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TECHNICAL NOTE 71-2

ANALYSIS OF CO-CHANNEL INTERFERENCE TEST

AVAILABLE IN
ELECTRONIC FORMAT

Project 198-001-32X

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INTRODUCTION

The Frequency Management Division, RD-500, of SRDS wanted tests conducted to subjectively evaluate the effects of various levels of interference on VHF air/ground voice communications. This Technical Note describes the specific tests that were set up to evaluate the effects of co-channel air/air voice interference experienced at various air-to-air and ground-to-air geographic spacings related to theoretically derived desired/undesired (D/U) signal ratios. Also, the intent was to conduct some live flight tests that could be related to bench tests reported in Report No. NA-69-21, "Effects of Selection System Parameters on Communications Intelligibility" (1969).

DISCUSSION

On 24 February 1971 two test aircraft from NAFEC utilizing off-the-shelf 360 channel VHF communication equipment flew three successful test flights to evaluate the effects of co-channel interference. The aircraft (DC-6) with the test subjects and the aircraft (Convair T-29) generating the interfering signal flew at an altitude of 9,000 feet with between 77 to 86 miles separation from each other. (See Appendix for data sheets for the specific DME readings and aircraft separation.)

A ground-based radio station located at NAFEC broadcasted a continuous sequence of air traffic control messages spoken by six different air traffic controllers. This ground-based VHF transmitter, 50 watts, with associated circularly polarized antenna, radiated approximately 37 watts. This was considered the desired signal.

The Convair T-29 had personnel on board who periodically transmitted air traffic control messages on the same frequency as the ground station so that an undesired message would coincide in time with a ground transmitted message. Frequency 118.75 MHz was used for the first flight and frequency 118.25 MHz was used for the second and third flights. The frequency of transmission is provided in the Appendix. These transmissions were considered the undesired signal. The aircraft transmitter was radiating approximately 15 watts.

The DC-6 had personnel on board who listened continuously to the received air traffic control messages and rated each message, i. e., those ground transmitted messages with and without interferences,

according to the subject's interpretation of the reception. The rating scale employed was the following:

- 5 - message completely understood and little or no interferences
- 4 - message understandable but interference quite noticeable
- 3 - message useable but interference is annoying
- 2 - message difficult to understand due to interferences
- 1 - message unuseable.

Each subject had a set of answer sheets on which he rated each message. The subjects listened to the reception through a set of monaural high impedance headsets with cushioned ear pieces.

For the first flight (labeled Westbound a. m. in the Appendix) there were ten test subjects with nine being air traffic control personnel, several of which are also certified pilots, and one psychologist (psychoacoustic specialist). For the second and third flight (labeled Eastbound p. m. and Westbound p. m. respectively) there were nine subjects composed of seven electronic/electrical technicians, one air traffic control specialist with single engine pilot rating, and one psychologist.

The test flights were flown so that each aircraft flew the same radial of the Atlantic City VORTAC. As the aircraft flew the DME readings in each aircraft were periodically recorded. These are presented in the data sheets in the Appendix. It was noted, though not measured precisely, that the transmitter of the DC-6 was about 1 kHz off tune from the ground station. This was evidenced by the 1 kHz tone observed by the listeners when both transmitters were transmitting.

SUMMARY

If a message had an average rating of 3.0 or greater, it was judged a useable message, that is, the expected message or sentence intelligibility approached 100 percent. However, it is suggested that an acceptable D/U for long term use should provide message reception with an average rating of 4.0 or greater. This is true for two reasons:

1. An average rating of around 3.0 allows for a considerable number of ratings to fall into an unacceptable category due to the variability of the amplitude of the two signals, both at r-f level and audio level.

2. When a person has to listen for any extended period of time to signals at a marginal level of utility (3.0), his overall performance might be subject to degradation or deterioration.

APPENDIX
WESTBOUND A. M.

24 Feb 71

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
Scim	53.00 (E)	136.5 (E)	83.5	73/87	
1				5.0	
2 + inter A/C				3.5	
3				4.3	
4 + inter A/C				2.8	
5				4.7	
6				4.3	
Scim	50.5 (E)	133.5 (E)	83.0	72/76	
7				4.9	
8 + inter A/C				3.1	
9				4.3	
10				4.8	
11 + inter A/C				3.2	
12				4.1	
Scim	48.25 (E)	131.5 (E)	83.25	68/79	
13				4.9	
14 + inter A/C				3.7	
15				5.0	
16				4.0	
17 + inter A/C				3.6	
18				4.2	
Scim	45.75 (E)	129.5 (E)	83.75	73/89	No RFI on 2nd Scim
19				4.8	
20 + inter A/C				3.4	
21				4.6	
22 + inter A/C				3.1	

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Westbound a. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
23				4.2	
Scim	43.5 (E)	127.0 (E)	83.5	76/85	No RFI on 2nd Scim
24				4.5	
25 + inter A/C				3.5	
26				5.0	
27				4.9	
28 + inter A/C				3.6	
29				4.2	
Scim	41.25 (E)	124.0 (E)	83.25	77/70	
30				4.8	
31 + inter A/C				3.5	
32				4.8	
33 + inter A/C				3.2	
34				4.4	
Scim	39.25 (E)	122.0 (E)	83.75	72/84	No RFI on 2nd Scim
35				4.9	
36 + inter A/C				2.5	
37				4.7	
38 + inter A/C				3.0	
39				3.9	
Scim	37.0 (E)	119.5 (E)	83.5	69/84	No RFI on 2nd Scim
40				4.8	
41 + inter A/C				3.4	
42				4.5	
43 + inter A/C				2.9	
44				4.4	

Westbound a. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
Scim	34.5 (E)	116.5 (E)	82.0	69/77	No RFI on 1/2 of 2nd Scim
45				4.8	
46 + inter A/C				1.3	Some RFI not part of System Test
47				3.2	RFI not part of System Test
48				4.6	
49 + inter A/C				2.6	
Scim	32.25 (E)	114.5 (E)	82.25	62/82	No RFI on 2nd Scim
50				4.8	
51 + inter A/C				2.4	
52				4.7	
53 + inter A/C				1.1	
54				4.1	
Scim	30.0 (E)	112.0 (E)	82.0	Unreadable/4.7	
55				4.9	
56 + inter A/C				2.2	
57				4.9	
58 + inter A/C				2.3	
59				4.7	
60				4.2	
Scim	27.5 (E)	109.0 (E)	81.5	34/86	No RFI on 2nd Scim
61				4.5	
62 + inter A/C				3.2	
63				4.8	
64				4.9	
65 + inter A/C				3.3	
66				4.4	
Scim	25.0 (E)	106.5 (E)	81.5	76/74	

Westbound a. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
67				4.8	
68 + inter A/C				3.4	
69				4.6	
70				4.7	
71				4.3	
Scim	22.75 (E)	105.5 (E)	82.75	66/70	
72				4.3	
73				4.2	
74 + inter A/C				3.3	
75				4.6	
76 + inter A/C				1.7	
Scim	20.5 (E)	102.5 (E)	82.0	70/69	
77				4.6	
78 + inter A/C				2.6	
79				4.9	
80				4.9	
81 + inter A/C				2.3	
82				4.1	
Scim	18.0 (E)	101.0 (E)	83.0	<u>blocked</u> 18	
83				4.6	
84 + inter A/C				1.2	
85				1.0	Receiver went out. Completely lost signal.
86				4.6	
87 + inter A/C				2.0	

Westbound a. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
88 Scim	15.25 (E)	98.5 (E)	83.25	2.2 57/86	Signal dropped out. No RFI on 2nd Scim
89				4.4	
90 + inter A/C				3.0	
91				4.6	
92 + inter A/C				3.6	
93 Scim	13.0 (E)	96.0 (E)	83.0	4.3 71/80	RFI on 1st 1/2 of scim. No RFI on 2nd Scim
94				4.4	
95 + inter A/C				3.8	
96				4.9	
97				4.5	
98 + inter A/C				2.8	
99 Scim	10.5 (E)	93.5 (E)	83.0	4.1 68/82	No RFI on 2nd Scim
100				4.2	
101 + inter A/C				1.1	Interference not part of System Test.
102				4.7	
103 + inter A/C Scim	8.0 (E)	91.5 (E)	83.5	3.6 70/81	No RFI on 2nd Scim
104				4.8	
105 + inter A/C				3.3	
106				4.9	
107 + inter A/C				3.9	

Westbound a.m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
108				4.4	
Scim	6.0 (E)	89.5 (E)	83.5	64/76	
109				4.9	
110 + inter A/C				3.9	
111				4.0	
112				4.4	
113 + inter A/C				2.7	
Scim	Not Recorded	Not Recorded			
114				4.0	
115 + inter A/C				3.4	
116				4.7	
117 + inter A/C				4.1	
118				3.6	Interference not part of System Test
Scim	3.0 (E)	85.5 (E)	83.5	67/68	
119				4.1	
120 + inter A/C				3.2	
121				4.7	
122 + inter A/C				3.7	
124				4.1	

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WESTBOUND P.M.

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Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
1				5.0	
2				5.0	
3				5.0	
4				4.9	
Scim	61.25 (E)	148.0 (E)	86.75	64/-	
5				5.0	
6 + inter A/C				1.6	
7				5.0	
8 + inter A/C				3.25	
9				4.9	
Scim	59.0 (E)	145.0 (E)	86.0	-/84	
10				4.6	
11 + inter A/C				1.4	
12				4.5	
13 + inter A/C				2.9	
14				4.5	
15				4.6	
Scim	56.25 (E)	142.5 (E)	86.25	60/93	No RFI on 2nd scim
16				5.0	
17 + inter A/C				2.25	
18				4.3	
19				5.0	
20				5.0	
21				4.9	
Scim	54.0 (E)	140.0 (E)	86.0	61/97	No RFI on 2nd Scim
22				5.0	

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Westbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
23 + inter A/C				3.1	
24				5.0	
25 + inter A/C				3.7	
26				5.0	
27				4.9	
Scim	51.75 (E)	136.0 (E)	84.25	60/94	No RFI on 2nd Scim
28				5.0	
29 + inter A/C				3.6	
30				4.9	
31 + inter A/C				2.9	
32				4.8	
Scim	49.5 (E)	132.0 (E)	82.5	60/97	No RFI on 2nd Scim
33				4.8	
34 + inter A/C				3.25	
35				5.0	
36 + inter A/C				3.8	
37				5.0	
38				4.9	
Scim	46.75 (E)	130.0 (E)	83.25	60/92	No RFI on 2nd Scim
39				5.0	
40 + inter A/C				3.4	
41				5.0	
42 + inter A/C				2.7	
43				4.9	
Scim	44.75 (E)	127.0 (E)	82.25	78/96	No RFI on 2nd Scim

Westbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
44				4.7	
45 + inter A/C				2.7	
46				5.0	
47				3.1	
48				3.2	RFI not part of System Test
Scim	42.25 (E)	122.5 (E)	80.25	44/95	No RFI on 2nd Scim
49				4.6	
50 + inter A/C				1.9	
51				1.7	} Broken up from RFI which is not part of System Test
52 + inter A/C				1.6	
53				1.8	
Scim	39.75 (E)	119.0 (E)	79.25	60/80	
54				5.0	
55 + inter A/C				3.7	
56				4.0	
57 + inter A/C				1.1	Broken up from RFI. Not part of Sys. Test
Scim	37.0 (E)	116.0 (E)	79.0	95/97	
58				1.3	Broken from outside RFI
59				5.0	
60 + inter A/C				2.1	
61				5.0	

Westbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
62 + inter A/C				2.9	
63				4.4	
Scim	35.0 (E)	113.0 (E)	78.0	-/81	
64				5.0	
65 + inter A/C				1.9	
66				5.0	
67 + inter A/C				1.8	
68				2.25	intermittent noise nonsystem test
69				4.9	
Scim	32.25 (E)	110.0 (E)	77.75	46/96	no RFI on 2nd Scim
70				5.0	
71 + inter A/C				3.0	
72				5.0	
73 + inter A/C				2.5	
74				5.0	
75				4.9	
Scim	29.0 (E)	107.0 (E)	78.0	61/83	
76				5.0	
77 + inter A/C				1.6	
78				5.0	
79 + inter A/C				1.9	
80				4.3	
Scim	25.75 (E)	104.0 (E)	78.25	-/81	
81				5.0	
82 + inter A/C				1.8	
83				5.0	
84 + inter A/C				1.5	
85				5.0	

Westbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
Scim	22.25 (E)	101.5 (E)	79.25	73/94	No RFI on 2nd Scim
86				5.0	
87 + inter A/C				3.9	
88				5.0	
89 + inter A/C				3.8	
90				5.0	
91				4.9	
Scim	19.0 (E)	98.0 (E)	79.0	68/90	No RFI on 2nd Scim
92				5.0	
93 + inter A/C				3.5	
94				5.0	
95 + inter A/C				4.0	
96				5.0	
97				4.9	
Scim	15.75 (E)	95.5 (E)	79.75	68/76	
98				5.0	
99 + inter A/C				3.9	
100				5.0	
101 + inter A/C				4.0	
102				4.9	
Scim	12.5 (E)	92.5 (E)	80.0	77/84	
103				5.0	
104 + inter A/C				4.6	
105				5.0	
106 + inter A/C				3.8	
107				5.0	
108				4.6	
Scim	9.5 (E)	89.0 (E)	79.5	63/82	

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Westbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
109				5.0	
110 + inter A/C				4.1	
111				3.4	
112 + inter A/C				3.1	
Scim	6.75 (E)	86.0 (E)	79.25	65/90	
113				5.0	
114				5.0	
115				5.0	
116				5.0	
117				4.6	
Scim	4.0 (E)	84.0 (E)	80.0	76/90	
118				4.8	
119 + inter A/C				3.9	
120				4.9	
121 + inter A/C				3.5	
122				4.6	
Scim	2.5 (E)	80.5 (E)	78.0	63/92	
123				4.8	
124 + inter A/C				3.4	
125				4.8	
126 + inter A/C				2.9	
127				4.9	
Scim	4.0 (W)	77.0 (E)	81.0	60/61	
128				4.9	
129 + inter A/C				4.1	
130				4.6	
131 + inter A/C				4.1	

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Westbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
132				4.9	
Scim	6.75 (W)	74.0 (E)	81.25	64/89	
133				4.9	
134 + inter A/C				4.1	
135				4.9	
136 + inter A/C				4.1	
137				4.9	
138				4.9	
Scim	9.75 (W)	71.0 (E)	80.75	73/82	
139				5.0	
140 + inter A/C				4.0	
141				4.9	
142 + inter A/C				4.25	
143				4.9	
144				4.9	
Scim	13.0 (W)	67.5 (E)	80.5	61/73	
145				5.0	
146 + inter A/C				3.9	
147				4.9	
148 + inter A/C				3.9	
149				5.0	
150				4.9	
Scim	16.5 (W)	63.5 (E)	80.0	65/76	
151				4.6	
152				5.0	
153 + inter A/C				3.9	
154				5.0	

Westbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
155 + inter A/C				3.6	
156				4.9	
Scim	20.5 (W)	60.0 (E)	80.5		
157				5.0	
158				5.0	
159				5.0	
160 + inter A/C				3.25	
161				4.7	
Scim	23.5 (W)	57.0 (E)	80.5	81/81	
162				5.0	
163 + inter A/C				3.6	
164				5.0	
165 + inter A/C				3.4	
166				4.9	
Scim	26.25 (W)	54.5 (E)	80.75	59/55	
167				1.6	Broken and RFI not part of system test
168 + inter A/C				2.5	
169				5.0	

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EASTBOUND P.M.

24 Feb 71

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
Scim	67.5 (W)	DME unknown		46/99	No RFI on 2nd Scim
1				4.8	
2 + inter A/C				1.8	
3				4.7	
4 + inter A/C				1.5	
5				4.9	
6				4.6	
Scim	63.5 (W)	10.0 (E)	73.5	54/53	
6				5.0	
7 + inter A/C				1.8	
8				4.8	
9 + inter A/C				1.5	
10				5.0	
Scim	59.75 (W)	15.0 (E)	74.75	50/-	
11				4.7	
12 + inter A/C				1.4	
13				4.6	
14 + inter A/C				1.1	
Scim	56.0 (W)	21.0 (E)	77.0	50/85	Partial RFI on 2nd Scim
15				4.2	
16 + inter A/C				1.4	
17				3.9	
18 + inter A/C				1.8	
19				5.0	
Scim	52.25 (W)	26.0 (E)	78.25	48/16	
20				4.8	
21 + inter A/C				1.1	

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Eastbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
22				4.3	
23 + inter A/C				1.7	
24				5.0	
Scim	48.0 (W)	30.0 (E)	78.0	54/70	
25				5.0	
26 + inter A/C				4.0	
27				4.7	
28 + inter A/C				1.1	Intermittent sig.
29				4.6	
Scim	43.75 (W)	33.0 (E)	77.75	57/63	
30				4.1	
31 + inter A/C				2.4	
32				4.2	
33 + inter A/C				1.3	Intermittent sig.
34				5.0	
35				3.1	Extraneous RFI
Scim	39.5 (W)	38.0 (E)	77.5	62/99	No RFI on 2nd Scim
36				4.7	
37 + inter A/C				1.5	
38				4.9	
39 + inter A/C				1.8	
40				5.0	
Scim	35.75 (W)	42.0 (E)	77.75	60/95	No RFI on 2nd Scim
41				4.8	
42 + inter A/C				2.7	
43				5.0	
44 + inter A/C				1.3	
45				4.6	

Eastbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
Scim	31.5 (W)	47.0 (E)	78.5	58/89	
46				4.3	
47 + inter A/C				2.0	
48				5.0	
49 + inter A/C				3.0	
50				4.2	
Scim	27.0 (W)	52.0 (E)	79.0	52/92	No RFI on 2nd Scim
51				4.9	
52 + inter A/C				3.3	
53				5.0	
54 + inter A/C				3.9	
55				4.9	
Scim	22.75 (W)	55.0 (E)	77.75	53/64	
56				5.0	
57 + inter A/C				2.8	
58				4.9	
59 + inter A/C				3.5	
60				5.0	
61				4.9	
Scim	19.0 (W)	60.0 (E)	79.0	57/99	No RFI on 2nd Scim
62 + inter A/C				3.3	
63				5.0	
64 + inter A/C				3.7	
65				5.0	
66				5.0	
Scim	14.75 (W)	64.0 (E)	80.75	59/99	No RFI on 2nd Scim
67				5.0	
68 + inter A/C				3.8	

1-17

Eastbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
69				4.9	
70 + inter A/C				3.6	
71				5.0	
72				5.0	
Scim	11.0 (W)	70.0 (E)	81.0	64/86	
73				5.0	
74 + inter A/C				3.8	
75				5.0	
76 + inter A/C				4.0	
77				4.8	
Scim	6.5 (W)	73.5 (E)	80.0	82/96	No RFI on 2nd Scim
78				4.9	
79 + inter A/C				4.0	
80				5.0	
81 + inter A/C				3.9	
82				4.9	
Scim	3.5 (W)	78.0 (E)	81.5	60/-	
83				5.0	
84 + inter A/C				4.1	
85				5.0	
86 + inter A/C				4.0	
87				5.0	
Scim	3.75 (E)	83.0 (E)	79.25	72/77	
88				5.0	
89 + inter A/C				4.6	
90				5.0	
91 + inter A/C				4.0	

1-18

Eastbound p. m.		(Continued)				
Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>	
92				4.7		
Scim	7.25 (E)	87.0 (E)	79.75	78/88		
93				5.0		
94 + inter A/C				4.0		
95				5.0		
96 + inter A/C				3.8		
97				4.8		
Scim	11.75 (E)	93.0 (E)	81.25	67/82		
98				5.0		
99 + inter A/C				3.8		
100				5.0		
101				5.0		
102 + inter A/C				3.3		
Scim	15.5 (E)	97.0 (E)	81.5	64/99	No RFI on 2nd Scim	
103				5.0		
104 + inter A/C				3.8		
105				5.0		
106 + inter A/C				3.7		
107				4.9		
Scim	19.75 (E)	101.0 (E)	81.25	75/98	No RFI on 2nd Scim	
108				5.0		
109 + inter A/C				3.8		
110				5.0		
111				5.0		
112 + inter A/C				3.7		
113				5.0		
114				5.0		
Scim	24.25 (E)	105.0 (E)	80.75	68/86		

61-1

Eastbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	Comments
115				4.8	
116 + inter A/C				3.3	
117				5.0	
118 + inter A/C				2.1	
119				5.0	
120				4.8	
Scim	29.0 (E)	111.0 (E)	82.0	27/-	
121				5.0	
122				5.0	
123				5.0	
124				5.0	
125 + inter A/C				1.6	
Scim	33.25 (E)	115.0 (E)	81.75	43/-	
126				5.0	
127 + inter A/C				1.2	
128				3.9	
129 + inter A/C				2.4	
130				4.9	
Scim	37.5 (E)	120.0 (E)	82.5	-/81	
131				5.0	
132 + inter A/C				3.1	
133				5.0	
134 + inter A/C				2.7	
135				5.0	
Scim	42.0 (E)	123.0 (E)	81.0	68/99	No RFI on 2nd Scim
136				2.9	Intermittent sig.
137 + inter A/C				2.0	
138				5.0	

1-20

Eastbound p. m. (Continued)

Ground Message	DME Sub. A/C (in nmi)	DME Inter. A/C (in nmi)	Range Between Aircraft (in nmi)	Av. Rating or Scim	<u>Comments</u>
139 + inter A/C				2.9	
140				4.6	
Scim	46.25 (E)	128.0 (E)	81.75	40/40	
141				4.8	
142 + inter A/C				1.9	
143				5.0	
144 + inter A/C				1.3	
145				5.0	
Scim	51.0 (E)	132.0 (E)	81.0	29/79	
146				5.0	
147 + inter A/C				1.9	
148				5.0	
149 + inter A/C				1.9	
150				4.4	
Scim	55.5 (E)	137.0 (E)	81.5	-/-	
151				5.0	
152 + inter A/C				1.6	
153				5.0	
154 + inter A/C				1.8	
155				5.0	
156				5.0	
Scim	60.0 (E)	142.0 (E)	82.0	-/-	

1-21

Expected D/U's for Various Distances and Separation of A/C

<u>P1</u> Distance to Ground Station	<u>D (dbm)</u>	90 nmi	P1-P2	80 nmi	P1-P2	70 nmi	P1-P2
		Loss level <u>P2</u> Distance to Ground Station	115 db - 73 dbm <u>D/U</u>	Loss level <u>P2</u>	114 db - 72 dbm <u>D/U</u>	Loss level <u>P2</u>	113 db - 71 dbm <u>D/U</u>
70	-67	160	+6	150	+5	140	+4
65	-66	155	+7	145	+6	135	+5
60	-65.5	150	+7.5	140	+6.5	130	+5.5
55	-65	145	+8	135	+7	125	+6
50	-64	140	+9	130	+8	120	+7
45	-63	135	+10	125	+9	115	+8
40	-62	130	+11	120	+10	110	+9
35	-61	125	+12	115	+11	105	+10
30	-59.5	120	+13.5	110	+12.5	100	+11.5
25	-58	115	+15	105	+14	95	+13
20	-56	110	+17	100	+16	90	+15
15	-53.5	105	+19.5	95	+18.5	85	+17.5
10	-50	100	+23	90	+22	80	+21