282.75  | 126.45 |       | 156.30  |

DIMENSIONAL DATA

| DIM. | INCHES | DIM. | INCHES  | DIM. | INCHES  |
|------|--------|------|---------|------|---------|
| A1   | 47.343 | Z1   | 100.000 | Y1   | 72.500  |
| A2   | 47.354 | Z2   | 72.501  | Y2   | 100.000 |
| B3   | 88.351 | Z3   | 100.000 | Y3   | 127.493 |
| B4   | 88.351 | Z4   | 127.499 | Y4   | 100.000 |
| C    | 50.000 |      |         |      |         |

LONGITUDINAL C.G.

| REACTION | NET WT. | ARM    | MOMENT   |
|----------|---------|--------|----------|
| R1       | 32.75   | 47.343 |          |
| R2       | 47.10   | 47.354 |          |
| R3       | 30.95   | 88.351 |          |
| R4       | 45.50   | 88.351 |          |
| AS WGD   | 156.30  | 67.40  | 10,535.3 |

LATERAL C.G.

| REACTION | NET WT. | ARM     | MOMENT   |
|----------|---------|---------|----------|
| R5       | 32.20   | 100.000 |          |
| R6       | 44.60   | 72.501  |          |
| R7       | 38.05   | 100.000 |          |
| R8       | 41.45   | 127.499 |          |
| AS WGD   | 156.30  | 99.45   | 15,543.4 |

VERTICAL C.G.

| REACTION | NET WT. | ARM     | MOMENT   |
|----------|---------|---------|----------|
| R5       | 32.20   | 72.500  |          |
| R6       | 44.60   | 100.000 |          |
| R7       | 38.05   | 127.493 |          |
| R8       | 41.45   | 100.000 |          |
| AS WGD   | 156.30  | 101.02  | 15,790.8 |

WORKING

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Fig "A" Number: 6501

Serial Number: 0000193

2-5590-0-79

| CHECK LIST NO.<br>3                                                    |                                      | 6.1.2 MISSILE WEIGHING CHECK LIST     |        | RECORD OF CHECKING (DATE) |       |       |  |
|------------------------------------------------------------------------|--------------------------------------|---------------------------------------|--------|---------------------------|-------|-------|--|
| DATE<br>2-19-63                                                        |                                      | MODEL VS-133                          |        | Mo 2<br>Day 19<br>Yr 63   |       |       |  |
|                                                                        |                                      | FINAL ASSEMBLY DRAWING NO. 21-33820-3 |        |                           |       |       |  |
| ITEM NUMBER                                                            | SECTION 45                           | MISSILE NO. OTM-020                   |        | COMPONENT                 |       |       |  |
| MISSILE COMPONENT BODY SECTION GUIDED MISSILE COMPONENT PART NO. Noted |                                      |                                       |        |                           |       |       |  |
|                                                                        | DESCRIPTION                          | PART NO.                              | WEIGHT | X ARM                     | Y ARM | Z ARM |  |
| <b>BODY SECTION ASSY</b>                                               |                                      |                                       |        |                           |       |       |  |
|                                                                        | Interstage Assy- Structural          | 25-36101-1                            |        |                           |       |       |  |
|                                                                        | Cork Insulation Installation         | 25-36102-1                            |        |                           |       |       |  |
|                                                                        | Instr Rack & Accelerometer           | 25-37084-1                            |        |                           |       |       |  |
|                                                                        | Marking Instl- Section 45            | 25-31659-4                            |        |                           |       |       |  |
|                                                                        | Cover- Insulating                    | 25-30134-28                           |        |                           |       |       |  |
|                                                                        | Cover- Insulating                    | 29-24652-2                            |        |                           |       |       |  |
|                                                                        | Cover- Insulating                    | 29-25598-1                            |        |                           |       |       |  |
|                                                                        | Cover- Insulating (8)                | 29-23365-1                            |        |                           |       |       |  |
|                                                                        | Cover- Insulating (8)                | 29-23365-2                            |        |                           |       |       |  |
|                                                                        | Cover- Insulating (7)                | 29-23365-3                            |        |                           |       |       |  |
|                                                                        | Cover- Insulating (4)                | 29-23365-4                            |        |                           |       |       |  |
|                                                                        | Cover- Insulating                    | 29-23365-5                            |        |                           |       |       |  |
|                                                                        | Cover- Insulating (4)                | 29-23365-6                            |        |                           |       |       |  |
|                                                                        | Seal- Forward                        | 29-23674-1                            |        |                           |       |       |  |
|                                                                        | Door- Access, Ordnance               | 29-22673-3                            |        |                           |       |       |  |
|                                                                        | Closure Panel- Access, Ordnance      | 29-22672-2                            |        |                           |       |       |  |
|                                                                        | Door- Access, Ignitor Stage II       | 29-22361-4                            |        |                           |       |       |  |
|                                                                        | Closure Panel- Access, Booster Skirt | 29-22081-5                            |        |                           |       |       |  |
|                                                                        | Door- Access, Detonator              | 26-11678-1                            |        |                           |       |       |  |
|                                                                        | Door- Access, Ignitor Stage III      | 26-11885-4                            |        |                           |       |       |  |
|                                                                        | Door- Access, GHI                    | 26-12909-1                            |        |                           |       |       |  |
|                                                                        | Plug- Screw, Insulated               | 26-15247-2                            |        |                           |       |       |  |
|                                                                        | Sleeve                               | 26-14713-1                            |        |                           |       |       |  |
|                                                                        | Bolt - 100° Head                     | BACB30EM-3-3                          |        |                           |       |       |  |
|                                                                        | Bolt - 100° Head                     | -3-4                                  |        |                           |       |       |  |
|                                                                        | Bolt - 100° Head                     | -4-6                                  |        |                           |       |       |  |
|                                                                        | Bolt - 100° Head                     | -4-7                                  |        |                           |       |       |  |
|                                                                        | Bolt - 100° Head                     | -4-10                                 |        |                           |       |       |  |
|                                                                        | Bolt - 100° Head                     | -5-3                                  |        |                           |       |       |  |

BOEING

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Fig. "A" Number: 6501

Serial Number: 0000193

| CHECK LIST NO.<br>5                                              |                  | MISSILE WEIGHING CHECK LIST |        | RECORD OF CHECKING (DATE)             |       |                         |              |            |                      |             |             |                 |
|------------------------------------------------------------------|------------------|-----------------------------|--------|---------------------------------------|-------|-------------------------|--------------|------------|----------------------|-------------|-------------|-----------------|
| DATE<br>2-19-63                                                  |                  | MODEL WS-133                |        | FINAL ASSEMBLY DRAWING NO. 21-53220-1 |       | Mo 2<br>Day 19<br>Yr 63 |              |            |                      |             |             |                 |
| ITEM NUMBER                                                      | DESCRIPTION      | PART NO.                    | WEIGHT | X ARM                                 | Y ARM | Z ARM                   | BASIC WEIGHT | AS WEIGHED | COMPONENT            |             |             | REV. OF USED ON |
|                                                                  |                  |                             |        |                                       |       |                         |              |            | REMOTE SITE SHIPMENT | AS RECEIVED | REMOTE SITE |                 |
| MISSILE NO. 07M-020                                              |                  |                             |        |                                       |       |                         |              |            |                      |             |             |                 |
| MISSILE COMPONENT BODY SECTION GUIDED MISSILE COMPONENT PART NO. |                  |                             |        |                                       |       |                         |              |            |                      |             |             |                 |
| BODY SECTION ASSY (CONTINUED)                                    |                  |                             |        |                                       |       |                         |              |            |                      |             |             |                 |
|                                                                  | Bolt - 1000 Head | (6)                         |        |                                       |       |                         |              |            |                      |             |             |                 |
|                                                                  | Bolt - 1000 Head | (3)                         |        |                                       |       |                         |              |            |                      |             |             |                 |
|                                                                  | Bolt - 1000 Head | (2)                         |        |                                       |       |                         |              |            |                      |             |             |                 |
|                                                                  | Insulation       | HMS 5-62                    |        |                                       |       |                         |              |            |                      |             |             |                 |

2-5550-0-79

BOEING

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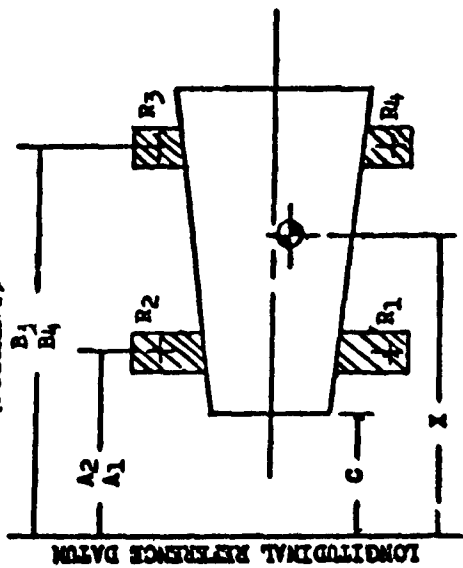
| EQUIPMENT CHANGE RECORD |                           |        |        | WEIGHT AND BALANCE |        |          |        |          |  |
|-------------------------|---------------------------|--------|--------|--------------------|--------|----------|--------|----------|--|
| PART NO.                | DESCRIPTION OF EQUIPMENT  | WEIGHT | X AXIS |                    | Y AXIS |          | Z AXIS |          |  |
|                         |                           |        | ARM    | MOMENT             | ARM    | MOMENT   | ARM    | MOMENT   |  |
| 1                       |                           |        |        |                    |        |          |        |          |  |
| 2                       | Body Section (As Weighed) | 156.30 | 67.40  | 10,535.3           | 99.45  | 15,543.4 | 101.02 | 15,790.8 |  |
| 3                       |                           |        |        |                    |        |          |        |          |  |
| 4                       |                           |        |        |                    |        |          |        |          |  |
| 5                       | ADD:                      | 0      |        |                    |        |          |        |          |  |
| 6                       |                           |        |        |                    |        |          |        |          |  |
| 7                       |                           |        |        |                    |        |          |        |          |  |
| 8                       | DEDUCT:                   | 0      |        |                    |        |          |        |          |  |
| 9                       |                           |        |        |                    |        |          |        |          |  |
| 10                      |                           |        |        |                    |        |          |        |          |  |
| 11                      | Body Section (Complete)   | 156.30 | 67.40  | 10,535.3           | 99.45  | 15,543.4 | 101.02 | 15,790.8 |  |
| 12                      |                           |        |        |                    |        |          |        |          |  |
| 13                      |                           |        |        |                    |        |          |        |          |  |
| 14                      |                           |        |        |                    |        |          |        |          |  |
| 15                      |                           |        |        |                    |        |          |        |          |  |
| 16                      |                           |        |        |                    |        |          |        |          |  |
| 17                      |                           |        |        |                    |        |          |        |          |  |
| 18                      |                           |        |        |                    |        |          |        |          |  |
| 19                      |                           |        |        |                    |        |          |        |          |  |
| 20                      |                           |        |        |                    |        |          |        |          |  |
| 21                      |                           |        |        |                    |        |          |        |          |  |
| 22                      |                           |        |        |                    |        |          |        |          |  |
| 23                      |                           |        |        |                    |        |          |        |          |  |
| 24                      |                           |        |        |                    |        |          |        |          |  |
| 25                      |                           |        |        |                    |        |          |        |          |  |
| 26                      |                           |        |        |                    |        |          |        |          |  |
| 27                      |                           |        |        |                    |        |          |        |          |  |
| 28                      |                           |        |        |                    |        |          |        |          |  |
| 29                      |                           |        |        |                    |        |          |        |          |  |
| 30                      |                           |        |        |                    |        |          |        |          |  |
| 31                      |                           |        |        |                    |        |          |        |          |  |
| 32                      |                           |        |        |                    |        |          |        |          |  |

2-5550-0-77

2-5550-0-77

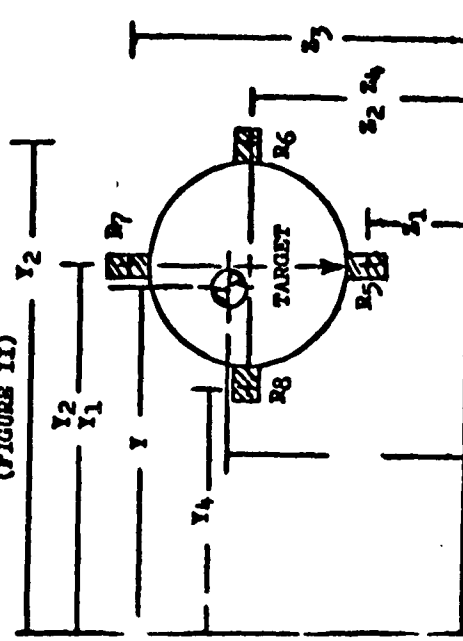
|                        |         |                                             |         |
|------------------------|---------|---------------------------------------------|---------|
| SERIAL NUMBER: 0000193 |         | 6.2.1 ACTUAL WEIGHT RECORD - INTERSTAGE 1-2 |         |
| U/O MISSILE            | QDM-020 | CHECK LIST NO.                              | 7       |
| MISSILE MODEL          | WS-133  | REPORTED BY                                 | TV/RB   |
| CONFIGURATION          | TAH     | CHECKED BY                                  | QVR     |
|                        |         | REPORT NO.                                  | OPR-968 |
|                        |         | PAGE NO.                                    |         |
|                        |         | DATE                                        | 2-22-63 |

(FIGURE 1)



LONGITUDINAL REFERENCE DATUM

(FIGURE 11)



VERTICAL REFERENCE DATUM

WEIGHING DATA

| REACTION | GR. WT. | TARE   | CORR. | NET WT. | REACTION | GR. WT. | TARE   | NET WT. |
|----------|---------|--------|-------|---------|----------|---------|--------|---------|
| R1       | 249.25  | 161.80 |       | 87.45   | R5       | 68.40   | 20.05  | 48.35   |
| R2       | 155.10  | 64.60  |       | 90.50   | R6       | 168.55  | 44.45  | 124.10  |
| R3       | 228.80  | 144.60 |       | 84.20   | R7       | 71.80   | 19.90  | 51.90   |
| R4       | 128.15  | 47.60  |       | 80.55   | R8       | 160.30  | 41.95  | 118.35  |
| TOTAL    | 761.30  | 418.60 |       | 342.70  | TOTAL    | 469.05  | 126.34 | 342.70  |

DIMENSIONAL DATA

| DIM. | INCHES  | DIM. | INCHES  | DIM. | INCHES  |
|------|---------|------|---------|------|---------|
| A1   | 49.072  | Z1   | 100.000 | Y1   | 72.500  |
| A2   | 49.070  | Z2   | 72.501  | Y2   | 100.000 |
| B3   | 109.070 | Z3   | 100.000 | Y3   | 127.493 |
| B4   | 109.070 | Z4   | 127.499 | Y4   | 100.000 |
| C    | 50.000  |      |         |      |         |

LONGITUDINAL C.G.

| REACTION | NET WT. | ARM     | MOMENT   |
|----------|---------|---------|----------|
| R1       | 87.45   | 49.072  |          |
| R2       | 90.50   | 49.070  |          |
| R3       | 84.20   | 109.070 |          |
| R4       | 80.55   | 109.070 |          |
| AS WGD   | 342.70  | 77.91   | 26,701.5 |

LATERAL C.G.

| REACTION | NET WT. | ARM     | MOMENT   |
|----------|---------|---------|----------|
| R5       | 48.35   | 100.000 |          |
| R6       | 124.10  | 72.501  |          |
| R7       | 51.90   | 100.000 |          |
| R8       | 118.35  | 127.499 |          |
| AS WGD   | 342.70  | 99.54   | 34,111.9 |

VERTICAL C.G.

| REACTION | NET WT. | ARM     | MOMENT   |
|----------|---------|---------|----------|
| R5       | 48.35   | 72.500  |          |
| R6       | 124.10  | 100.000 |          |
| R7       | 51.90   | 127.493 |          |
| R8       | 118.35  | 100.000 |          |
| AS WGD   | 342.70  | 100.28  | 34,367.5 |

Pl "A" Number 6701

Serial Number: 0000193

| CHECK LIST NO. 7                                                       |                                  | 6.2.2 MISSILE WEIGHING CHECK LIST                |        | RECORD OF CHECKING (DATE) |       |       |  |
|------------------------------------------------------------------------|----------------------------------|--------------------------------------------------|--------|---------------------------|-------|-------|--|
| DATE 2/22/63                                                           |                                  | MODEL VS-133 FINAL ASSEMBLY DRAWING NO. 21-53220 |        | Mo                        | Day   | Yr    |  |
| SECTION AT                                                             |                                  | MISSILE NO. OTM-620                              |        | COMPONENT                 |       |       |  |
| MISSILE COMPONENT BODY SECTION GUIDED MISSILE COMPONENT PART NO. Noted |                                  |                                                  |        | MISSILE                   |       |       |  |
| ITEM NUMBER                                                            | DESCRIPTION                      | PART NO.                                         | WEIGHT | X ARM                     | Y ARM | Z ARM |  |
| <b>BODY SECTION (REWORKED)</b>                                         |                                  |                                                  |        |                           |       |       |  |
| <b>BODY SECTION ASSY</b>                                               |                                  |                                                  |        |                           |       |       |  |
|                                                                        | Interstage Assy- Structural      | 25-36101-1                                       |        |                           |       |       |  |
|                                                                        | Shield- Assy of, Insulated       | 25-36101-2                                       |        |                           |       |       |  |
|                                                                        | Shield-Time Delay, Booster       | 25-29544-1                                       |        |                           |       |       |  |
|                                                                        | Cork Insulation Instl-Exterior   | 25-37131-1                                       |        |                           |       |       |  |
|                                                                        | Plug- Access Hole                | 29-23663-1                                       |        |                           |       |       |  |
|                                                                        | Seal- Fwd Adapter Ring (2)       | 29-24180-1                                       |        |                           |       |       |  |
|                                                                        | Door- Access Stage Separation    | 26-11886-1                                       |        |                           |       |       |  |
|                                                                        | Door- Access, Booster            | 26-11888-1                                       |        |                           |       |       |  |
|                                                                        | Door Assy - Safe & Arm           | 29-20567-4                                       |        |                           |       |       |  |
|                                                                        | Closure Panel Ord. Access (1170) | 29-28371-1                                       |        |                           |       |       |  |
|                                                                        | Door- Ordnance Access            | 29-28391-1                                       |        |                           |       |       |  |
|                                                                        | Cover Panel Tie                  | 29-23654-1                                       |        |                           |       |       |  |
|                                                                        | Cover Panel Tie                  | 29-23654-2                                       |        |                           |       |       |  |
|                                                                        | Panel- Insulation                | 29-25565-1                                       |        |                           |       |       |  |
|                                                                        | Panel- Insulation                | 25-36383-1                                       |        |                           |       |       |  |
|                                                                        | Marking Instl                    | 25-30134-29                                      |        |                           |       |       |  |
|                                                                        | Cover Receptacle                 | 29-22725-1                                       |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | BAC30EM-3-8                                      |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 4-11                                             |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 4-9                                              |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 4-5                                              |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 3-4                                              |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 3-3                                              |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 4-10                                             |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 4-19                                             |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 4-20                                             |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 41-9                                             |        |                           |       |       |  |
|                                                                        | Bolt - 1000 Head                 | 41-16                                            |        |                           |       |       |  |

2-2260-0-21

FORM 12-13946-2

**2-8860-0-21**

2-5550-0-11 R1

| 6.2.3 WEIGHT AND BALANCE CHANGE RECORD |                           |                |        |                    |        |               |        |            |  |              |  |
|----------------------------------------|---------------------------|----------------|--------|--------------------|--------|---------------|--------|------------|--|--------------|--|
| ASSOCIATE CONTRACTOR                   |                           | BOEING         |        | CONTRACT NO.       |        | AF04(694)-046 |        | REPORT NO. |  | OFR-968      |  |
| COMPONENT                              |                           | INTERSTAGE 1-2 |        | LOT NO.            |        |               |        | DATE       |  | 2-22-63      |  |
| MODEL NO.                              |                           | WS-133         |        | DRAWING NO.        |        | 25-30109-4    |        | PREPARED   |  | R. ST. ROMAN |  |
| SERIAL NO.                             |                           | 0000193        |        | U.O. MISSILE       |        | OTM-020       |        | APPROVED   |  | G. ROBERTS   |  |
| EQUIPMENT CHANGE RECORD                |                           |                |        | WEIGHT AND BALANCE |        |               |        |            |  |              |  |
| PART NO.                               | DESCRIPTION OF EQUIPMENT  | WEIGHT         | X AXIS |                    | Y AXIS |               | Z AXIS |            |  |              |  |
|                                        |                           |                | ARM    | MOMENT             | ARM    | MOMENT        | ARM    | MOMENT     |  |              |  |
| 1                                      | 25-30109-4                | 342.70         | 77.91  | 26,701.5           | 99.54  | 34,111.9      | 100.28 | 34,367.5   |  |              |  |
| 2                                      |                           |                |        |                    |        |               |        |            |  |              |  |
| 3                                      | Body Section (As Weighed) |                |        |                    |        |               |        |            |  |              |  |
| 4                                      |                           |                |        |                    |        |               |        |            |  |              |  |
| 5                                      | ADD:                      | 0              |        |                    |        |               |        |            |  |              |  |
| 6                                      |                           |                |        |                    |        |               |        |            |  |              |  |
| 7                                      |                           |                |        |                    |        |               |        |            |  |              |  |
| 8                                      | DEDUCT:                   | 0              |        |                    |        |               |        |            |  |              |  |
| 9                                      |                           |                |        |                    |        |               |        |            |  |              |  |
| 10                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 11                                     | 25-30109-4                | 342.70         | 77.91  | 26,701.5           | 99.54  | 34,111.9      | 100.28 | 34,367.5   |  |              |  |
| 12                                     | Body Section (Complete)   |                |        |                    |        |               |        |            |  |              |  |
| 13                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 14                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 15                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 16                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 17                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 18                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 19                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 20                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 21                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 22                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 23                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 24                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 25                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 26                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 27                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 28                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 29                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 30                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 31                                     |                           |                |        |                    |        |               |        |            |  |              |  |
| 32                                     |                           |                |        |                    |        |               |        |            |  |              |  |

BOEING

NO. D2-13946-2

MAR 86



2-782-0-8

|                        |  |                                    |  |                    |
|------------------------|--|------------------------------------|--|--------------------|
| Serial Number: 0000191 |  | 6.3.1 ACTUAL WEIGHT RECORD - SKIRT |  | REPORT NO. CFR-903 |
| U/O MISSILE GYM-021    |  | DRAWING NO. 25-37472               |  | PAGE NO.           |
| MISSILE MODEL WS-133   |  | DCN B                              |  | DATE 2/11/63       |
| CONFIGURATION TAH      |  | ADCN 5                             |  | CHECKED BY GVR     |
| CHECK LIST NO. 9       |  | REPORTED BY HC/TV/R.BT             |  |                    |

LONGITUDINAL REFERENCE DATUM

LATERAL REFERENCE DATUM

NOTE: Views taken from top.

| WEIGHING DATA |         |        |       | DIMENSIONAL DATA |          |          |          |     |        |     |         |     |         |
|---------------|---------|--------|-------|------------------|----------|----------|----------|-----|--------|-----|---------|-----|---------|
| REACTION      | GR. WT. | TARE   | CORR. | NET WT.          | X ARM    | Y ARM    | Z ARM    | DIM | INCHES | DIM | INCHES  | DIM | INCHES  |
| R1            | 172.25  | 63.65  |       | 108.60           | 52.353   |          |          | X1  | 52.353 | Y5  | 63.752  | Z5  | 63.661  |
| R2            | 55.35   | 8.50   |       | 46.85            | 52.354   |          |          | X2  | 52.354 | Y7  | 63.727  | Z6  | 63.698  |
| R3            | 127.80  | 96.85  |       | 30.95            | 89.854   |          |          | X3  | 89.854 | Y6  | 136.253 | Z7  | 136.160 |
| R4            | 239.95  | 151.30 |       | 88.65            | 89.854   |          |          | X4  | 89.854 | Y8  | 136.229 | Z8  | 136.198 |
| TOTAL         | 595.35  | 320.30 |       | 275.05           |          |          |          |     |        |     |         |     |         |
| R5            | 111.20  | 51.86  |       | 59.34            |          |          |          |     |        |     |         |     |         |
| R6            | 209.90  | 134.45 |       | 75.45            |          |          |          |     |        |     |         |     |         |
| R7            | 184.80  | 108.15 |       | 76.65            |          |          |          |     |        |     |         |     |         |
| R8            | 89.35   | 25.80  |       | 63.55            |          |          |          |     |        |     |         |     |         |
| MOMENT        |         |        |       |                  | 18,884.9 | 27,609.2 | 27,679.5 |     |        |     |         |     |         |
| TOTAL         | 595.25  | 320.20 |       | 275.05           | 68.66    | 100.38   | 100.68   |     |        |     |         |     |         |

| REMARKS |  |
|---------|--|
|         |  |

2-12-3

| CHECK LIST NO.                                                         |                           | 6.3.2 MISSILE WEIGHING CHECK LIST   |                 | RECORD OF CHECKING (DATE) |       |       |
|------------------------------------------------------------------------|---------------------------|-------------------------------------|-----------------|---------------------------|-------|-------|
| DATE                                                                   |                           | MODEL WS-133                        |                 | Mo                        |       |       |
| 2-11-63                                                                |                           | FINAL ASSEMBLY DRAWING NO. 21-53220 |                 | Day                       |       |       |
|                                                                        |                           |                                     |                 | Yr                        |       |       |
| SECTION 49                                                             | MISSILE NO. QTM-021       |                                     | COMPONENT       |                           |       |       |
| MISSILE COMPONENT BODY SECTION-GUIDED MISSILE COMPONENT PART NO. Noted |                           |                                     | REV. OF USED ON |                           |       |       |
| ITEM NUMBER                                                            | DESCRIPTION               | PART NO.                            | WEIGHT          | X ARM                     | Y ARM | Z ARM |
|                                                                        | BODY SECTION (1-2-1)      | 25-37472-1                          |                 |                           |       |       |
|                                                                        | BODY SECTION / SKIRT      | 25-36080-1                          |                 |                           |       |       |
|                                                                        | Screw                     | 25-36081-1                          |                 |                           |       |       |
|                                                                        | (4) Screw                 | NAS514P832-8                        |                 |                           |       |       |
|                                                                        | (4) Screw                 | NAS603-10                           |                 |                           |       |       |
|                                                                        | Suppt Brkt G&C CTRY Conn. | 25-37345-1                          |                 |                           |       |       |
|                                                                        | Brkt, G&C Cable           | 29-28033-1                          |                 |                           |       |       |
|                                                                        | Brkt, Cable Suppt         | 29-28847-1                          |                 |                           |       |       |
|                                                                        | Brkt, Cable Suppt         | 29-28847-2                          |                 |                           |       |       |
|                                                                        | Marking Installation      | 25-30134-30                         |                 |                           |       |       |
|                                                                        | Insulation                | MS 5-62                             |                 |                           |       |       |
|                                                                        | Doubler                   | 29-23902-1                          |                 |                           |       |       |
|                                                                        | Support                   | 26-15031-1                          |                 |                           |       |       |

2-5550-0-11 R1

**BOEING**

NO. D2-13946-2

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