ANTENNA DEVELOPMENT
FOR
OH-58A HELICOPTER
FINAL REPORT

206-099-212B
Best Available Copy
ANTENNA DEVELOPMENT
FOR
OH-58A HELICOPTER (U)

Final Report

July 1969

By

J. G. Mast
R. C. Henschel

Prepared Under Contract DAJ01-68-1699

For

U. S. Army Aviation Material Command
Department of The Army

By

BELL HELICOPTER COMPANY
Fort Worth, Texas 76101
A Division of Bell Aerospace Corporation
## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Paragraph</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PART I</strong></td>
<td></td>
</tr>
<tr>
<td>1.0</td>
<td>Purpose</td>
</tr>
<tr>
<td>2.0</td>
<td>General Factual Data</td>
</tr>
<tr>
<td>3.0</td>
<td>Detail Factual Data</td>
</tr>
<tr>
<td>4.0</td>
<td>Weight Control Data</td>
</tr>
<tr>
<td>5.0</td>
<td>Conclusions</td>
</tr>
<tr>
<td><strong>PART II</strong></td>
<td></td>
</tr>
<tr>
<td>6.0</td>
<td>Recommendations</td>
</tr>
<tr>
<td><strong>PART III</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data Sheets</td>
</tr>
</tbody>
</table>
1.0 PURPOSE

The objective of the task described in this report was to design, develop, and manufacture an antenna system for use with the Standard Lightweight Avionics Equipment (SLAE) on OH-58A helicopters. This final report is submitted pursuant to paragraph 3.3.6.4 of MIL-A-7772B and paragraph 3.1.15 of Bell Helicopter Detail Specification 206-947-031, Appendix VI.

The antenna system consists of the following functionally independent components:

a. A communications antenna for use with the Number One AN/ARC-114 VHF/FM transceiver over the frequency range of 30 to 75.95 megahertz. BHC P/N 206-075-518.

b. A communications antenna for use with the Number Two AN/ARC-114 transceiver over the frequency range of 30 to 75.95 megahertz. AS-2485/ARC-114, BHC P/N 206-075-543.

c. A communications antenna for use with the AN/ARC-115 VHF/AM transceiver over the frequency range of 116 to 149.975 megahertz. BHC P/N 206-075-518.

d. A communications antenna for use with the AN/ARC-116 UHF/AM transceiver over the frequency range of 225 to 399.95 megahertz. AS-2487/ARC-116, BHC P/N 206-075-551.

e. A homing antenna for use with the AN/ARC-114 VHF/FM radio. AS-2486/ARC-114, BHC P/N 206-075-523.
2.0 GENERAL FACTUAL DATA

2.1 Summary

During the period covered by this report extensive testing of the antenna system described in BHC Reports 206-099-212 and 206-099-212A was accomplished. The results of this testing serve to confirm that the design of the antenna system will provide the OH-58A helicopter with clear and reliable communications and FM Homing.

In the course of this testing it was noted that severe tail rotor modulation of received and transmitted UHF signals was taking place. Therefore, the UHF element has been deleted from the vertical stabilizer antenna assembly and has been replaced by a lightweight blade type antenna mounted under the nose of the helicopter. Figure 1, page 4 illustrates the final location of all antennas, and photographs of the individual antennas may be found in Figures 2 thru 5, pages 5 thru 8.

Moving the UHF antenna to this forward location has the farther desirable effect of reducing the required transmission line run by a considerable amount, thus reducing line loss by approximately 2.5 db.

It was also determined during flight testing that the FM Homing system exhibited excessive sensitivity to the roll attitude of the aircraft. A slight modification to the tip loading of the FM Homing dipoles resulted in completely successful homing throughout the 30 to 76 MHz band.
FIGURE 2
NUMBER ONE VHF/FM AND VHF/AM COMMUNICATION ANTENNA
RHC P/N 206-075-518
FIGURE 3

NUMBER TWO VHF/FM COMMUNICATION ANTENNA
AS-2485/ARC-114 BHC P/N 206-075-543
FIGURE 5
VHF/FM HOMING ANTENNA
AS-2486/ARC-114  BHC P/N 206-075-523
2.1 Summary (Continued)

FM retransmission tests performed confirm that isolation between the numbers one and two FM communication antennas is sufficient to permit successful two-way retransmission between two ground stations separated by 80 miles.

2.2 Formula

Measured antenna pattern field strengths were corrected to free space values by the methods given by Bailey in TV & OTHER RECEIVING ANTENNAS, Chapter 5, pp. 214-220. Correction factors thus developed for the test frequencies used are given in Table I, page 10.

SAMPLE CALCULATION:

\[
\frac{h}{h + h_0} = \frac{h}{1320 \frac{D984}{h_1 F} + \frac{D^2}{2}}
\]

\(h\) = ground antenna height above terrain = 10 ft

\(h_1\) = aircraft altitude above terrain = 1000 ft

\(h_0\) = height of ground antenna first pattern maximum above terrain at aircraft location.

\(D\) = distance between aircraft and ground station = 18 mi.

\(F\) = frequency = 30.5 MHz

\[
\frac{h}{h + h_0} = .01095
\]

Referring to Figure 6, page 11 (from Bailey, P. 218) Free Space Correction = 41 db
<table>
<thead>
<tr>
<th>FREQUENCY MHz</th>
<th>CORRECTION FACTOR db</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.50</td>
<td>41.0</td>
</tr>
<tr>
<td>40.10</td>
<td>37.0</td>
</tr>
<tr>
<td>46.65</td>
<td>35.0</td>
</tr>
<tr>
<td>49.80</td>
<td>34.5</td>
</tr>
<tr>
<td>54.50</td>
<td>33.5</td>
</tr>
<tr>
<td>57.80</td>
<td>33.0</td>
</tr>
<tr>
<td>60.00</td>
<td>32.5</td>
</tr>
<tr>
<td>65.95</td>
<td>32.0</td>
</tr>
<tr>
<td>72.05</td>
<td>31.0</td>
</tr>
<tr>
<td>75.60</td>
<td>30.5</td>
</tr>
<tr>
<td>126.45</td>
<td>26.00</td>
</tr>
<tr>
<td>128.65</td>
<td>25.95</td>
</tr>
<tr>
<td>132.60</td>
<td>25.90</td>
</tr>
<tr>
<td>134.65</td>
<td>25.85</td>
</tr>
<tr>
<td>138.05</td>
<td>25.80</td>
</tr>
<tr>
<td>141.45</td>
<td>25.75</td>
</tr>
<tr>
<td>143.85</td>
<td>25.70</td>
</tr>
<tr>
<td>148.00</td>
<td>25.65</td>
</tr>
<tr>
<td>148.80</td>
<td>25.60</td>
</tr>
<tr>
<td>149.90</td>
<td>25.55</td>
</tr>
<tr>
<td>225.3</td>
<td>23.5</td>
</tr>
<tr>
<td>242.5</td>
<td>23.4</td>
</tr>
<tr>
<td>265.5</td>
<td>23.3</td>
</tr>
<tr>
<td>278.5</td>
<td>23.2</td>
</tr>
<tr>
<td>299.9</td>
<td>23.1</td>
</tr>
<tr>
<td>321.5</td>
<td>23.0</td>
</tr>
<tr>
<td>356.5</td>
<td>22.9</td>
</tr>
<tr>
<td>374.4</td>
<td>22.8</td>
</tr>
<tr>
<td>386.6</td>
<td>22.7</td>
</tr>
<tr>
<td>399.8</td>
<td>22.6</td>
</tr>
</tbody>
</table>
FIGURE 6

ACTUAL RECEIVED FIELD STRENGTH RELATIVE TO FREE SPACE FIELD VS RECEIVING ANTENNA HEIGHT FACTOR

(Redrawn from Bailey, P. 218)
2.3 Measurement Procedures

FM Homing antenna patterns were measured using the methods described in BHC Report No. 206-099-212, page 5. The radiation pattern of all other antennas described in this report were measured in flight using the method shown in the block diagram of Figure 7, page 13.

VSWR of the FM Homing Antennas were measured using a Hewlett-Packard Model 4815A RF Vector Impedance Meter. VSWR of the other antennas was measured with a Bird Model 4311 Directional Wattmeter.

2.4 Applicable Documents

<table>
<thead>
<tr>
<th>Code</th>
<th>Document Description</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>206-947-031</td>
<td>Detail Specification for Model 206A (MOD) Light Observation Helicopter</td>
<td>11 March 69</td>
</tr>
<tr>
<td>R-4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EL-CP1000-0007A(1)</td>
<td>FM Communications Antenna for LOH</td>
<td>26 Oct 67</td>
</tr>
<tr>
<td>EL-CP1000-0008A(1)</td>
<td>FM Homing Antenna for LOH</td>
<td>26 Oct 67</td>
</tr>
<tr>
<td>EL-CP1000-0009A(1)</td>
<td>VHF Antenna for LOH</td>
<td>26 Oct 67</td>
</tr>
<tr>
<td>EL-CP1000-0010A(1)</td>
<td>UHF Antenna for LOH</td>
<td>26 Oct 67</td>
</tr>
<tr>
<td>MIL-E-5400J</td>
<td>Electronic Equipment, Aircraft, General Specification for TV and Other Receiving Antennas</td>
<td>7 Dec 66</td>
</tr>
</tbody>
</table>

by Arnold B. Bailey, John F. Rider, Publisher
AIRCRAFT EQUIPMENT

DIRECTIONAL GYROSCOPE — VOLTAGE TO FREQUENCY CONVERTER — TRANSMITTER

HEADING INFORMATION TRANSMITTER

ANTENNA UNDER TEST

CALIBRATED RECEIVING ANTENNA

NF-105 or NF-112

Y-AXIS INPUT

X-Y RECORDER

X-AXIS INPUT

COMMUNICATION RECEIVER — FREQUENCY TO VOLTAGE CONVERTER

GROUND RECORDING STATION

FIGURE 7

ANTENNA PATTERN RECORDING SCHEME
3.0 DETAIL FACTUAL DATA

3.1 Number One FM Communication Antenna  
BHC P/N 206-075-518

The number one FM communication antenna is a folded radiator enclosed within the upper half of the OH-58A vertical stabilizer. The radiating elements of the antenna are grounded for direct current and static charges and all matching circuitry is passive. The frequency range is 30 thru 76 MHz. The antenna provides vertically polarized radiation. VSWR in a 50 ohm system is 5:1 maximum, radiation efficiency varies from more than 25% at 30 MHz to better than 75% at 76 MHz, and pattern symmetry is generally better than 10 db. Final performance results of the 206-075-518 FM communication antenna S/N 002 are given in tabular form on Data Sheet 1, page 22, part III of this report. Radiation pattern polar plots may be found on Data Sheets 2 thru 11, pp 23 thru 32 of part III.

3.2 FM Homing Antenna, AS-2486/ARC-114  
BHC P/N 206-075-523

The FM homing antenna consists of two short vertical radiators, one mounted on each side of the helicopter. Each of the two elements is center fed via a balun and tip loaded at each end to provide the proper characteristics. The antenna provides vertical polarization and a VSWR not exceeding 2.5:1 in a 50 ohm system over the frequency range of 30 thru 76 MHz. Homing capability when tested in conjunction with a vertical whip six feet above the ground fed with four watts, is better than 20 statute miles with a maximum angular error of 10 degrees and no false indications
3.2 Continued

across the 30 thru 76 MHz band. Test results on the
AS-2486/ARC-115 S/N 001 are presented on Data Sheet 12,
page 33 and polar radiation patterns on Data Sheets 13
thru 22, pp 34 thru 42, part III.

3.3 Number Two FM Communications Antenna AS-2485/ARC-114
BHC P/N 206-075-543

The number two FM communications antenna consists of a
22 inch vertical member extending up and forward at an
angle of approximately 60 degrees from the horizontal,
topped by a 44 inch whip extension extending aft nearby
horizontally. The antenna provides vertically polarized
radiation with an efficiency exceeding 25% at 30 MHz to
75% at 76 MHz, and pattern symmetry of generally better
than 10 db. A passive network in the antenna base matches
the antenna to 50 ohm with a VSWR of less than 5:1. The
AS-2485/ARC-114 is mounted on the roof of the OH-58A
between the upper edge of the windshield and the forward
dge of the boost cylinder cowl. Tabulated test results
for the AS-2485/ARC-114 S/N 001 are presented on Data
Sheet 23, page 44 and polar radiation patterns on Data
Sheets 24 thru 33, pages 45 thru 54, part III.

3.4 VHF Communication Antenna BHC P/N 206-075-518

Like the number one FM Communication antenna, the VHF
communication antenna is integral to the OH-58A Vertical
Stabilizer. The antenna is a vertical radiator which is
shunt fed against a portion of the FM element in the
206-075-518 combination antenna. Matching in a 50 ohm
3.4 Continued

system to better than 2.5:1 VSWR over the 116 to 150 MHz band is provided by a passive network. Radiation is vertically polarized at an efficiency of better than 75% and pattern symmetry is better than 10 db. Tabulated test results of the 206-075-518 VHF communication antenna S/N 002 are given on Data Sheet 34, page 55 and radiation pattern polar plots on Data Sheets 35 thru 44, pages 56 thru 65, part III.

3.5 UHF Communication Antenna AS-2487/ARC-116, BHC P/N 206-075-551

The AS-2487/ARC-116 is a blade type antenna 5.8 inches high, 11 inches long, and 2.25 inches wide at its base. The antenna is mounted underneath the OH-58A with its leading edge approximately 18 inches aft of the helicopter's nose. Passive matching provides a VSWR of better than 2.5:1 in a 50 ohm system over a frequency range of 225 to 400 MHz. A vertically polarized radiation efficiency of better than 75% with pattern symmetry better than 10 db is realized with this antenna. Test results of AS-2487/ARC-116 S/N 001 are presented in tabular form on Data Sheet 45, page 66 and polar radiation plots are on Data Sheets 46 thru 55, pages 67 thru 76, part III.
4.0 WEIGHT CONTROL DATA

4.1 Summary

<table>
<thead>
<tr>
<th>Total Weight of OH-58A Antenna System</th>
<th>Total Allowable Antenna System Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.08 lb</td>
<td>18.0 lb</td>
</tr>
</tbody>
</table>

4.2 Number One VHF/FM and VHF/AM Communication Antennas

*Difference between weights of standard vertical fin and fin including 206-075-518

<table>
<thead>
<tr>
<th>VHF/FM-VHF/AM Antenna Assembly Specification Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minus 0.95 lb</td>
</tr>
</tbody>
</table>

VHF/FM: - 4 lb
VHF/AM: - 3 lb

*Standard Vertical fin -13.4 lb
OH-58A Vertical fin including Antennas -12.45 lb

4.3 VHF/FM Homing Antenna

AS-2486/ARC-114
BHC P/N 206-075-523

2.3 lb

Specification Weight
4.0 lb

4.4 Number Two VHF/FM Communication Antenna

AS-2485/ARC-114
BHC P/N 206-074-543

1.96 lb

Specification Weight
6.0 lb

4.5 UHF/AM Communication Antenna

AS-2487/ARC-116
BHC P/N 206-075-551

0.77 lb

Specification Weight
1.0 lb
5.0 CONCLUSIONS

Based upon the work discussed in the preceding sections and the data presented in Part III of this report it is concluded that the final antenna configuration of the OH-58A provides performance which meets or exceeds the respective minimum requirements for each system.
6.0 RECOMMENDATIONS

No recommendations will be made at this time.
DATA SHEET NO. 1

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518
S/N 002

Range 18 Miles  Altitude 1000 feet

<table>
<thead>
<tr>
<th>FREQ (MHz)</th>
<th>VSWR</th>
<th>MAX (uv/M)</th>
<th>MIN (uv/M)</th>
<th>MIN REQ (uv/M)</th>
<th>db Above Min Req.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.50</td>
<td>4.0:1</td>
<td>1200</td>
<td>380</td>
<td>302</td>
<td>12.0</td>
</tr>
<tr>
<td>40.10</td>
<td>4.3:1</td>
<td>680</td>
<td>110</td>
<td>348</td>
<td>5.8</td>
</tr>
<tr>
<td>46.65</td>
<td>2.8:1</td>
<td>1600</td>
<td>610</td>
<td>380</td>
<td>12.5</td>
</tr>
<tr>
<td>49.80</td>
<td>2.0:1</td>
<td>2175</td>
<td>880</td>
<td>395</td>
<td>14.8</td>
</tr>
<tr>
<td>54.50</td>
<td>1.3:1</td>
<td>1500</td>
<td>710</td>
<td>417</td>
<td>11.2</td>
</tr>
<tr>
<td>57.80</td>
<td>1.3:1</td>
<td>1250</td>
<td>690</td>
<td>433</td>
<td>9.2</td>
</tr>
<tr>
<td>60.00</td>
<td>1.0:1</td>
<td>1950</td>
<td>1150</td>
<td>444</td>
<td>13.0</td>
</tr>
<tr>
<td>65.95</td>
<td>1.2:1</td>
<td>2600</td>
<td>1410</td>
<td>472</td>
<td>14.8</td>
</tr>
<tr>
<td>72.05</td>
<td>1.2:1</td>
<td>1800</td>
<td>900</td>
<td>501</td>
<td>11.0</td>
</tr>
<tr>
<td>75.60</td>
<td>1.4:1</td>
<td>2050</td>
<td>910</td>
<td>518</td>
<td>11.7</td>
</tr>
</tbody>
</table>
DATA SHEET NO. 2

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 feet

30.5 MHz
DATA SHEET NO. 3

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 feet

40.1 MHz
DATA SHEET NO. 4

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 feet

46.65 MHz
DATA SHEET NO. 5

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 feet

49.80 MHz
DATA SHEET NO. 6
NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 feet

54.5 MHz

[Diagram showing radiation pattern with readings at various angles and distances]
DATA SHEET NO. 7

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 feet

57.80 MHz

- 1500 uv/M
DATA SHEET NO. 8

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 feet

60.00 MHz

330
300
270
240
210
180
150
30
60
90
120
2000 uv/M
DATA SHEET NO. 9
NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 feet

65.95 MHz

[Diagram showing antenna radiation pattern with levels and angles]
DATA SHEET NO. 10

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 feet

72.05 MHz
DATA SHEET NO. 11

NUMBER ONE FM COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 feet

75.6 MHz

2600 uv/M
DATA SHEET NO. 12

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523
S/N 001

<table>
<thead>
<tr>
<th>FREQ (MHz)</th>
<th>VSWR -1(L/H)</th>
<th>VSWR -2(R/H)</th>
<th>COURSE ERROR at 20 miles, 1000 feet</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-30° On Course</td>
<td>-30° Reciprocal</td>
<td></td>
</tr>
<tr>
<td>30.00</td>
<td>1.74:1</td>
<td>1.66:1</td>
<td>-5° +5°</td>
</tr>
<tr>
<td>30.50</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>35.00</td>
<td>1.62:1</td>
<td>1.52:1</td>
<td></td>
</tr>
<tr>
<td>40.00</td>
<td>1.56:1</td>
<td>1.56:1</td>
<td></td>
</tr>
<tr>
<td>40.10</td>
<td></td>
<td></td>
<td>-5° +5°</td>
</tr>
<tr>
<td>45.00</td>
<td>1.56:1</td>
<td>1.56:1</td>
<td></td>
</tr>
<tr>
<td>46.65</td>
<td></td>
<td></td>
<td>0° +5°</td>
</tr>
<tr>
<td>49.80</td>
<td></td>
<td></td>
<td>-5° +5°</td>
</tr>
<tr>
<td>50.00</td>
<td>1.64:1</td>
<td>1.6:1</td>
<td></td>
</tr>
<tr>
<td>54.50</td>
<td></td>
<td></td>
<td>0° 0°</td>
</tr>
<tr>
<td>55.00</td>
<td>1.66:1</td>
<td>1.66:1</td>
<td></td>
</tr>
<tr>
<td>57.80</td>
<td></td>
<td></td>
<td>-5° 0°</td>
</tr>
<tr>
<td>60.00</td>
<td>1.6:1</td>
<td>1.56:1</td>
<td>-3° +5°</td>
</tr>
<tr>
<td>65.00</td>
<td>1.5:1</td>
<td>1.48:1</td>
<td></td>
</tr>
<tr>
<td>65.95</td>
<td></td>
<td></td>
<td>-5° +10°</td>
</tr>
<tr>
<td>70.00</td>
<td>1.5:1</td>
<td>1.5:1</td>
<td></td>
</tr>
<tr>
<td>72.05</td>
<td></td>
<td></td>
<td>+5° +5°</td>
</tr>
<tr>
<td>75.60</td>
<td></td>
<td></td>
<td>0° +7°</td>
</tr>
<tr>
<td>76.00</td>
<td>1.58:1</td>
<td>1.6:1</td>
<td></td>
</tr>
</tbody>
</table>
DATA SHEET NO. 13

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

30.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 14

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

36.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 15

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

40.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 16

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

45.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 17

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

50.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 18

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

55.00 M Hz

Plotted in Relative Voltage
DATA SHEET NO. 19

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

60.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 20

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

65.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 21

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

70.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 22

FM HOMING ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-523

76.00 MHz

Plotted in Relative Voltage
DATA SHEET NO. 23

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2485/ARC-114 BHC P/N 206-075-543
S/N 001

Range 18 Miles                           Altitude 1000 feet

<table>
<thead>
<tr>
<th>FREQ (MHz)</th>
<th>VSWR</th>
<th>MAX (uv/M)</th>
<th>MIN (uv/M)</th>
<th>MIN REQ (uv/M)</th>
<th>db Above Min Req.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30.50</td>
<td>2.7:1</td>
<td>2100</td>
<td>1650</td>
<td>302</td>
<td>16.8</td>
</tr>
<tr>
<td>40.10</td>
<td>2.6:1</td>
<td>1160</td>
<td>630</td>
<td>348</td>
<td>10.5</td>
</tr>
<tr>
<td>46.65</td>
<td>2.9:1</td>
<td>870</td>
<td>440</td>
<td>380</td>
<td>7.2</td>
</tr>
<tr>
<td>49.80</td>
<td>2.9:1</td>
<td>910</td>
<td>400</td>
<td>395</td>
<td>7.3</td>
</tr>
<tr>
<td>54.50</td>
<td>3.3:1</td>
<td>760</td>
<td>340</td>
<td>417</td>
<td>5.3</td>
</tr>
<tr>
<td>57.80</td>
<td>2.7:1</td>
<td>1260</td>
<td>575</td>
<td>433</td>
<td>9.2</td>
</tr>
<tr>
<td>60.00</td>
<td>2.8:1</td>
<td>1130</td>
<td>292</td>
<td>444</td>
<td>8.1</td>
</tr>
<tr>
<td>65.95</td>
<td>2.0:1</td>
<td>1340</td>
<td>440</td>
<td>472</td>
<td>9.1</td>
</tr>
<tr>
<td>72.05</td>
<td>1.7:1</td>
<td>1440</td>
<td>600</td>
<td>501</td>
<td>9.1</td>
</tr>
<tr>
<td>75.60</td>
<td>1.8:1</td>
<td>640</td>
<td>205</td>
<td>518</td>
<td>1.6</td>
</tr>
</tbody>
</table>
DATA SHEET NO. 24

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles  Altitude 1000 feet

30.50 MHz
DATA SHEET NO. 25

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles                      Altitude 1000 feet

40.1 MHz
DATA SHEET NO. 26

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles  Altitude 1000 feet

46.65 MHz
DATA SHEET NO. 27

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles.   Altitude 1000 feet

49.80 MHz
DATA SHEET NO. 28

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles  
Altitude 1000 feet

54.50 MHz
DATA SHEET NO. 29

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles
Altitude 1000 feet

57.80 MHz
DATA SHEET NO. 30

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles  Altitude 1000 feet

60.00 MHz
DATA SHEET NO. 31
NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543
Range 18 Miles 
Altitude 1000 feet 
65.95 MHz
DATA SHEET NO. 32
NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles  Altitude 1000 feet

72.05 MHz
DATA SHEET NO. 33

NUMBER TWO FM COMMUNICATION ANTENNA
AS-2486/ARC-114 BHC P/N 206-075-543

Range 18 Miles Altitude 1000 feet

75.60 MHz
DATA SHEET NO. 34

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518
S/N 002

Range 18 Miles

<table>
<thead>
<tr>
<th>FREQ (MHz)</th>
<th>VSWR</th>
<th>MAX (uv/M)</th>
<th>MIN (uv/M)</th>
<th>MIN REQ (uv/M)</th>
<th>db Above Min Req.</th>
</tr>
</thead>
<tbody>
<tr>
<td>126.45</td>
<td>1.4:1</td>
<td>1750</td>
<td>940</td>
<td>520</td>
<td>10.6</td>
</tr>
<tr>
<td>128.65</td>
<td>1.5:1</td>
<td>2250</td>
<td>930</td>
<td></td>
<td>12.8</td>
</tr>
<tr>
<td>132.60</td>
<td>1.7:1</td>
<td>1260</td>
<td>475</td>
<td></td>
<td>7.7</td>
</tr>
<tr>
<td>134.65</td>
<td>2.0:1</td>
<td>1050</td>
<td>555</td>
<td></td>
<td>6.1</td>
</tr>
<tr>
<td>135.05</td>
<td>1.4:1</td>
<td>880</td>
<td>405</td>
<td></td>
<td>4.6</td>
</tr>
<tr>
<td>141.45</td>
<td>1.4:1</td>
<td>1050</td>
<td>550</td>
<td></td>
<td>6.1</td>
</tr>
<tr>
<td>143.85</td>
<td>1.0:1</td>
<td>1340</td>
<td>690</td>
<td></td>
<td>8.2</td>
</tr>
<tr>
<td>148.00</td>
<td>1.8:1</td>
<td>1350</td>
<td>805</td>
<td></td>
<td>8.3</td>
</tr>
<tr>
<td>148.80</td>
<td>1.8:1</td>
<td>670</td>
<td>440</td>
<td></td>
<td>2.2</td>
</tr>
<tr>
<td>149.90</td>
<td>1.9:1</td>
<td>1125</td>
<td>655</td>
<td>520</td>
<td>6.7</td>
</tr>
</tbody>
</table>

Altitude 1000 feet
DATA SHEET NO. 35

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 feet

126.45 MHz
DATA SHEET NO. 36

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 Feet

128.65 MHz
DATA SHEET NO. 37

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 Feet
132.60 MHz
DATA SHEET NO. 38

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles                   Altitude 1000 Feet

134.65 MHz
DATA SHEET NO. 39

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 Feet

138.05 MHz
DATA SHEET NO. 40

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 Feet

141.45 MHz
DATA SHEET NO. 41

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 Feet

143.85 MHz
DATA SHEET NO. 42

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles
Altitude 1000 Feet

148.00 MHz
DATA SHEET NO. 43

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles  Altitude 1000 Feet

148.80 MHz
DATA SHEET NO. 44

VHF COMMUNICATION ANTENNA
BHC P/N 206-075-518

Range 18 Miles          Altitude 1000 Feet

149.90 MHz

Diagram showing the radiation pattern of the VHF communication antenna with contour lines indicating the field strength in microvolts per meter (uv/M) at various angles.
DATA SHEET NO. 45

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116 BHC P/N 206-075-551
S/N 001

Range 18 Miles  Altitude 1000 feet

<table>
<thead>
<tr>
<th>FREQ (MHz)</th>
<th>VSWR</th>
<th>MAX (uv/M)</th>
<th>MIN (uv/M)</th>
<th>MIN REQ (uv/M)</th>
<th>db Above Min Req.</th>
</tr>
</thead>
<tbody>
<tr>
<td>225.3</td>
<td>1.4:1</td>
<td>5500</td>
<td>2850</td>
<td>520</td>
<td>20.5</td>
</tr>
<tr>
<td>242.5</td>
<td>2.0:1</td>
<td>3900</td>
<td>2780</td>
<td>17.4</td>
<td></td>
</tr>
<tr>
<td>265.5</td>
<td>2.0:1</td>
<td>8300</td>
<td>4300</td>
<td>24.0</td>
<td></td>
</tr>
<tr>
<td>278.5</td>
<td>2.2:1</td>
<td>3500</td>
<td>2300</td>
<td>16.6</td>
<td></td>
</tr>
<tr>
<td>299.9</td>
<td>1.8:1</td>
<td>6300</td>
<td>3500</td>
<td>21.6</td>
<td></td>
</tr>
<tr>
<td>321.5</td>
<td>1.5:1</td>
<td>6500</td>
<td>3750</td>
<td>22.0</td>
<td></td>
</tr>
<tr>
<td>356.5</td>
<td>1.9:1</td>
<td>5500</td>
<td>3450</td>
<td>20.5</td>
<td></td>
</tr>
<tr>
<td>374.4</td>
<td>1.9:1</td>
<td>7800</td>
<td>3950</td>
<td>23.5</td>
<td></td>
</tr>
<tr>
<td>386.6</td>
<td>1.7:1</td>
<td>5800</td>
<td>4400</td>
<td>21.0</td>
<td></td>
</tr>
<tr>
<td>399.8</td>
<td>1.4:1</td>
<td>4500</td>
<td>2000</td>
<td>18.8</td>
<td></td>
</tr>
</tbody>
</table>
DATA SHEET NO. 46

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116 BHC P/N 206-075-551

Range 18 Miles  Altitude 1000 Feet

225.30 MHz
DATA SHEET NO. 47

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116 BHC P/N 206-075-551

Range 18 Miles
Altitude 1000 Feet

242.50 MHz
DATA SHEET NO. 48

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116  BHC P/N 206-075-551

Range 18 Miles  Altitude 1000 Feet

265.50 MHz
DATA SHEET NO. 49

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116  BHC P/N 206-075-551

Range 18 Miles  Altitude 1000 Feet

278.50 MHz
DATA SHEET NO. 50

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116  BHC P/N 206-075-551

Range 18 Miles  Altitude 1000 Feet

299.90 MHz
DATA SHEET NO. 51

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116  BHC P/N 206-075-551

Range 18 Miles  Altitude 1000 Feet

321.50 MHz
DATA SHEET NO. 52
UHF COMMUNICATION ANTENNA
AS-2487/ARC-116     BHC P/N 206-075-551

Range 18 Miles
Altitude 1000 Feet

356.50 MHz

8000 uv/M
DATA SHEET NO. 53

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116 BHC P/N 206-075-551

Range 18 Miles
Altitude 1000 Feet

374.40 MHz
DATA SHEET NO. 54

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116  BHC P/N 206-075-551

Range 18 Miles  Altitude 1000 Feet

386.60 MHz
DATA SHEET NO. 55

UHF COMMUNICATION ANTENNA
AS-2487/ARC-116  BHC P/N 206-075-551

Range 18 Miles  Altitude 1000 Feet

399.80 MHz
The OH-58A Communication Antenna System consists of a 30-76 MHz antenna and a 116-150 MHz antenna, both integral to the helicopters vertical stabilizer, a combination blade and whip 30-76 MHz antenna mounted on the cabin roof and a 225-400 MHz antenna mounted under the nose of the helicopter. FM homing is provided by a pair of vertical dipoles, one mounted on each side of the helicopter. All antenna utilize completely passive matching. Extensive testing has shown that this system provides excellent performance in all respects. Radiated field strengths exceed minimum requirements by as much as 24 db and pattern symmetry is generally better than 10 db. There are no false FM homing indications across the 30-76 MHz band. Isolation between the two 30-76 MHz communication antennas is sufficient to allow retransmission between two ground stations separated by 80 miles.
<table>
<thead>
<tr>
<th>DISTRIBUTION LIST</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Electrical Group</td>
<td>8</td>
</tr>
<tr>
<td>Kelley/Mackenzie/Library</td>
<td>1</td>
</tr>
<tr>
<td>OH-58A Project Office</td>
<td>1</td>
</tr>
<tr>
<td>AMCPM-LH-T</td>
<td>5+1 reproducible</td>
</tr>
<tr>
<td>AMSEL-PP-EA-3</td>
<td>5</td>
</tr>
<tr>
<td>BFA</td>
<td>1</td>
</tr>
</tbody>
</table>
### Antennas, Helicopter

#### INSTRUCTIONS

1. **ORIGONATING ACTIVITY:** Enter the name and address of the contractor, subcontractor, grantees, Department of Defense activity or other organization (contractor author) issuing the report.

2a. **REPORT SECURITY CLASSIFICATION:** Enter the overall security classification of the report. Indicate whether "Restricted Data" is included. Marking to be in accordance with appropriate security regulations.

2b. **GROUP:** Antennas downgraded to DoD Directive 5200.10 and Armed Forces Industrial Manual. Enter the group number. Also, when applicable, show that optional markings have been used for Group 3 and Group 4 as authorized.

3. **REPORT TITLE:** Enter the complete report title in all capital letters. Titles in all cases should be unclassified. If a meaningful title cannot be selected without classification, show title classification in all capitals in parenthesis immediately following the title.

4. **DESCRIPTION NOTES:** If appropriate, enter type of report, e.g., interim, progress, summary, annual, or final. Give the inclusive dates when a specific reporting period is covered.

5. **AUTHOR(S):** Enter the name(s) of author(s) as shown on or in the report. Enter last name, first name, middle initial. If military, show rank and branch of service. The name of the principal author is an absolute minimum requirement.

6. **REPORT DATE:** Enter the date of the report as day, month, year, year. If more than one date appears in the report, use date of publication.

7a. **TOTAL NUMBER OF PAGES:** The total page count should follow normal pagination procedures, i.e., enter the number of pages containing information.

7b. **NUMBER OF REFERENCES:** Enter the total number of references cited in the report.

8a. **CONTRACT OR GRANT NUMBER:** If appropriate, enter the applicable number of the contract or grant under which the report was written.

8b. **Gr. & 4d. PROJECT NUMBER:** Enter the appropriate military department identification, such as project number, subproject number, system number, task number, etc.

9a. **ORIGINATOR'S REPORT NUMBER:** Enter the official report number by which the document will be identified and controlled by the originating activity. This number must be unique to this report.

9b. **OTHER REPORT NUMBER(S):** If the report has been assigned any other report numbers (either by the originator or by the sponsor), also enter this number(s).

10. **AVAILABILITY/LIMITATION NOTICES:** Enter any limitations on further dissemination of the report, other than those imposed by security classification, using standard statements such as:

   (1) "Qualified requesters may obtain copies of this report from DDC."

   (2) "Foreign dissemination and dissemination of this report by DDC is not authorized."

   (3) "U. S. Government agencies may obtain copies of this report directly from DDC. Other qualified DDC users shall request through "

   (4) "U. S. military agencies may obtain copies of this report directly from DDC. Other qualified users shall request through "

   (5) "All distribution of this report is controlled. Qualified DDC users shall request through "

If the report has been furnished to the Office of Technical Services, Department of Commerce, for sale to the public, indicate this fact and enter the price, if known.

11. **SUPPLEMENTARY NOTES:** Use for additional explanatory notes.

12. **SPONSORING MILITARY ACTIVITY:** Enter the name of the departmental project office or laboratory sponsoring (paying for) the research and development. Include address.

13. **ABSTRACT:** Enter an abstract giving a brief and factual summary of the document indicative of the report, even though it may also appear elsewhere in the body of the technical report. If additional space is required, a continuation sheet shall be attached.

It is highly desirable that the abstract of classified reports be unclassified. Each paragraph of the abstract shall end with an indication of the military security classification of the information in the paragraph, represented as (T), (S), (C), or (U).

There is no limitation on the length of the abstract. However, the suggested length is from 125 to 225 words.

14. **KEY WORDS:** Key words are technically meaningful terms or short phrases that characterize a report and may be used as index entries for cataloging the report. Key words must be selected so that no security classification is required. Identifiers, such as equipment model designation, trade name, military project code name, geographic location, may be used as key words but will be followed by an indication of technical context. The assignment of limits, rates, and weights is optional.