SUBJECT:

Additional USB Communications Coverage Provided by an Apollo Instrumentation Ship West of South America for Mission AS 204. Case 320 DATE:

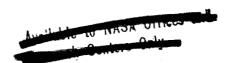
October 20, 1966

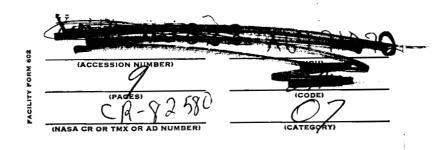
FROM:

J. P. Maloy

ABSTRACT

The attached study examines the effect of stationing a ship west of South America at 118°W; 25°S in order to increase the USB communications coverage for Apollo mission AS 204. The results of the study show that a ship at that location, would eliminate all gaps in the USB communications coverage that exceed 101 minutes in duration.





(NASA-CR-154473) ADDITIONAL USB COMMUNICATIONS COVERAGE PROVIDED BY APOLLO I INSTRUMENTATION SHIP WEST OF SOUTH AMERICA FOR MISSION AS 204 (Bellcomm, Inc.) 9 p

N79-72743

Unclas 00/32 12490 SUBJECT:

Additional USB Communications Coverage Provided by an Apollo Instrumentation Ship West of South America for Mission AS 204. Case 320 DATE:

October 20, 1966

FROM:

1: J. P. Maloy

MEMORANDUM FOR FILE

Introduction

A study was made to determine the additional USB communications coverage that would be provided for Apollo mission AS-204 by stationing a ship west of South America at 118°W; 25°S. A coverage analysis was made of the 14 day mission for a launch azimuth of 72° assuming coverage from an elevation angle of 0° at the ground stations and a constant altitude of 105 nm for the spacevehicle. The data presented does not include irregularities in the coverage caused by local masking, antenna "keyhole" effects, or ship orientation. In addition to the ship, eight USB stations expected to be used during AS 204, were included in the study namely: Bermuda (BDA), Ascension (ASC), Carnarvon (CRO), Guam (GWM), Texas (TEX), and Cape Kennedy (MILA).

Observations

Table I indicates the gaps in USB coverage greater than 120 minutes that would exist without the ship. There would be 21 of these - 14 exceeding 3 hours and 7 lasting more than 4 hours but less than five. With the ship in position, the maximum gap is about 101 minutes. Table 1 shows the stations, revolutions, and gaps that are involved.

Figures 1 thru 5 give the USB contacts for the entire mission. The check mark indicates that the contact made by that station for that revolution is equal to or greater than three minutes in duration. Where a contact is less than three minutes the amount is indicated in these figures. (When one of these exists at the beginning or ending of a gap exceeding 120 minutes it is specified by an asterisk in Table 1.)

The large gaps in coverage are shown in Figures 1 thru 5 by the shaded areas. It should be noted that these shaded areas appear about every 15 revolutions. It should be noted too, that when the ship is deployed, at least one contact per revolution for the entire mission can be provided by two combinations of only three stations, namely the ship, HAW, and MILA and the ship, HAW, and CRO.



Another ship location was examined 4° further south (118°W; 29°S as specified in the AS 204 PSRD). This location also eliminated all coverage intervals of greater than 120 minutes but did not provide coverage on six revolutions of the 214 revolutions in the mission that the more northerly ship location did.

The effectiveness of any one station in reducing the number of long intervals between contacts can be seen by examining figures 1 thru 5. Ascension for example does not eliminate any of the long gaps but does reduce the size of these gaps in six cases by approximately 40 minutes. (See Table I)

A similar study based on MSC data showed that the interval between USB contacts (excluding ASC) exceeded 120 minutes 28 times. This was based on contacts 3 minutes at 5° elevation. The MSC mission was planned at 72° launch azimuth into a 85 - 130 nm elliptical orbit for approximately one day and then circularizing at 130 nm for the remainder of the 14 day mission.

Conclusions

An Apollo USB ship located off the west coast of South America at 118°W; 25°S would make it possible to provide USB contact on each revolution of a 14 day orbital mission like AS 204.

J. P. Maloy

2021-JPM-jad

Attachments Table 1 Appendix I

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TABLE 1

Gaps in USB Communications Coverage for 14 Day Mission

Launch Az = 72°; Elev = 0°; Alt = 105 n.m.

Gap >120 Minutes

1. GWM - CRO	
3. GWM - CRO	
4. GWM - CRO 56-58 181.4 86.7 5. GWM - CRO 71-73 182.0* 86.6 6. HAW - GWM 82-84 169.2 87.9 HAW - ASC "" 130.9 " 7. GWM - CRO 85-88 272.0 87.5 8. HAW - GWM 97-99 169.2 87.4 HAW - ASC "" 127.9 " 9. GWM - CRO 100-103 271.9 87.5 10. HAW - GWM 112-114 169.8 87.1 HAW - ASC "" 127.8 " 11. GWM - CRO 115-118 271.8 87.4 12. HAW - GWM 127-129 169.2 86.8 HAW - ASC "" 127.8 " 13. GWM - CRO 130-133 261.7 87.3 14. HAW - GWM 142-144 169.2 86.6	
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14. HAW - GWM 142-144 169.2 86.6	
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HAW - ASC " " 127.8 "	
15. GWM - CRO 145-148 271.8 87.3	
16. HAW - GWM 157-159 169.3 86.6	
HAW - ASC " " 127.9 "	
17. GWM - CRO 160-163 271.8 87.2	
18. HAW - GWM 171-173 170.8* 101.2	
19. GWM - CRO 175-178 271.8 87.1	
20. GWM - BDA 190-193 229.8* 87.0 .	
21. GWM - CRO 205-207 181.6* 86.9	

^{*}Indicates a gap that has a contact of < 3 min at the start or the end of the interval.

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FIGURE Z

MISSION AS 204 USB COVERAGE LAUNCH AZ=72°; ELEV=0; ALT=105NM

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MISSION AS 204 USB COVERNE A-116 (7-63) V LAUNCH AZ=72°; ELEV=0°; ALT=105NM REVOLUTION 181 182 183 184 185 185 187 182 189 190 191 192 198 194 195 USB STATIONS VV BDA ASC. 111 CRO GWM HAW (118°W; 255) SH IP GYM TEX MILA 196 177 198 199 200 201 202 203 204 205 206 207 208 201 210 REVOLUTION BDA 2.7 / / ASC 2.5 / / / CRO GWM HAUS [18W;255) SHIP V. / / V V V V GYM VV 1111 0.7 V V TEX V V V MILA REVOLUTION 211 212 213 214 BDA ASC CRO GWM HAIN [118]W;25"S) SHIP

LEGEND: / GOVERNGE 73MIN

///

CYM TEX

MILA

SGAP WITHOUT SHIP