Airborne Radio Navigation Equipment Distribution and Technical Characteristics

Contract FAA/BRD-61
Task 1 and Task 2

August, 1959

PREFACE

This report has been compiled in accordance

with the requirements set forth in contract

FAA/BRD-61

awarded by the

BUREAU OF RESEARCH AND DEVELOPMENT

of the

FEDERAL AVIATION AGENCY

to the

RCA SERVICE COMPANY

March, 1959

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SECTION A

INTRODUCTION

1. Scope. The Federal Aviation Agency, Washington, D. C., through its Bureau of Research and Development, awarded the Air Traffic Control VHF Radio Airborne Navigation Equipment Contract FAA/BRD-61 to the Radio Corporation of America Service Company, Cherry Hill, New Jersey. This contract was performed in conjunction with the counterpart Air Traffic Control Communications Equipment Contract FAA/BRD-60; the joint effort was known as Project DANCE (Domestic Airways Navigation and Communication Evaluations).

   Contract FAA/BRD-61 provides on a national scale, the air traffic control VHF radio navigation equipment information required to determine the optimum utilization of present VHF radio navigation equipment. In addition, information supplied by this contract may be utilized in the development of air traffic control radio navigation concepts, doctrine, frequency allocation procedures, and in the formulation of parameters for the proposed automatic or semi-automatic air traffic control position reporting system.

   Specifically, Contract FAA/BRD-61 was divided into two tasks:

   Task 1, Airborne Equipment Distribution, contains tabulations defining the quantity and type of airborne VOR, ILS, and 75 megacycle marker equipment presently in use in the three fleets (Military, Commercial, and General Aviation) comprising the aviation community.

   Task 2, Airborne Equipment Characteristics, contains a detailed laboratory analysis under standard test conditions of a representative number of significant types of airborne VOR, ILS, and 75 megacycle marker equipment. A realistic determination was made of actual equipment operating characteristics by performing laboratory and field tests and when the latter were compared with laboratory findings, the degree of degradation was determined.

2. Data Sources. Data was obtained through the following primary sources:

   USA:

   Through the Office of the Chief Signal Officer, Combat Development and Operations Division, Signal Aviation Branch. Records maintained by this office were used to obtain airborne equipment distribution data.

USN:

Through the Office of the Chief, Bureau of Aeronautics, Avionics Division. Records maintained by this office were used to obtain airborne equipment distribution data.

USAF:

Through Headquarters, United States Air Force, Office of the Director for Maintenance Engineering. Records available in this office were used to obtain airborne equipment distribution data.

USCG:

Through Headquarters, United States Coast Guard. Airborne and ground equipment distribution data was obtained from records maintained in this office.

Airlines:

Through the offices of the individual communications directors, managers, or superintendents. Airborne equipment distribution data was obtained from the appropriate airline office during a personal visit by contract research analysts.

Other Commercial Carriers:

Through direct correspondence to the air taxi, contract, intrastate, and supplemental operators. Inquiries were sent to each carrier of record and follow-up letters were sent to those who failed to reply after a reasonable waiting period. Data was received from 50 percent of the carriers queried. Some letters were undelivered due to the addressee having moved leaving no forwarding address. Others simply failed to reply.

General Aviation Fleet:

Through a statistically prepared post card polling of aircraft owner-operators. The mailing piece was in the form of a questionnaire and was sent to approximately 13,000 aircraft owner-operators distributed among the various general aircraft categories. Two follow-up mailings of questionnaires were accomplished. Overall response and the statistical projection of data received is treated in detail in FAA/BRD-61, Section E.

Manufacturers:

Through direct correspondence with the appropriate manufacturer. This correspondence was for the purpose of obtaining equipment manuals and other technical data and to obtain equipment for laboratory tests.

ASD:

This facility (Airborne Systems Division, Defense Electronics Products, Radio Corporation of America) performed all laboratory and field testing of the significant airborne equipments and supplied the detailed analysis of each of the significant equipment types.

Miscellaneous:

In addition to these primary sources, data was also obtained from technical libraries of the military departments, the Library of Congress, the National Archives, commercial repair stations serving the general aviation community, and from individuals. These contacts were made for the purpose of obtaining technical data on various types of equipment and were accomplished by personal visits.

3. Format. Formats used for data presentation have been carefully designed to be complete, easy to read, and as self-explanatory as possible. Bar-graphs have been used extensively in presenting the results of laboratory testing of significant airborne equipments. Tabulated information originally requiring a large typing area has been photo-reduced to single page size in order to eliminate fold-out sheets.

4. Statistical Analysis. Statistical analysis of the selection and laboratory testing of significant airborne equipments is found in FAA/BRD-61, Section E, Sub-Section 1.

5. References. References are found in FAA/BRD-61, Section D. Included in this section are applicable extracts from appropriate RTCA papers governing certain laboratory tests performed under this contract.

SECTION B

AIRBORNE NAVIGATION EQUIPMENT DISTRIBUTION

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NOTES

(1) The Tabulation of Equipment Distribution for the Air Taxi, Intrastate, Contract, and Supplemental Operators represents 50 percent of those of record. The remaining 50 percent did not reply despite follow-up requests for information.

(2) The Tabulation of Equipment Distribution for the General Aviation Fleet, representative of actual totals based upon a statistical projection, is treated fully in FAA/BRD-61, Section E.

EQUIPMENT TYPE	MILITARY TOTAL	AIRCRAFT TYPE																										EQUIPMENT FUNCTION(S)			
		AIR FORCE										NAVY								ARMY					COAST GUARD						
		BOMBER	TANKER	FIGHTER	CARGO	TRAINER	RECON-NAISSANCE	SEARCH AND RESCUE	LIAISON	ROTARY WING	TOTAL	FIGHTER	ATTACK/ SEARCH	PATROL	TRANSPORT	TRAINER	UTILITY AND OBSERVATION	ROTARY WING	LIGHTER THAN AIR	TOTAL	SINGLE ENGINE	TWIN ENGINE	HELICOPTER (LIGHT)	HELICOPTER (HEAVY)	TOTAL	FIXED WING	ROTARY WING	TOTAL	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON
51R-3	39														39					39									X	X		
AN/ARN-14( )	16791	2011	1099	3003	2944	3163	481	96		4	12801	1470	465	764	167	939	69	1		3875						109	6	115	X	X		
AN/ARN-30( )	2414					259	16		142	17	434		531			423	4			958	630	131	152	89	1002		20	20	X	X		
AN/ARN-38	45	6			39						45																		X	X		
AN/ARN-56	100			100							100																		X	X		
AN/ARN-36	30			2					28		30																			X		
RC-103( )	462	60		28	225	137	4				454				8					8										X		
AN/ARN-31	1829	131	182	1040	77	246	152		1		1829																			X	X	
51V-( )	88														88					88											X	
AN/ARN-5( )	2065	98	53	130	1485	248	31	3			2048				17					17											X	
AN/ARN-18	9865	1825	804	2200	1336	2652	378	93			9288			138	106	149	69			462						109	6	115			X	
AN/ARN-37	50	1	1		33	9	6				50																				X	
AN/ARN-39	28				27	1					28																				X	
R-746/AR	131																					131			131						X	
AN/ARN-12( )	16501	1881	864	2831	1969	3163	415	96	5	5	11229	151	1840	688	67	1269	73		48	4136	606		104	324	1034	96	6	102				X
AN/ARN-32	1807	266	187	714	66	280	120				1633		1							1	46	118	5	4	173							X
MN-61B	39														39					39												X
AN/ARN-8	1415												540	200	286	213	146		30	1415												X
R-20( )/Type 12	76				1	16			46		63											13			13							X
RC-193( )	2037	98			1089	150	20	1	6		1364					673				673												X

Airborne Radio Navigation Equipment Distribution, August, 1959

MILITARY FLEET

AIRLINE WITH EQUIPMENT TYPES	TOTALS	AIRCRAFT TYPE																																EQUIPMENT FUNCTION(S)			
		FIXED WING																											ROTARY WING								
		BOEING			CONVAIR				CURTISS	DOUGLAS										FAIRCHILD	LOCKHEED					MARTIN		VICKERS	BELL		SIKORSKY			VERTOL	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON
		377	707	720	240	340	440	880	C-46	DC-3	DC-4	DC-6	DC-6A	DC-6B	DC-7	DC-7B	DC-7C	DC-8	F-27	049	749	1049	1649	188	202	404	745	47G	47J	S-51	S-55	S-58	44B				
AAXICO	34								34																											
51R-( )	34								34																									X	X		
MN-53( )	34								34																												X
AEROVIAS	4								3		1																										
51R-( )	1										1																							X	X		
BC-733( )	3								3																										X		
51V-( )	1										1																									X	
R-89B/ARN-5A	3								3																											X	
MN-53( )	4								3		1																										X
ALASKA	8								3		2	3																									
51R-( )	8										2	6																						X	X		
BC-733( )	3								3																										X		
51V-( )	5											5																								X	
R-89B/ARN-5A	5								3		2																									X	
MN-53( )	8								3		2	3																									X
ALLEGHENY	23									12															11											
MN-85( )	46									24															22									X	X		
R-89B/ARN-5A	23									12															11											X	
MN-53( )	23									12															11												X
AMERICAN	222		33		51							73	10		46									9												
51R-( )	444		66		102							146	20		92									18										X	X		
51V-( )	444		66		102							146	20		92									18												X	
MKA-7A	42		33																					9													X
MN-61( )	180				51							73	10		46																						X
BONANZA	13									10									3																		
706A	26									20									6																X	X		
429A	9									9																										X	
700( )	4									1									3																	X	
702( )	6																		6																	X	
MN-61( )	10									10																											X
BRANIFF	76		4			25	6		2	12		9		1			6			2				9												
51R-( )	50		8							12							12							18											X	X		
MN-85( )	102					50	12		4	12		18		2						4															X	X		
51V-( )	80		8			25	6		4			9		2			6			2				18												X	
R-89B/ARN-5A	12									12																										X	
27B	12									12																											X
MKA-7A	19		4														6							9													X
MN-53( )	45					25	6		2			9		1						2																	X
CAPITAL	100									18	12									12							58										
51R-( )	182									18	24									24							116								X	X		
51V-( )	116																										116									X	
R-89B/ARN-5A	42									18	12									12																X	
27B	42									18	12									12																	X
MN-61( )	58																										58									X
CENTRAL	15									15																											
51R-( )	30									30																									X	X		
R-89B/ARN-5A	30									30																											X	
MN-61( )	15									15																											X

Airborne Radio Navigation Equipment Distribution, August, '1959

COMMERCIAL AIR CARRIERS

AIRLINE WITH EQUIPMENT TYPES	TOTALS	AIRCRAFT TYPE																																EQUIPMENT FUNCTION(S)			
		FIXED WING																											ROTARY WING								
		BOEING			CONVAIR				CURTISS	DOUGLAS									FAIRCHILD	LOCKHEED				MARTIN		VICKERS	BELL		SIKORSKY			VERTOL	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON
		377	707	720	240	340	440	880	C-46	DC-3	DC-4	DC-6	DC-6A	DC-6B	DC-7	DC-7B	DC-7C	DC-8	F-27	049	749	1049	1649	188	202	404	745	47G	47J	S-51	S-55	S-58	44B				
CHICAGO HELICOPTER	8	NO NAVIGATIONAL EQUIPMENT																										3				5				
CONTINENTAL	35		4							10				1		5											15									
51R-( )	60		8							10				2		10											30							X	X		
MN-85( )	10									10																								X	X		
51V-( )	50		8											2		10											30									X	
R-89B/ARN-5A	20									20																										X	
MKA-7A	19		4																								15									X
MN-53( )	10									10																										X	
MN-61( )	6													1		5																				X
DELTA	85					20	8	1	5	12		12			11	10		6																			
51R-( )	156					40	16		10	24		24			22	20																			X	X		
344( )/51X-2	14							2										12																	X	X		
51V-( )	148					40	16	2	10	12		14			22	20		12																			X	
MN-100( )	10											10																									X	
27B	12									12																											X
51Z-( )	27					20		1										6																			X
MN-53( )	41						8					12			11	10																					X
EASTERN	230						20					7			48			2			17	38		40		58											
51R-( )	214														32						28	61				93									X	X		
706A	194						40					14			56			4						80											X	X		
MN-85( )	52														8						6	15				23									X	X		
429A	266														40						34	76				116											X	
700( )	194						40					14			56			4						80													X	
702( )	97						20					7			28			2						40													X	
MN-53( )	133														20						17	38				58											X
FLYING TIGER	16								2													14															
51R-( )	32								4													28													X	X		
51V-( )	30								2													28															X	
MN-53( )	16								2													14																X
FRONTIER	29					4				25																												
51R-( )	8					8																													X	X		
MN-85( )	50									50																									X	X		
51V-( )	9									9																											X	
MN-100( )	8					8																															X	
R-89B/ARN-5A	16									16																											X	
MN-53( )	25									25																												X
MN-61( )	4					4																																X
LAKE CENTRAL	12									12																												
51R-( )	24									24																											X	X		
R-89B/ARN-5A	12									12																												X	
MKA-7A	12									12																													X
LOS ANGELES	7	NO NAVIGATIONAL EQUIPMENT																												2	5						
MACKEY	5									2	3																											
51R-( )	3										3																										X	X		
BC-733( )	2									2																												X	
R-89B/ARN-5A	5									2	3																											X	
MN-53( )	3										3																												X
MN-55( )	2									2																													X

Airborne Radio Navigation Equipment Distribution, August, 1959

COMMERCIAL AIR CARRIERS

Figure B-2

AIRLINE WITH EQUIPMENT TYPES	TOTALS	AIRCRAFT TYPE																														EQUIPMENT FUNCTION(S)			
		FIXED WING																										ROTARY WING							
		BOEING			CONVAIR				CURTISS	DOUGLAS									FAIRCHILD	LOCKHEED				MARTIN		VICKERS	BELL	SIKORSKY			VERTOL	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON
		377	707	720	240	340	440	880	C-46	DC-3	DC-4	DC-6	DC-6A	DC-6B	DC-7	DC-7B	DC-7C	DC-8	F-27	049	749	1049	1649	188	202	404	745	47G	47J	S-51	S-55	S-58	44B				
MOHAWK	20				11					9																									
51R-( )	40				22					18																							X	X		
51V-( )	11				11																													X	
R-89B/ARN-5A	9									9																								X	
27B	9									9																									X
MKA-7A	11				11																														X
NATIONAL	42					8	6					4		8	4		4	3				4		1											
51R-( )	10											8												2									X	X		
MN-85( )	74					16	12							16	8		8	6				8											X	X		
51V-( )	44						12								8		8	6				8		2										X	
R-89B/ARN-5A	40					16						8		16																				X	
MKA-7A	4																	3						1											X
MN-53( )	34					8	6					4			8		4					4													X
NEW YORK	7	NO NAVIGATIONAL EQUIPMENT																											2			5			
NORTH CENTRAL	37					5				32																									
MN-85( )	74					10				64																							X	X		
51V-( )	10					10																												X	
R-89B/ARN-5A	32									32																								X	
MN-53( )	32									32																									X
MN-61( )	5					5																													X
NORTHEAST	31									11		10															10								
MN-85( )	62									22		20															20						X	X		
51V-( )	40											20															20								
R-89B/ARN-5A	11									11																								X	
27B	5									5																								X	
MKA-7A	10											10																							X
MN-61( )	16									6																	10								X
NORTHWEST	65	9									11	23			17			5																	
51R-( )	120	18									22	46			34																		X	X		
NVA-21/RA-21A	10																	10															X	X		
51V-( )	80											46			34																				X	
GSA-8A	10																	10																X	
R-89B/ARN-5A	40	18									22																								X	
MKA-7A	45											23			17			5																	
MN-53( )	20	9									11																								X
OZARK	27									24									3																
51R-( )	52									46									6														X	X		
51V-( )	24									24																									
5607A	6																		6															X	
5608A	3																		3															X	
MN-53( )	24									24																									X

Airborne Radio Navigation Equipment Distribution, August, 1959

COMMERCIAL AIR CARRIERS

AIRLINE WITH EQUIPMENT TYPES	TOTALS	AIRCRAFT TYPE																																EQUIPMENT FUNCTION(S)			
		FIXED WING																										ROTARY WING									
		BOEING			CONVAIR				CURTISS	DOUGLAS									FAIRCHILD	LOCKHEED					MARTIN		VICKERS	BELL		SIKORSKY			VERTOL	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON
		377	707	720	240	340	440	880	C-46	DC-3	DC-4	DC-6	DC-6A	DC-6B	DC-7	DC-7B	DC-7C	DC-8	F-27	049	749	1049	1649	188	202	404	745	47G	47J	S-51	S-55	S-58	44B				
PACIFIC	24									11									6						7												
51R-( )	25									11															14									X	X		
344B/51X-2	12																		12															X	X		
51V-( )	12																		12																	X	
R-89B/ARN-5A	18									11															7											X	
51Z-( )	6																		6																		X
MN-53( )	7																								7												X
MN-61( )	11									11																											X
PACIFIC NORTHERN	9									3											6																
51R-( )	12																				12													X	X		
R-89B/ARN-5A	6																				6															X	
MN-53( )	9									3											6																X
PANAGRA	20									4	2			4	6			4																			
MN-85( )	28													8	12			8																X	X		
BC-733( )	2										2																								X		
51V-( )	16													4	12																					X	
GSA-8A	8																	8																	X	
R-89B/ARN-5A	2										2																								X	
MKA-7A	4																	4																		X
MN-53( )	12										2			4	6																					X
PAN AMER WORLD	133	22	15							1	14		4	44		13	19	1																		
51R-( )	181	40	30							2	15		4	44		13	31	2																X	X		
MN-85( )	77	4									5		4	44		13	7																	X	X		
51V-( )	225	30	30							1			8	90		26	38	2																		X	
R-89B/ARN-5A	32	14								1	17																								X	
MKA-7A	42		15							1						6	19	1																		X
MN-53( )	91	22									14		4	44		7																				X
PIEDMONT	29									21									8																		
51R-( )	58									42									16															X	X		
51V-( )	16																		16																	X	
R-89B/ARN-5A	42									42																										X	
MN-53( )	8																		8																		X
51Z-( )	21									21																											X
RESORT	11										11																										
51R-( )	22										22																								X	X		
R-89B/ARN-5A	22										22																									X	
MN-53( )	11										11																										X
RIDDLE	29								27		2																										
51R-( )	58								54		4																								X	X		
R-89B/ARN-5A	58								54		4																									X	
51Z-( )	14								13		1																										X
MN-53( )	15								14		1																										X
SEABOARD & WESTERN	12								1		3											8															
51R-( )	24								2		6											16													X	X		
51V-( )	12								1		3											8														X	
MN-53( )	12								1		3											8															X

Airborne Radio Navigation Equipment Distribution, August, 1959

COMMERCIAL AIR CARRIERS

Figure B-2

AIRLINE WITH EQUIPMENT TYPES	TOTALS	AIRCRAFT TYPE																														EQUIPMENT FUNCTION(S)			
		FIXED WING																									ROTARY WING									
		BOEING			CONVAIR				CURTISS	DOUGLAS									FAIRCHILD	LOCKHEED				MARTIN		VICKERS	BELL		SIKORSKY			VERTOL	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON
		377	707	720	240	340	440	880	C-46	DC-3	DC-4	DC-6	DC-6A	DC-6B	DC-7	DC-7B	DC-7C	DC-8	F-27	049	749	1049	1649	188	202	404	745	47G	47J	S-51	S-55	S-58	44B				
SLICK	11								5		3		3																						
51R-( )	22								10		6		6																				X	X		
51V-( )	3												3																						X	
R-89B/ARN-5A	8								5		3																							X	
2200( )	7								5		2																								X
MN-53( )	4										1		3																						X
SOUTHERN	17									17																									
51R-( )	34									34																							X	X		
R-89B/ARN-5A	34									34																								X	
27B	17									17																									X
TRANS CARIBBEAN	3										1	2																							
51R-( )	6										2	4																					X	X		
51V-( )	4											4																							X	
R-89B/ARN-5A	2										2																								X	
MKA-7A	2											2																								X
MN-53( )	1										1																								X
TRANS-TEXAS	23									23																									
51R-( )	46									46																							X	X		
R-89B/ARN-5A	23									23																								X	
27B	23									23																									X
TRANS WORLD	209		19					1			6									32	39	46	29			37										
51R-( )	418		38					2			12									64	78	92	58			74							X	X		
51V-( )	231		38					2			8									32	39	46	29			37									X	
51Z-( )	20		19					1																											X
MN-53( )	189										6									32	39	46	29			37										X
UNITED	252			18		51						42	5	41	55			40																		
51R-( )	388					102						84	10	82	110																			X	X		
344( )/51X-2	116			36														80																X	X		
51V-( )	116			36														80																		X	
MN-100( )	388					102						84	10	82	110																					X	
51Z-( )	58			18														40																		X
MN-61( )	228					51						42	5	41	89																					X
WEST COAST	20									14									6																	
MN-85( )	40									28									12															X	X		
GSA-8A	6																		6																X	
R-89B/ARN-5A	14									14																									X	
MN-61( )	20									14									6																	X
WESTERN	38				6									27										5											
51R ( )	76				12									54										10										X	X		
51V-( )	37													27										10											X	
R-89B/ARN-5A	6				6																														X	
MKA-7A	5																							5											X
MN-53( )	33				6									27																					X
TOTAL AIRCRAFT	1991	31	75	18	68	113	40	2	82	298	71	185	22	126	187	28	29	61	26	46	62	110	29	64	18	95	83	3	2	2	5	5	5				

Airborne Radio Navigation Equipment Distribution, August, 1959

COMMERCIAL AIR CARRIERS

EQUIPMENT TYPE	TOTALS	AIRCRAFT TYPE																													EQUIPMENT FUNCTION(S)			
		FIXED WING																									ROTARY WING								
		BOEING			CONVAIR				CURTISS	DOUGLAS									FAIRCHILD	LOCKHEED				MARTIN		VICKERS	BELL		SIKORSKY			VERTOL				
		377	707	720	240	340	440	880	C-46	DC-3	DC-4	DC-6	DC-6A	DC-6B	DC-7	DC-7B	DC-7C	DC-8	F-27	049	749	1049	1649	188	202	404	745	47G	47J	S-51	S-55	S-58	44B	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON
51R-( )	2838	58	150		136	150	16	2	114	317	119	318	40	182	290	43	43	2	22	88	118	197	58	48	14	167	146							X	X		
344( )/51X-2	142			36				2										92	12														X	X		
706A	220						40			20		14			56			4	6					80										X	X		
MN-85( )	615	4				76	24		4	210	5	38	4	70	28	13	15	14	12	4	6	23			22	23	20							X	X		
NVA-21A/RA-21A	10																	10															X	X		
BC-733( )	10								6	2	2																							X		
51V-( )	1764	30	150	36	113	75	34	4	17	46	12	244	31	125	168	56	52	100	28	34	39	90	29	48		37	166								X	
429A	275									9					40						34	76				116									X	
700( )	198						40			1		14			56			4	3					80												X	
5607A	6																		6																X	
GSA-8A	24																	18	6																X	
MN-100( )	406					110						94	10	82	110																				X	
R-89B/ARN-5A	567	32			6	16			65	299	89	8		16						12	6				18										X	
27B	120									96	12									12																X	X
51Z-( )	146		19	18		20		2	13	21	1							46	6																X	X
702( )	103						20					7			28			2	6					40												X	X
2200( )	7								5		2																									X	X
5608A	3																		3																	X	X
MKA-7A	215		56		11					13		35			17	6	25	13						24			15									X
MN-53( )	844	31			6	33	20		59	106	56	28	7	76	45	17	4		8	34	62	110	29		18	95										X
MN-55( )	2									2																											X
MN-61( )	553				51	60				56		115	15	42	135	5			6								68										X
AIRCRAFT REPORTED 1991		31	75	18	68	113	40	2	82	298	71	185	22	126	187	28	29	61	26	46	62	110	29	64	18	95	83	3	2	2	5	5	5				

Figure B-3

Airborne Radio Navigation Equipment Distribution Summary, August, 1959

COMMERCIAL AIR CARRIERS

EQUIPMENT TYPE	TOTALS	AIRCRAFT TYPE										EQUIPMENT FUNCTION(S)											
		SINGLE ENGINE						MULTI-ENGINE			ROTARY WING					LMF	HF		VHF		UHF	
		1 & 2 PLACE			3 OR MORE PLACE																		
		65-HP OR LESS	66-HP TO 100-HP	OVER 100-HP	144-HP OR LESS	145-HP TO 200-HP	OVER 200-HP	800-HP OR LESS	801-HP TO 2000-HP	OVER 2000-HP	LIGHT & HEAVY	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON	RECEIVER	TRANSMITTER	RECEIVER	TRANSMITTER	RECEIVER	TRANSMITTER	RECEIVER
NUMBER OF AIRCRAFT	535	7	32	47	15	151	83	91	33	63	13												
2214	1							1				X											
VOA-2	1				1							X											
VHT-1	5			3		2						X							X	X			
VHT-2	21		3	11	1	6						X							X	X			
VHT-3	73		10	15	8	39					1	X							X	X			
51R-( )	127							4	50	73		X	X										
344( )/51X-2	23						23					X	X										
B-13( )/51X-3	2							2				X	X										
MN-85( )	12								4	8		X	X										
NVA-21	2							2				X	X										
Type 15 A R C	76			1			1	50	3	21		X	X										
VOA-3	8				1	1	3	3				X	X										
706A	4							4				X	X									X	
VTR-1	9		1		1	3	3	1				X	X		X				X	X			
VTR-2	146		3	7	5	32	67	31	1			X	X		X				X	X			
BC-733( )	2								1	1			X										
51V-( )	50							3	15	32				X									
429A	2								2					X									
700( )	5							5						X									
5607	2							2						X									
DGS-20	3							3						X									
MN-100( )	6									6				X									
R-89B/ARN-5A	87							16	18	53				X									
27B	6							1	3	2					X								
51Z-( )	5									5					X								
702( )	2							2							X								
2200	4						1	3							X								
BC-1023	1							1							X								
BC-1033	4							4							X								
BC-1333	1							1							X								
DM-3	2							2							X								
MB-3	45							5	15	25					X								
MBT-12	17						15	2							X								
MKA-7A	2							1		1					X								
MN-53( )	31						2	5	12	12					X								
MN-61( )	3									3					X								
R-8/ARN-8	1							1							X								
R-20/A R C	6						1	3		1	1				X								
AVTR-116	1			1											X	X			X				
AT-99-45( )	3						2	1							X	X			X	X			
LTRA-6	47		5		8	21	12	1							X	X			X	X			

Airborne Radio Navigation Equipment Distribution, August, 1959

OTHER COMMERCIAL AIR CARRIERS (Air Taxi, Contract, Intrastate, Supplemental)

EQUIPMENT TYPE	TOTALS	AIRCRAFT TYPE										EQUIPMENT FUNCTION(S)											
		SINGLE ENGINE						MULTI-ENGINE			ROTARY WING					LMF	HF		VHF		UHF	
		1 & 2 PLACE			3 OR MORE PLACE																		
		65-HP OR LESS	66-HP TO 100-HP	OVER 100-HP	144-HP OR LESS	145-HP TO 200-HP	OVER 200-HP	800-HP OR LESS	801-HP TO 2000-HP	OVER 2000-HP	LIGHT & HEAVY	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON	RECEIVER	TRANSMITTER	RECEIVER	TRANSMITTER	RECEIVER	TRANSMITTER	RECEIVER
NUMBER OF AIRCRAFT	65100	11608	11167	6563	5302	13767	11651	3842	706	90	404												
2214/LR-6	380		10		14	72	256	28				X								X		
LCP-5/LR-5, 6	4162	24	81	75	95	1526	2130	225	6			X								X		
VOA-1/VRA-1	353	12	51	37	54	115	84					X										
VOA-2/VC-12	344		91	12	54	130	43	14				X										
VOA-2/VC-27	779		152	12	41	173	298	103				X										
344B-1/51X-2	414						128	240	32	14		X	X									
B-10, 13/Type 15	4183		20	50		29	533	3368	181	2		X	X									
NVA-21/RA-21A	13								13			X	X							X		
OC-3A/DTR-360	42					14		28				X	X						X	X		
VOA-3/VC-27	423		91		27	29	234	42				X	X									
VOA-3A/1016	147							141	6			X	X									
VOA-3A/MARK V	871		20		41	101	596	113				X	X									
2374/5611	167			12		14	85	56				X	X		X					X		
VTR-1, 2	11222	24	183	162	597	2994	6348	902	12			X	X		X				X	X		
51R-( )	1817			25				676	978	138		X	X							X		
706( )	113							113				X	X							X		
MN-85( )	250							85	142	23		X	X							X		
AT-99-45( )	573	24	51	100	81	274	43					X			X	X			X	X		
VHT-1, 2, 3	10997	284	1900	662	1426	5557	1108	56			4	X							X	X		
BC-733/RC-103( )	13								13				X							X		
VCA( )/LR-6	715			12		101	469	127	6				X							X		
VFA-1/VC-12	106		10	12	27	14	43						X						X	X		
51V-( )	1432					14	21	606	648	143				X								
429A	54							28	26					X								
700	238							225	13					X								
5607A/LNC-100	85						43	42						X								
DGS-20	140						21	113	6					X								
GSA-8A	41							28	13					X								
MN-100( )	42							14	26	2				X								
R-89( )/ARN-5A	2011					14	107	1564	324	2				X								
27A, B	27							14	13						X							
51Z-( )	369							254	97	18					X							
702	161							155	6						X							
2200/2201( )	501						21	409	71						X							
BC-357	14					14									X							
BC-1023A	335		41	25		58	149	56	6						X							
BC-1333	70							70							X							
DM-3	159			12			21	113	13						X							
LDMR-5/LTR-5	223		20	12	14	72	85	14	6						X				X	X		
MBT-12, 24	213					43	85	85							X							
MB-3	849					14	21	705	104	5					X							
MKA-7A	76							28	32	16					X							
MN-53( )	731					14	64	352	266	35					X							
MN-55	19								19						X							
MN-61( )	61								45	16					X							
R-8/ARN-8	82			12				70							X							

Airborne Radio Navigation Equipment Distribution, August, 1959

GENERAL AVIATION FLEET

EQUIPMENT TYPE	TOTALS	AIRCRAFT TYPE										EQUIPMENT FUNCTION(S)											
		SINGLE ENGINE						MULTI-ENGINE			ROTARY WING					LMF	HF		VHF		UHF	
		1 & 2 PLACE			3 OR MORE PLACE																		
		65-HP OR LESS	66-HP TO 100-HP	OVER 100-HP	144-HP OR LESS	145-HP TO 200-HP	OVER 200-HP	800-HP OR LESS	801-HP TO 2000-HP	OVER 2000-HP	LIGHT & HEAVY	VHF OMNI RANGE	ILS LOCALIZER	ILS GLIDE SLOPE	75 MC MARKER BEACON	RECEIVER	TRANSMITTER	RECEIVER	TRANSMITTER	RECEIVER	TRANSMITTER	RECEIVER
NUMBER OF AIRCRAFT	65100	11608	11167	6563	5302	13767	11651	3842	706	90	404												
R-20A/Type 12	607						298	296	13						X								
V-12-MP-2, A	819	12	152	25	81	187	320	42							X								
LRA-6( )	3560	12	183	37	68	1065	1938	240			17				X	X							
AT-99-44-BH	696	24	61	37	54	158	362								X	X	X						
AVTR-116	381		51	25	54	144	107								X	X			X				

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GENERAL AVIATION FLEET

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SECTION C

AIRBORNE RADIO NAVIGATION EQUIPMENT CHARACTERISTICS

(Task 2)

1. General and Statistical Information.

a. Introduction - The Airborne Systems Division, Defense Electronic Products, Camden, New Jersey, performed the following work under Task 2 of the Federal Aviation Agency Contract No. FAA/BRD-61, in cooperation with the RCA Service Company, Cherry Hill, New Jersey.

(1). Determination of the sampling rates of the various airborne navigation equipment in civil and military use.

(2). Performance of tests, in the laboratory and in the field, in accordance with the contract and applicable papers of the Radio Technical Commission for Aeronautics.

(3). The collection and tabulation of the accumulated data for use by the FAA.

(4). Analysis of the individual and weighted characteristics with the intent of ascertaining factors which contribute to degradation of performance.

b. Test Program.

(1). Selection of Samples - The determination of the equipments and number of samples to be tested was based on a consideration of the various equipment types to be investigated and the time period involved. It was determined that approximately 100 navigation equipments could be tested both in the laboratory and in the field. This number would include VHF omni-range (VOR) receivers, marker beacons, VHF localizers, and UHF instrument landing

system glide slope receivers which were New, In-Use, and Ready for Issue (RFI).

The tabulation of airborne navigation equipments prepared by the RCA Service Company was used to prepare separate lists for the four navigation functions. The numerical quantities were weighted according to approximated use as follows:

CATEGORY OF EQUIPMENT	WEIGHTING FACTOR
Commercial Air Lines (AL)	20
Military (MIL)	5
General Aviation Fleet (G)	1

The three equipments of each function with the highest weighted quantities were selected for the test program, with some additions made at FAA request. The breakdown of the final selections is as follows:

Marker Beacon ----------3 equipments (1 MIL, 2 AL)

VOR ----------6 equipments (2 MIL, 1 AL, 3 G)

Localizer----------4 equipments (2 MIL, 1 AL, 1 G)

Glide Slope ----------3 equipments (1 MIL, 2 AL)

Nine samples of each equipment were tested (3 New, 3 In-Use, and 3 RFI) except in the following instances:

(a). Only two New units of one VOR receiver (VO-6) could be obtained and tested. Three In-Use and three RFI units of this receiver were available.

(b). One General Aviation Fleet equipment was not available in In-Use and RFI form for VOR and localizer tests. The equipment performed these functions by means of a converter which was not obtainable in the field; therefore, only New test data is provided. Other deviations are noted on the pertinent graphs.

New equipments were obtained from various government agencies and commercial sources. In-Use equipments were those actually installed and being used in operating aircraft. The RFI equipments were those that had been removed for repair or adjustment and were available for installation or replacement.

(2). Test Specifications - Tests of the equipment characteristics were performed in accordance with the following Radio Technical Commission for Aeronautics papers:

225-55/DO-69 - Minimum Performance Standards, Airborne VOR Receiving Equipment.

89-54/DO-59 - Minimum Performance Standards, Airborne ILS Localizer Receiving Equipment.

88-54/DO-58 - Minimum Performance Standards, Airborne ILS Glide Slope Receiving Equipment.

87-54/DO-57 - Minimum Performance Standards, Airborne Radio Marker Receiving Equipment Operating on 75 mc.

In addition to the above tests, one unit of each equipment selected for tests was subjected to the temperature variation test described in Section VIII of RTCA Paper 100-54/DO-60, Environmental Test Procedures, Airborne Radio Equipment.

In performing the test for checking two navigational receivers operating from the same antenna, one setup was used for each type of equipment. This was accomplished in accordance with RTCA procedures, except that the test was limited to observation of deflection of the deviation indicator.

Certain characteristics, which were considered to be design parameters, were excluded from the field test program. However, one piece of each type of equipment was checked in the laboratory for these design parameters, as follows:

(a). Marker Beacon.

1. Par. 2.9: Emission of RF Energy

(a). Marker Beacon (Continued).

2.	Par. 2.10:	Sensitivity Depression
3.	Par. 2.13:	Cross Modulation
4.	Par. 2.14:	Spurious Response
5.	None	Receiver Response to Radar-Type Signals

(b). VOR.

1.	Par. 2.3(d):	Bearing Accuracy Variation in Ambient Temperature
2.	Par. 2.6:	Spurious Response
3.	Par. 2.7:	Cross Modulation and Intermodulation
4.	Par. 2.9:	Emission of RF Energy
5.	None	Receiver Response to Radar-Type Signals

(c). ILS Localizer.

1.	Par. 2.7:	Spurious Response
2.	Par. 2.8:	Cross Modulation
3.	Par. 2.10:	Emission of RF Energy
4.	None	Receiver Response to Radar-Type Signals

(d). ILS Glide Slope.

1.	Par. 2.7:	Spurious Response
2.	Par. 2.8:	Cross Modulation
3.	Par. 2.10:	Emission of RF Energy
4.	None	Receiver Response to Radar-Type Signals

In the test for receiver response to radar signals, a modulated RF signal was injected into the receiver at a level sufficient to produce rated output. The signal was removed, and a radar-type signal, at a level of 3.5 volts (open circuit) and pulse-modulated at 1000 pulses per second with a 0.5 microsecond pulse width was applied over the range from 100 to 2000 mc. The receiver was considered to be susceptible to the radar signals when the specified allowable output was exceeded.

As agreed with the FAA Project Officer, the following tests were not included in the laboratory or field tests:

(a). Marker Beacon.

1. Par. 2.12: Voltage Standing Wave Ratio

(b). VOR.

1. Par. 2.1: Voltage Standing Wave Ratio (Receiver)
2. Par. 2.2: Voltage Standing Wave Ratio (Antenna)
3. Par. 2.10: Damping Characteristics

(c). ILS Localizer.

1. Par. 2.1: Voltage Standing Wave Ratio (Receiver)
2. Par. 2.2: Voltage Standing Wave Ratio (Antenna)
3. Par. 2.11: Damping Characteristics

(d). ILS Glide Slope.

1. Par. 2.1: Voltage Standing Wave Ratio (Receiver)
2. Par. 2.2: Voltage Standing Wave Ratio (Antenna)
3. Par. 2.11: Damping Characteristics

Tabulated data on output regulation for the marker beacons and audio output regulation and distortion for the VOR and localizer equipments are included with respective equipment data.

(3). Test Equipment - The following test equipments were used in the program:

LABORATORY TESTS

Equipment	Model
Zifor	Collins 478A-1

LABORATORY TESTS (Continued)

Equipment	Model
Precision Track Selector	Collins 479V-3
Signal Generator	Collins 479S
Signal Generator	Boonton 211A
Signal Generator	Boonton 232A
Deviation Indicator (RCA Fabrication)	Weston 271
Power Supply, AC, Variable Frequency	CML 1420B
Phase Test Set	Boonton 213A
Electronic Frequency Counter	HP 524B
Frequency Counter Unit	HP 525A
Frequency Counter Unit	HP 525B
Oscilloscope	Tektronix 545
Preamp Plug-In Unit	Tektronix 53/54C
Distortion Analyzer	HP 330B
Transfer Oscillator	HP 540A
Audio Oscillator	HP 201B
Signal Generator, VHF	HP 608C
Output Power Meter	GR 583A
VTVM	Ballantine 300
VTVM	RCA WV-97A
Multimeter	Simpson 260

FIELD TESTS

Equipment	Model
Electronic Frequency Counter	HP 524B
Frequency Converter Unit	HP 525B
Frequency Converter Unit	HP 525A
Oscilloscope	Tektronix 545
Preamp Plug-In Unit	Tektronix 54/54C
Distortion Analyzer	HP 330B
Transfer Oscillator	HP 540A
Precision Track Selector	Collins 479V-3
Signal Generator	Collins 479S
Signal Generator	Boonton 211A
Signal Generator SG2A/GRM-4	Collins 232A
Signal Generator, VHF	HP 608D
Deviation Indicator (RCA Fabrication)	Weston 271
Power Supply, DC	Perkins M60V
Power Supply, AC, Variable Frequency	Sorenson FCR-250
Power Supply, AC, Variable Frequency	CML 1420B
Audio Oscillator	HP
Output Power Meter	GR 583A
VTVM	Ballantine 300
VTVM	RCA WV-98A
Multimeter	Simpson 260
Variac	GR W5MT

(4). Laboratory and Field Tests - New equipments were tested in the RCA laboratory at Camden, New Jersey. In-Use and RFI equipments were tested in the field at Maxwell AFB, Alabama; Miami International Airport, Florida; and Idlewild Airport, New York.

The facilities were selected on the basis of equipment availability, accessibility in distance and time, and cooperation by the agency.

c. Test Results.

(1). General.

(a). Presentation of Data - Reduced data are presented as straight-line graphs. Weighted data and the arithmetic means for the basic data are presented as bar graphs. The limits for the equipment characteristics for 90%, 30%, and 70% confidence levels are presented in Table 1.

(b). Reduced Data - Data reduction was performed to permit an evaluation of equipments on the basis of how well they meet their requirements. The RTCA requirements were used for this purpose where applicable. Manufacturer's ratings were used where RTCA requirements did not exist.

Reduction of the data was accomplished in most instances simply by converting the average, or arithmetic mean, of the measurements of any characteristic into a percentage by setting the standard (or rated) limit equal to 100%. For example, the signal-plus-noise to noise ratio of 45 db would be 100% + 10/35 = 131% for a rated minimum ratio of 35 db. An actual ratio of 30 db would be rated as 30/35 = 86%. Where a maximum level is specified, for example 10 db for audio frequency deviation, 6 db would be 100% + (10-6)/10 = 140% and 14 db would correspond to 100% - (14-10)/10 = 60%.

The application of ranges within which measured values were acceptable, were treated as follows:

1. Where direct measurements were recorded as indicator deflection currents in the deviation indicator stability test with change in frequency of 90 and 150 cps, the lower and upper limits were used as 100% reference levels and the range of the limits was given a rating of 200% (100% for each half). Thus, with acceptable limits of 10% of a deflection which is measured

as 100 microamperes, a measurement of 80 microamperes would be reduced to 80/90 = 88.9%. A deflection of 96 microamperes would be reduced to 100% + (96-90)/10 = 160%, and a deflection of 109 microamperes would be reduced to 100% + (110-109)/10 = 110%.

2. The asymmetrical limits of -10% to +20% and -20% to +10%, applied only to sensitivity and deflection characteristics for glide slope receivers, required different handling. In these tests, the readings were recorded as a percentage of a reference deflection, the latter equal to 100%. The established acceptable limits were rated at 100% for reducing purposes. For data within the limits, the error above or below the 100% reference was reduced with respect to the percent acceptable error and added to 100%. For example for -20% and +10%, the acceptable readings should be between 80% and 110% of the reference level. A value of 104% reduced to 100% + (110-104)/10 = 160%, and a value of 88% reduces to 100% + (88-80)/20 = 140%. Values which fell outside the limits were reduced in proportion to the limit on that side and subtracted from 100%. Thus, in the above example, a value of 60% would be reduced to 100% - (80-60)/20 = 0% (since this corresponds to twice the maximum acceptable error).

The reduced values of those characteristics which might contribute significantly to degradation of equipment performance are plotted on one graph for each equipment function.

Reduction of the flag-alarm data was based on the selection of 250 microamperes as a reference value. Observation of when a flag was "just starting to show" proved to be inconsistent and measurements were made to determine the current required to keep a flag from showing. This was determined to be 250 microamperes. However, it is probable that flags will "just show" with less currents; therefore, this test should not be used as an absolute measure of the flag-alarm characteristics.

(c). Weighted Data - The performance characteristics of the navigation equipments were weighted in order to obtain an estimate of overall equipment degradation. Weighting factors were assigned on the basis of their estimated relative importance to overall performance. Where characteristics were not common to all equipments of a type, the weighting had to be redistributed accordingly.

Following are sample weighting charts:

MARKER BEACON

Characteristics	Weighting
Nose Bandwidth	30%
Lamp Frequency Response	20
AF Response	10
Audio Level Characteristics	10
Rated Audio Power Output	10
Lamp Operate Selectivity	10
Audio Noise Level w/Signal	5
Audio Output Distortion	5
	100%

LOCALIZER

Centering Characteristics	25%
Sensitivity and Deflection Characteristics	15
Selectivity	15
Deflection Linearity	15
Alarm Signal	15
Deviation Indicator Stability	10
Percentage Modulation Characterisitcs	5
	100%

VOR

Bearing Accuracy	30%
Selectivity	20
Deflection Linearity	10
Deflection Sensitivity	15
Alarm Signal	10
AF Response	5
AVC Characteristics	5
Gain	5
	100%

GLIDE SLOPE

Characteristics	Weighting
Centering Characteristics	15%
Frequency Channel Selection	15
Sensitivity and Deflection Characteristics	15
Selectivity	15
Deflection Linearity	10
90 and 150 cps Phase Characteristics	10
Alarm Signal	10
Deviation Indicator Stability w/change in Modulation Percentage	5
Deviation Indicator Stability w/change in 90 and 150 cps	5
	100%

The total weighted values were graphed for New, In-Use, and RFI equipment status.

(d). Basic Data - Basic Data are those obtained from tests made for each characteristic for which there is a standard requirement. The arithmetic mean and standard deviations were computed from the basic data obtained for each performance characteristic from New, In-Use, and RFI equipments. The bars in the graphs indicate the means. The standard deviations are tabulated on the applicable graphs. In the review of the data in Section c(2), references to the performance of equipment imply that the average of the data is being considered, unless otherwise stated.

Most of the navigation equipments used separate indicators. Since these meters were part of cockpit panel installations, they were not removed for tests. Deflections were, therefore, recorded in terms of current flow through a standard microammeter. The results must be interpreted as characteristic of the equipment and not of the indicators.

After data was obtained from "as is" In-Use equipment, some of the units were re-adjusted, completely in accordance with the manufacturer's adjustment procedures. The RTCA standards tests were then repeated in order to ascertain whether misalignment contributed to performance degradation.

(e). Interference Measurements - Interference measurements were made in RCA's Interference Laboratory at Camden, New Jersey. The raw data have been consolidated into tables, one for each equipment tested. Included

which equipment failed to meet the requirements.

(f). Survey of Field Facilities - A checklist was prepared to help the RCA engineers and technicians in the field collect facility maintenance information. This information is useful in determining factors which contribute to degradation in equipment performance. The requested information applied to the equipment(number, types, test procedures, calibration intervals, spares, failures, time between failures, ease of maintenance, etc.), test facilities, and personnel (types, experience).

(g). Confidence Limits - Table 1, Page C-356, shows a confidence curve, based on Student's t- distribution, for various sample sizes. To illustrate the use of this curve, assume 80% confidence is desired with a sample size of 3. Note the corresponding ordinate for the curve: $\bar{x} = \pm 1.34$. The product of this ordinate and the standard deviation for the sample gives the range of values in which the mean of the characteristic for the total population of like equipments can be found with a probability of 0.80. Table 1 also gives the limits of the performance characteristics for confidence levels of 90%, 80%, and 70%.

(2). Evaluation.

(a). Marker Beacons.

1. MB-1.

a. Reduced and Weighted Data - The graph of the reduced data, Page C-44, shows compliance with all of the RTCA standards to which weighting values have been applied. The rated audio power output indicates extremely high performance; however, the applied manufacturer's rated minimum output of 1 milliwatt was considerably less than the manufacturers' rated output for the other marker beacons tested. For actual performance of the equipment in this capacity, the basic data should be examined. The results of the weighted performance, Page C-45, indicate a slight degradation of performance for In-Use equipments. The RFI equipments show somewhat poorer performance than In-Use equipments. The lamp-operate selectivity test is for equipment designed to operate three lamps, one for each of three modulation frequencies, and was not, therefore, applicable to the MB-1 which operates but one lamp.

b. Basic Data - The spread of the output in the audio frequency response test, Page C-46, averages less than 1 db for New, In-Use, and RFI MB-1's. This is considerably less than the RTCA maximum acceptable level of 9 db. The lamp frequency response deviation, Page C-47, was about 3 db, well under the 9 db maximum acceptable level. Audio level characteristics were also acceptable, as shown on Page C-48, with an average maximum deviation of only about 3 db. The average audio power output, shown on Page C-49, was about 80 milliwatts. This is considerably greater than the manufacturer's rated minimum level of 1 milliwatt. The receiver signal-plus-noise ratios for the specified RF signals, Page C-50, were about 50 db for New units, 22 db for In-Use units, and about 34 db for RFI units. The RTCA minimum acceptable level is 20 db. In-Use equipments show degradation in this characteristic, although the results are acceptable. However, the large New and In-Use standard deviations indicate a wide scattering of data for these conditions. The signal-plus-noise to noise ratio, for the noise level test without signal, was also found to be satisfactory, Page C-51. In this test, too, the ratios for the New units, at about 72 db, were well above the RTCA minimum acceptable level of 35 db, whereas the In-Use and RFI ratios were considerably less, although acceptable, at 45 db. On Page C-52, the distortion levels are all below the maximum acceptable level of 30%. The In-Use distortion is a little higher than 30% in the other conditions. The input operating differentials, plotted on Page C-53, are less than 2 db, more than 4 db under the RTCA maximum acceptable level of 6 db (2:1 ratio). The input signal levels required to produce lamp operate threshold for the nose bandwidth test were all under the RTCA maximum acceptable level of 6 db, Page C-54.

c. Interference Tests - The unit subjected to the interference tests met the RTCA requirements for spurious response, cross modulation, cable-conducted interference (RF energy emission), and sensitivity depression with TV signals, Pages C-55 and C-56. However, RF emission at the antenna input was found at 68.1 mc, and sensitivity depression was affected by FM signals at 74.35, 74.6, 75.4, 75.68, and 75.98 mc.

d. Temperature Variation Test - The maximum nose bandwidth ratio obtained in the temperature variation test was less than 1 db, Page C-57, more than 5 db under the RTCA maximum acceptable level.

2. MB-2.

a. Reduced and Weighted Data - From Page C-60, it may be seen that marker beacon MB-2 met all the weighted requirements except for audio level characteristics (RFI), audio power output at 3000 cps (RFI), and

nose bandwidth (RFI). The weighted performance, Page C-61, shows the In-Use performance to be as good as the New, with RFI performance considerably poorer.

b. Basic Data - Page C-62, audio frequency response, shows the maximum deviation of the audio output to be more than 6 db below the RTCA maximum acceptable level of 9 db. The lamp frequency response maximum acceptable deviation of 9 db was exceeded by about 10 db by RFI units, as shown on Page C-63. It should be noted, however, the RFI bar represents the average for only two units. The lamp-operate threshold could not be obtained for the third RFI unit at the extreme of the specified audio frequency ranges. Audio level characteristics were satisfactory, Page C-64, as was audio power output, Page C-65, except for RFI equipment, which had an average output of about 82 milliwatts at 3000 cps. The manufacturer's rating of 100 milliwatts minimum was used to reduce this data. The standard deviations indicate a generally wide scattering of data. The requirements for audio noise level, with and without signal, Pages C-66 and C-67, were met satisfactorily, as was distortion, Page C-68, and input operating differential, Page C-69. New and In-Use units met the nose bandwidth requirement, Page C-70; but RFI units averaged about 10 db above the maximum acceptable level at the ± 10 kc points. The large RFI standard deviation indicates widely scattered results. The lamp-operate selectivity ratio was met by all the units tested, Page C-71.

c. Interference Tests - Tests for spurious response, cross modulation, antenna conducted interference (RF energy emission), and sensitivity depression were met satisfactorily, Pages C-72 and C-73. Cable-conducted interference capability was found at 15.25 and 23 mc.

d. Temperature Variation Test - The MB-2 was subjected to the temperature test of procedure A, Paragraph VIII of RTCA Paper 100-54/DO-60, instead of Procedure B. Although Procedure A is more stringent, the unit's maximum nose bandwidth ratio was about 1.5 db under the RTCA maximum acceptable level of 6 db, Page C-74.

3. MB-3.

a. Reduced and Weighted Data - The reduced data on Page C-78 indicates satisfactory performance except for audio power output (New) at 400, 1300, and 3000 cps, and lamp-operate selectivity (RFI) at 1300 cps. The weighted performance, Page C-79, indicates a slight degradation of performance of In-Use equipment.

b. Basic Data - Audio frequency response, lamp frequency response, and audio level characteristics, Pages C-80 through C-82, were satisfactory. In-Use units averaged about 55 milliwatts of audio power output at the three test frequencues; this was 45 milliwatts less, Page C-83, than the manufacturer's minimum acceptable level. New units averaged between 120 and 160 milliwatts. The RTCA minimum acceptable levels for audio noise level, with and without signal, Pages C-84 and C-85, were exceeded by large margins; distortion levels, Page C-86, were about half the RTCA maximum acceptable level of 30%. The requirements for input operating differential, Page C-87, and nose bandwidth, Page C-88, were also met satisfactorily. The maximum acceptable level of 30% for lamp-operate selectivity was met satisfactorily, except that RFI units at 1300 cps had an average level of 32% as shown on Page C-89.

c. Interference Tests - The interference tests were met satisfactorily, Pages C-90 and C-91, except in the following respects:

Cable conducted interference: Emission greater than 200 microvolts at 23 mc on +28 volt line.

Antenna Conducted Interference: Emission greater than 400 micromicrowatts at 220 and 230 mc.

d. Temperature Variation Test - An MB-3 unit was subjected to the temperature variation test of Procedure A, Paragraph VIII of RTCA Paper 100-54/DO-60, instead of to the applicable Procedure B. Although the test was more stringent, the maximum nose bandwidth ratio obtained was about 2.3 db, well under the RTCA maximum acceptable level of 6 db, Page C-92.

(b). VOR.

1. VO-1.

a. Reduced and Weighted Data - The reduced data, Page C-96, indicates that some or all of the VO-1 units failed to meet the requirements bearing accuracy (negative error), deflection linearity, selectivity (6 db-down), and alarm signal. The requirements for bearing accuracy (positive error), channel accuracy, AF response, AVC characteristics, gain and deflection sensitivity were met satisfactorily. The weighted performance, Page C-97, shows some degradation from New performance.

b. Basic Data - The bearing error with 95% probability, measured in accordance with the RTCA standards, was less than the specified limit of 2.7° except for In-Use equipment, which had an average extreme error of 3.0°, Page C-98. Adjustment of two units in accordance with manufacturer's recommended procedures resulted in a reduction in the positive error to about 0.4°, but an increase in the negative error to almost 5°. Deflection linearity is shown on Pages C-99, C-101, and C-103, for three ratios of phase angle required to produce the specified deflections. The In-Use units failed to meet the requirements under all three conditions at input voltages of 10 and 1000 microvolts; RFI units failed at all conditions and at all voltage inputs. New equipments failed the full scale deflection test, Page C-103, with 10 microvolts input.

Pages C-100, C-102, and C-104 show the change in results obtained when two equipments with unacceptable linearity were adjusted in accordance with the recommended procedures. In all three conditions, the average deflection linearity fell within the RTCA limits except at input voltages of 1000 microvolts. The phase difference required to produce standard deflection and the symmetry of deflection for this phase difference met the RTCA requirements satisfactorily, Page C-105. Page C-106 shows some degradation of the average deflection sensitivity performance after adjustment.

In-Use and RFI equipments had 6 db-down bandwidths of about 36 kc, Page C-107, about 6 kc less than the minimum of 42.2 kc determined from the applicable RTCA standard. New equipments had an average bandwidth of about 48 kc. The 60 db-down bandwidths were between 70 and 95 kc, well under the maximum calculated bandwidth of 174.6 kc. Page C-108 shows that adjustment of two of the In-Use units resulted in improvement of both the 6 and 60 db-down bandwidths. The test for alarm signal, Page C-109, was performed using a current of 250 microamperes as the criterion for determining acceptability of results. This value was obtained by measuring the actual currents required to actuate VO-1 alarm signal devices. It also permitted a quantitative comparison of the results. The figure shows that, except for the test without RF signal, In-Use equipment had currents at or in excess of the 250 microampere level, where this was the maximum acceptable. All equipments had flag-alarm currents greater than 250 microamperes, where this value was used as the required minimum for no flag indication. Adjustment to two In-Use equipments resulted in a reduction in the alarm current in all test conditions and a degradation with the input signal at 10 microvolts, Page C-110. The requirements for audio frequency response, AVC characteristics and gain were met satisfactorily, as shown on Pages C-111 through C-113, respectively. The one unit checked for audio frequency response and AVC characteristics after adjustments showed a slight increase in the measured variations. The noise levels, Page C-114, were greater than the RTCA minimum acceptable level of 25 db. The unit checked after adjustments showed a small decrease in signal-plus-noise to noise ratio.

c. Interference Tests - The VO-1 met all the interference tests satisfactorily, Pages C-115 and C-116. No deflection of the deviation indicator was noted in the test for operation of two VOR receivers from the same antenna.

d. Temperature Variation Test - The unit subjected to the temperature variation test had a shift in center response frequency of +7 kc in the -55°C environment, and -5 kc in the +55°C environment, Page C-117. The RTCA allowable shifts are +21.1 kc and -23.1 kc.

2. VO-2.

a. Reduced and Weighted Data - From Page C-120 it is seen that the VO-2 equipments failed to meet the following applicable requirements: bearing accuracy, positive error (In-Use); bearing accuracy, negative error (New); deflection linearity; deflection sensitivity, selectivity, 6 db-down bandwidth (In-Use); alarm signal (New and RFI); gain (New).

The weighted data, Page C-121, indicates virtually no degradation of performance of In-Use units. RFI units show slightly superior overall performance than either New or In-Use units.

b. Basic Data - The bearing accuracy error for RFI units were within the RTCA limit of 2.7°, Page C-122; however, New units had a negative extreme error of about 3.5°, and In-Use units had an extreme error of about 4.2°. The results of the tests for deflection linearity, shown on Pages C-123 through C-125, indicate noncompliance with the RTCA requirements by In-Use units for all deflection ratios at input voltages of 1000 and 10,000 microvolts. The RFI units failed all conditions at all three specified input voltages except for the 10:1 deflection ratio with 10,000 microvolts. New equipments failed marginally in the test for 10:1 deflection ratio with 1000 microvolts input. Deflection sensitivity requirements were met satisfactorily, Page C-126, by all units tested. The selectivity measurements, shown on Page C-127, indicate an approximately rectangular curve, with 6 db-down bandwidth of about 40 kc, and 60 db-down bandwidth about 60 kc. Only In-Use units with an average 6 db-down bandwidth of about 17.5 kc failed to come up to the RTCA minimum requirement of 36.2 kc. However, the large standard deviations for In-Use and RFI units at the 6 db-down bandwidths indicate a wide scattering of data.

The alarm signal results, Page C-128, show that In-Use units failed to meet four of the six applied conditions, and RFI units failed to

meet three of the six conditions. New units met the requirements satisfactorily under all conditions. The requirements for audio frequency response and AVC characteristics were met satisfactorily, Pages C-129 and C-130. The input voltages required to produce the equipment rated output of 300 milliwatts in the gain test were about 8 microvolts for In-Use units and 4 microvolts for RFI units, well below the RTCA maximum acceptable level of 20 microvolts, as shown on Page C-131. New units, however, required an average of almost 50 microvolts to produce the same rated output.

The signal-plus-noise to noise ratios for all units averaged about 34 db, about 9 db more than the RTCA minimum acceptable level for the noise level test, Page C-132.

c. Interference Tests - The unit subjected to the interference tests met all the requirements, Pages C-133 and C-134, except for antenna conducted interference, where emission greater than 400 micro-microwatts was found at 102, 511, and 615 mc.

The test for operation of two receivers from the same antenna showed no deviation of the test unit indicator when the second unit was tuned over the VOR frequency band.

d. Temperature Variation Test - One unit was subjected to temperature extremes of -55°C and +55°C in the temperature variation test. The maximum shift in center response frequency was only 2 kc, as shown on Page C-135, considerably under the maximum specified allowable shift of 18.1 kc.

3. VO-3.

a. Reduced and weighted Data - The reduced characteristics, Page C-138, failed to meet the RTCA performance standards as follows:

Bearing Accuracy - Positive Error (New and RFI).

Bearing Accuracy - Negative Error (New and RFI).

Selectivity - 6 db-down (New).

Deflection Linearity.

Selectivity - 60 db-down (In-Use and RFI).

Audio Frequency Response.

Gain (In-Use and RFI).

The weighted data, Page C-139, indicates an apparently large degradation of equipment performance with use. A statistical check, however, of the differences in the data for New and In-Use units shows no significance at the 5% level of significance. It is interesting to note the very poor overall performance of RFI units.

b. Basic Data - The average 95% probability errors were greater in all cases than the RTCA maximum limits of 4.2^{o} for bearing accuracy, Page C-140. The extreme error for both New and In-Use units was as great as 15^{o}, and as great as 10^{o} for RFI units. The results of the deflection linearity tests, Pages C-141 through C-143, show that the required phase angle ratios met the RTCA limits only for the following conditions:

5:1 Standard Deflection Ratio - 1000 microvolts (RFI).

5:1 Standard Deflection Ratio - 10,000 microvolts (RFI).

10:1 Standard Deflection Ratio - 10,000 microvolts (New).

The units failed all the other conditions.

Deflection sensitivity was satisfactory, Page C-144, both for the phase difference producing standard deflection and for deflection symmetry. The 6 db-down bandwidth of the VO-3's averaged more than 35 kc greater than the RTCA minimum acceptable level of 40 kc, as shown on Page C-145. Only the New units met the 60 db-down maximum bandwidth requirements of 320 kc, although the standard deviation was very large. In-Use and RFI units had 60 db-down bandwidths of about 480 kc. None of the units tested met the RTCA requirement for audio frequency response, Page C-146. The average variation was about 9 db, 3 db more than the RTCA maximum acceptable level. The AVC characteristics, Page C-147, were satisfactory, although In-Use and RFI units had much greater audio output variations than New units. Only New

units met the RTCA maximum acceptable level of 20 microvolts in the sensitivity test, Page C-148. In-Use units and RFI units averaged inputs of about 97 and 185 microvolts, respectively, although the standard deviations show a wide scattering of data.

The signal-plus-noise to noise ratios for all units tested averaged about 30 db, 5 db more than the RTCA minimum acceptable level, as shown on Page C-149.

c. Interference Tests - The VO-3 which was subjected to interference tests failed to meet the requirements in the following respects, Pages C-150 and C-151:

Spurious Response: Response less than 60 db-down at 124.6 mc.

Cross Modulation and Intermodulation: Bearing error of 5.5° near 114.7 mc.

Antenna Conducted Interference: Emission greater than 400 micromicrowatts at 116.5, 349, 469, and 585 mc.

Susceptibility to Radar-Type Signals: Susceptibility probable in the following ranges: 124.6 to 143.0 mc, 170.0 to 197.5 mc, 178.0 to 206.0 mc, 223.0 to 261.5 mc, 228.0 to 260.5 mc, 241.0 to 277.5 mc, 340.0 to 395.0 mc, 690.0 to 798.5 mc, (The frequency synthesis is shown on Page C-152).

The operation of two receivers from the same antenna showed deflection from center position of 0.7° for the deviation indicator at 112.0 mc for all frequencies of the second receiver.

d. Temperature Variation Test - The unit was subjected to extreme temperatures of -10°C and +55°C. The maximum shift in center frequency, shown on Page C-153, was 108 kc, and occurred at the low temperature. This was slightly less than the RTCA maximum allowable shift of 114.9 kc. At +55°C, the shift was 45 kc.

4. VO-4.

a. Reduced and Weighted Data - The reduced data, Page C-156, shows failure to comply with the RTCA requirements as follows:

Bearing Accuracy - Positive Error (All).

Bearing Accuracy - Negative Error (In-Use and RFI).

Deflection Linearity - (In-Use and RFI).

Alarm Signal - (All).

Gain - (All).

The weighted data, Page C-157, reflects the poor gain characteristics of the New and In-Use units tested. If the gain factor were eliminated, the weighted ratings would be about 1.8 and 1.3 for New and In-Use performance, respectively; the RFI rating would show little change. Despite the apparent degradation, an examination of the standard deviations for all the characteristics (note the large standard deviation for the gain data) shows that no statistical significance can be attached to the difference in performance.

b. Basic Data - The RTCA requirement for bearing accuracy (maximum error not greater than 2.7°) was met marginally by the New units, Page C-158. In-Use units had an average negative error of 3.3°, and RFI units had an average negative error of 3.8°. The deflection linearity requirements were met, Pages C-159 through C-161, except as follows:

5:1 Standard Deflection Ratio - 1000 microvolts (RFI).

5:1 Standard Deflection - 10,000 microvolts (RFI).

10:1 Standard Deflection Ratio - 10 microvolts (New).

10:1 Standard Deflection Ratio - 1000 microvolts (RFI).

10:1 Standard Deflection Ratio - 10,000 microvolts (New and RFI).

Full Scale Deflection Ratio - 1000 microvolts (In-Use and RFI).

Full Scale Deflection Ratio - 10,000 microvolts (RFI).

The requirements for deflection sensitivity were met satisfactorily, Page C-162. The selectivity requirements were also met satisfactorily, Page C-163, except marginally at the 60 db-down bandwidth requirement of 320 kc.

The maximum acceptable flag-alarm level of 250 microamperes, determined from actual measurements of flag-alarm currents, was exceeded in all conditions except for that with no RF signal applied, and for RFI units in the absence of 9960 cps and for In-Use units, Page C-164. Page C-165 shows that adjustment of two VO-4 units actually resulted in degradation of the alarm signal performance. Audio frequency response and AVC characteristics, Pages C-166 and C-167, met their respective requirements satisfactorily. However, gain tests, Page C-168, show that the average input levels required to produce rated output of 170 milliwatts were all in excess of the RTCA maximum acceptable level of 20 microvolts. In-Use units were particularly poor, requiring an average of 350 uv to produce rated output. The standard deviations indicate a wide scattering of the measured data, expecially for New and In-Use units.

The RTCA noise level requirement of at least 25 db for signal-plus-noise to noise ratio was met satisfactorily by all units tested, Page C-169.

c. Interference Tests - The units subjected to interference tests met all requirements satisfactorily, Pages C-170 and C-171, including susceptibility to radar-type signals and operation of two receivers from the same antenna.

d. Temperature Variation Test - The frequency shift at the temperature extremes of $-55^{o}C$ and $+55^{o}C$ was -37 kc and -39 kc, respectively, as shown on Page C-172, both within the maximum acceptable shift of 114.9 kc.

5. VO-5.

Only New units of this equipment are reported here, since these were the only units that could be obtained for tests. The converters which make the basic equipment operate as VOR receivers are scarce, and the combination was not available for tests.

a. Reduced and Weighted Data - The New units failed to meet the requirements for bearing accuracy, deflection linearity, selectivity at the 60 db-down level, and audio frequency response, as shown on Page C-176. The weighted data, Page C-177, for the New equipment may be used to gauge the performance of the New VO-5 units against other New VOR equipments, provided that only the same weighted characteristics are considered.

b. Basic Data - The maximum bearing error was found to be 5.8°, 1.6° greater than the RTCA allowable error, Page C-178. None of the phase angle ratios met the RTCA requirements for the three deflection angle ratios, as shown on Pages C-179 through C-181.

Deflection sensitivity was satisfactory, as shown on Page C-182, but the unit failed to meet the 60 db-down maximum bandwidth requirement of 320 kc by about 100 kc, Page C-183. The output variation in the audio frequency response test was about 1.2 db greater, as shown on Page C-184, than the RTCA maximum acceptable level of 6 db. The AVC characteristics and gain input levels were within the RTCA limits, Pages C-185 and C-186. The average signal-to-noise ratio for the New units was greater than 35 db, more than 10 db over the minimum acceptable level, Page C-187.

c. Interference Tests - The unit tested for interference failed the cross modulation and intermodulation test with a bearing error of 5.1° at 114.69 mc, and the antenna conducted interference test with emission greater than 400 micro-microwatts at 123 and 500 mc, as shown on Pages C-188 and C-189. No susceptibility to radar-type signals was found.

The test for operation of two receivers from the same antenna showed no deflection of the deviation indicator from its central position.

d. Temperature Variation Test - The maximum shift in center response frequency was 135 kc, as shown on Page C-190. This occurred at -10°C, and was greater than the RTCA maximum allowable shift of 114.8 kc. The shift at +55°C was about 76 kc.

6. VO-6.

a. Reduced and Weighted Data - The reduced data on Page C-194 shows that the VO-6 units tested failed to meet the requirements for bearing accuracy, deflection linearity, selectivity (60 db-down), and gain. Measurements of deflection indications could not be made because New and In-Use VO-6's were not provided with micro-ammeters, and the RTCA standards were not applicable.

The weighted data, shown on Page C-195, is based only on those characteristics for which measurements could be made on New, In-Use

and RFI units: bearing accuracy, selectivity, AF response, AVC characteristics, and gain. In addition, the data presented for New performance are based on the average results from tests on only two units, which were all that could be obtained. The generally poor performance indicated is influenced primarily by two of the factors: bearing accuracy and gain. The data indicates a trend toward poorer performance of In-Use than New units; however, the difference cannot be established as statistically significant.

b. Basic Data - None of the units tested met the RTCA maximum limits of 4.2° for bearing error. The average maximum errors for New, In-Use, and RFI units were 20°, 41°, and 50° respectively, Page C-196. The data was widely scattered as indicated by the large standard deviations. The RFI units, which were the only ones that could be subjected to the deflection linearity tests, failed to meet the RTCA limits for the various deflection angles considered, Pages C-197 through C-199. However, they did meet the RTCA requirements for deflection sensitivity, as shown on Page C-200. The 6 db-down minimum bandwidth limit of 40 kc was met satisfactorily, Page C-201; but the maximum limit of 320 kc was exceeded by from 40 to 110 kc. Audio frequency response and AVC characteristics were satisfactory, Pages C-202 and C-203. None of the average input values required to produce rated output for the gain tests, Page C-204, were below the RTCA maximum acceptable level of 20 microvolts: New units averaged 2500 microvolts; In-Use units, 10,000 microvolts; and RFI units 1000 microvolts. A wide scattering of data is indicated by the standard deviations of these measurements.

The RTCA minimum acceptable signal-to-noise ratio requirement of 25 db was met by In-Use and RFI equipments, Page C-205; but the average for the two New units tested was about 23.5 db.

c. Interference Tests - The interference tests were met satisfactorily, Pages C-206 through C-208, except in the following respects:

Spurious Response: Output less than 60 db-down at 8.5, 9.1, 10.5, 13.6, 15.2, 34.1, 45.4, 68, 120, 128, 129, 131, 134, 240, 262, 366, 388, 487, and 510 mc.

Antenna Conducted Interference: Emission greater than 400 micro-microwatts at 125, 250, 372, 510, and 630 mc.

Susceptibility to Radar-Type Signals: Susceptibility was found to radar-type signals at 31 frequencies between 102.0 and 870.0 mc.

No deflection of the deviation indicator was observed in the test for operation of two VOR receivers from the same antenna.

d. Temperature Variation Test - The maximum shift in center response frequency of the VO-6 subjected to the temperature variation test was 100 kc. This occurred at the -10°C temperature extreme, Page C-209. The shift at +55°C was about 60 kc. Both frequency shifts were within the RTCA maximum allowable shift of 114.8 kc.

(c). Localizer Receivers.

1. LO-1.

a. Reduced and Weighted Data - The percent performance data shown on Page C-212 indicates failure of the LO-1 to meet the RTCA requirements for deflection linearity and percentage modulation characteristics (In-Use).

The weighted data, Page C-213, indicates some degradation in performance of In-Use equipment. The RFI equipment shows better performance than New equipment.

b. Basic Data - The largest indicator deviation obtained in the centering characteristics test, Page C-214, was about 4.7 microamperes for In-Use units. This was less than the RTCA maximum acceptable deviation of 9.0 microamperes. Adjustment of the units according to the manufacturer's recommended procedure reduced the deviations to very low average values. The 6 db and 60 db-down bandwidths were satisfactory for all units, Page C-215. Adjustments to In-Use units produced negligible changes. Sensitivity and deflection characteristics were satisfactory over the range of voltage inputs from 40 to 20,000 microvolts, as shown on Page C-216. Adjustments to the In-Use units resulted in improvement of the average characteristic.

The RTCA maximum acceptable ratio of 1.0 (for ratio of difference in depth of modulation to deflection with respect to 10%) for deflection linearity was exceeded by New units and by In-Use units, Page C-217, the latter having an average ratio 70% in excess of the requirement. The adjustment of the In-Use units brought the linearity below the maximum acceptable ratio of 1.0 to about 0.74.

The alarm signal data, Page C-218, was evaluated on the assumption (made from actual measurements) that alarm meter currents less than 250 microamperes caused the alarm device to show, and that currents greater than 250 microamperes kept the device from showing. The alarm signal test was met satisfactorily under all specified conditions. Page C-219 shows that adjustment of In-Use units caused little change in the alarm signal characteristics.

The deviation indicator stability tests show, Page C-220, that the deviations from center position and standard deflection were less than the maximum amount considered acceptable by the RTCA paper. The In-Use units, which gave poorer results than New or RFI units, showed marked improvement when adjusted. Page C-221, percentage modulation characteristic, shows that In-Use equipment had indicator deviations greater than the RTCA maximum acceptable limit of 4.5 microamperes, exceeding this limit when the 90 and 150 cps modulation levels were increased from 20% to 25%. However, the large standard deviation indicates a very large spread of data for the three units tested. Adjustment resulted in considerable improvement of the average deviation of the In-Use units and in a reduction of the standard deviation.

Page C-222 shows the failure of In-Use units to meet the deviation indicator sensitivity adjustment range test requirements for centering characteristics at 40 and 20,000 microvolts. Adjustment of the In-Use units reduced the deviations to values well below the RTCA maximum acceptable levels for the extreme sensitivity settings for 0.4 and 0.8 full-scale. The sensitivity adjustment range test for sensitivity and deflection characteristics, Page C-223, was met satisfactorily by the LO-1 units, with In-Use units showing even better performance with adjustment. The deflection linearity ratios for New and In-Use equipment were greater than the RTCA maximum acceptable ratio of 1.0 under the deviation indicator sensitivity adjustment test, Page C-224. The In-Use ratios improved considerably with adjustment. The audio output variation in the audio frequency response test, Page C-225, was less than the RTCA maximum acceptable level of 9 db. Two In-Use units showed response improvement of about 1 db after adjustment.

c. Interference Tests - The unit subjected to the interference tests failed to meet the cable conducted interference test, Pages C-226 and C-227, in which emission greater than 200 microvolts was detected at 20.6 mc. Operation of two receivers from the same antenna produced no deflection of the deviation indicator under test.

d. Temperature Variation Test - The maximum shift in center response frequency was 5 kc during the temperature variation test, Page C-228. This occurred at -55°C, and was well within the RTCA acceptable deviation of 12 kc. The maximum deviation indicator change, with a centering signal applied, was only about 1% of standard deflection (15% allowed); and the maximum deflection with a deviation signal applied was less than 6% of standard deflection (30% allowed).

2. LO-2.

a. Reduced and Weighted Data - The reduced data on Page C-232 indicates failure of RFI LO-2's to meet the 6 db-down bandwidth requirements. In-Use units show marginal performance in the deflection linearity ratio test, and RFI units had marginal results for the deviation indicator stability test with deflection signal.

The weighted data, Page C-233, shows the performance of RFI equipment to be slightly inferior to New or In-Use equipment. The overall performance, however, is high.

b. Basic Data - The indicator deviations measured under centering characteristics, Page C-234, were all less than the RTCA maximum acceptable deviations corresponding to 9 microamperes. In-Use units had the worst average deflection, 2.5 microamperes. Selectivity and sensitivity and deflection requirements were met satisfactorily as shown on Pages C-235 and C-236, respectively. The maximum deflection linearity error throughout the deviation indicator range was slightly greater than the RTCA maximum acceptable error for In-Use units. This is shown, on Page C-237, as a ratio slightly more than 1.0.

The alarm signal requirements were met by all the LO-2's tested, Page C-238, and the deviation indicator deflections were within the RTCA requirements except for RFI units, which had an average deflection of 2.7% more than the allowable 15% of the standard deflection when both modulation signals were varied from the nominal frequencies, Page C-239. In tests for percentage modulation characteristic, Page C-240, and deviation indicator sensitivity adjustment centering characteristics, Page C-241, and sensitivity and deflection characteristics, Page C-242, were met satisfactorily. The deflection linearity failed to meet the RTCA requirements at the deviation indicator sensitivity adjustments of 0.4 and 0.8 full scale, except for In-Use units at the 0.8 full scale setting, as shown on Page C-243. The large standard deviation for the In-Use average at the 0.8 full scale setting

indicates a large scatter of the sampled data. The maximum output variation in the audio frequency response tests, shown on Page C-244, was about 7 db below the RTCA maximum acceptable level.

c. Interference Tests - The LO-2 tested met all the requirements of the interference tests, Pages C-245 and C-246, including operation of two receivers from the same antenna and susceptibility to radar-type signals.

d. Temperature Variation Test - The units subjected to the temperature variation test showed a center response frequency shift of 3 kc at the temperature extremes of $-55^{\circ}C$ and $+55^{\circ}C$, as shown on Page C-247. This shift is within the RTCA allowable shift of 12 kc. The deviation indicator deflections with the centering signal and deviation signal were also less then the maximum acceptable deviation.

3. LO-3.

a. Reduced and Weighted Data - From Page C-250, it is seen that the LO-3 failed to meet the requirements for sensitivity and deflection, deflection linearity ratio (In-Use), and two conditions for the alarm signal.

On Page C-251, weighted performance, it may be seen that In-Use equipment performance was somewhat better than that of New equipments, and RFI performance was better than that of In-Use equipments.

b. Basic Data - Centering characteristics and selectivity requirements, Pages C-252 and C-253, respectively, were met satisfactorily. The deviation indicator deflection, however, was about 15% more than the RTCA maximum acceptable deviation of 20% for the sensitivity and deflection test, Page C-254. In the test for deflection linearity, only the average for In-Use units exceeded the maximum acceptable RTCA error, as shown on Page C-255. All the units failed the alarm signal test, Page C-256, when the percentage modulation of the 90 and 150 cps signals was zero for one and 20% for the other. The reference level is based on the assumption that the alarm signal shows when the current is less than 250 microamperes. The deviation indicator stability test was met satisfactorily, as shown on Page C-257. The deviation indicator deflections measured in the percentage modulation characteristic test, Page C-258, were found to be within RTCA limits. A second set of limits is shown for the In-Use units to allow for an average

residual current of about 0.57 microamperes at the "center" position.

The centering characteristics of the LO-3's were satisfactory at the extreme sensitivity settings at 0.4 and 0.8 full scale, Page C-259; however, the deviations for sensitivity and deflection characteristics at the extreme sensitivity setting were marginal, falling at or near the RTCA limits, Page C-260. The RTCA maximum acceptable level for deflection linearity at the specified sensitivity settings was exceeded by the RFI average at the lower settings and by the In-Use average at the higher setting, Page C-261. The average for New units at the higher setting was slightly greater than the maximum acceptable level.

The audio frequency response requirements were met satisfactorily, Page C-262, the In-Use output variation averaging about 1.4 db greater than the New output variation.

c. Interference Tests - All the interference tests were met satisfactorily, as shown on Pages C-263 and C-264.

d. Temperature Variation Test - The shift in center response frequency and the deviation indicator deflections were all within RTCA limits at the extreme temperatures of -55°C and +55°C of the temperature test, Page C-265.

4. LO-4.

a. Reduced and Weighted Data - Since no In-Use or RFI LO-4's were available, the reduced data on Page C-268 shows the percent performance only for the New units tested. The results show failure to meet the RTCA standards in the following tests: sensitivity and deflection, selectivity (at the 60 db-down level), deflection linearity, and deflection signal deviation under the indicator stability test. The mean deviation obtained in the percentage modulation characteristic test was marginal.

Only the weighted performance of New units is shown on Page C-269.

b. Basic Data - The maximum deviation with centering signal applied over the range of input voltage from 40 to 20,000 microvolts was e-

quivalent to 1.8 microamperes, considerable under the RTCA maximum acceptable deviation of 9 microamperes for the centering characteristics test as shown on Page C-270. The 6 db-down bandwidth was 70 kc, as shown on Page C-271, 30 kc over the minimum acceptable level. The average maximum deflection of the deviation indicator in the sensitivity and deflection test, Page C-272, exceeded the RTCA maximum acceptable level of 20% by 11% over the range of input voltages from 40 to 20,000 microvolts. The results of the deflection linearity test, Page C-273, show that the measured error was 1.8 times greater than the maximum allowable error. The deviation indicator showed stability at the centered position, Page C-274, but did not meet the stability requirements for standard deflection at any of the modulating frequencies. When the modulation of the 90 and 150 cps signals was increased from 20% to 25%, deviation from centered position was slightly greater than the 5% of standard deflection considered acceptable, Page C-275.

The maximum variation in the audio frequency response test, Page C-276, was nearly 7 db, about 2 db below the RTCA maximum acceptable variation of 9 db.

c. Interference Tests - The LO-4 subjected to the interference test failed, as shown on Page C-277 and C-278, in the following respects:

Spurious Response: Output less than 60 db below the response frequency of 127 mc.

Cross Modulation: Deviation indicator departure from centered position greater than 10% of standard deflection at 110.394 and 110.365 mc.

Antenna Conducted Interference: Emission greater than 400 micromicrowatts at 119 and 480 mc.

In addition, susceptibility to radar-type signals was found in the frequency range from 102 to 144 mc at the center response frequency of 110.1 mc.

d. Temperature Variation Tests - The unit subjected to the temperature variation test was exposed to temperature extremes of -10°C and +55°C, Page C-279. The shift in center response frequency was +146 kc at +55°C and -122 kc at -10°C. Both shifts were greater than the maximum acceptable shift of 110.3 kc. In addition, at -10°C the deviation indicator

deflection with centering signal was twice the acceptable deviation; and the deflection with deviation signal was almost 70%, more than twice the acceptable deviation of 30%.

(d). ILS Glide Slope.

1. GS-1.

a. Reduced and Weighted Data - The reduced data on Pages C-282 and C-283 show failure of the GS-1 to comply with the RTCA requirements for sensitivity and deflection characteristics (with input voltages from 200 to 30,000 microvolts), deflection linearity, 90 and 150 cps phase characteristics (RFI), alarm signal (some conditions), and deviation indicator stability with change in frequency (some conditions).

The weighted performance, Page C-284, shows virtually no difference in overall performance of New and In-Use units. The RFI performance is comparable to the others, but slightly lower.

b. Basic Data - The average deflection of the deviation indicator from its centered position, measured in the test for centering characteristics and shown on Page C-285, was 4.6%, 1.7%, and 1.5% for New, In-Use, and RFI units, respectively. These values meet the RTCA maximum acceptable deflection of 5% over the specified input voltage range. The average deviation from the nominal channel frequency, shown on Page C-286, was less than 30 kc for all the units tested. This was less than the 45 kc deviation allowable; however, the large standard deviations, especially for In-Use equipment, denote a wide spread of data and the probability that some individual measurements fall outside the maximum specified limits. The sensitivity and deflection characteristics show, on Page C-287, that over the input voltage range of 40 to 200 microvolts, the average of the maximum deviations of the indicator was within the RTCA limits, but over the range from 200 to 30,000 microvolts, the average maximum deviations were about 27% below the 200 microvolt deflection (the RTCA maximum allowable negative variation is 10%). The deviations of two units showed virtually no change after they were adjusted according to the manufacturer's procedures, Page C-288.

For the selectivity tests, Page C-289, the signal generator could not be swept over the -60 to +60 kc, -530 to -230 kc, and +230 to +530 kc

frequency ranges with any degree of accuracy. Measurements were taken at discrete frequencies, instead of f_c -450 kc, f_c -230 kc, f_c -60 kc, f_c +60 kc, f_c +230 kc, f_c +450 kc where the frequencies could be checked with a frequency counter. At these levels, the RTCA acceptable variations were met satisfactorily. It is highly probable that the levels at intermediate points of the selectivity curves met the requirements. As a check of the low and high frequency ends of the band, the response was checked at 328.77 mc with the receiver tuned to 329.3 mc and at 335.53 mc with the receiver tuned to 335.0 mc. The response under these conditions was considerably below the RTCA minimum acceptable level of 60 db down. The deflection linearity ratios were in excess of the RTCA maximum acceptable ratio of 1:1, Page C-290, although In-Use performance came close to meeting this requirement. Two units adjusted after tests actually showed poorer linearity when rechecked. Only the average deviation for RFI units exceeded the RTCA maximum acceptable deviation of 5% of standard deflection (=4.5 microamperes), when the phase relationship between the 90 and 150 cps signals was varied from the extremes of positive peaks adding to a maximum to negative peaks adding to a maximum, Page C-291. Two units adjusted afterwards showed a slight improvement of this characteristic.

The units tested failed to meet the alarm signal tests, Page C-292, in the following respects (using 250 microamperes as the reference level):

50% of Standard Deflection - In-Use.

0% Modulation of either 90 or 150 cps - All.

45% Modulation of either 90 or 150 cps - All.

22.5% Modulation of both 90 and cps - In-Use.

Adjustments to two In-Use units reduced the flag-alarm currents to within the acceptable level for two of four conditions, Page C-293. The random movements obtained in the indicator stability tests were less than the RTCA maximum acceptable levels at the prescribed input signal levels of 40 and 200 microvolts, as shown on Page C-294. Adjustments to one unit produced no change in indicator stability, Page C-295.

The deflection currents obtained at the extremes of the specified frequency ranges for standard glide slope deviation signal were within the RTCA limits, as shown on Page C-296. However, the deflection currents obtained with the standard glide slope centering signal exceeded the RTCA max-

mum acceptable deflection of 5% of standard deflection at the low limits of the specified frequency ranges (New units only) and at the upper frequency limits (In-Use and RFI). Page C-297 shows that adjustments of In-Use units improved the deviation indicator stability with frequency change.

The deviation indicator sensitivity range for the GS-1 was found to be about .18 to .96 of full-scale deflection with an input standard glide slope deviation signal of 200 microvolts, Page C-298. This range is well above the RTCA required minimum of 0.4 to 0.8 of full-scale deflection. No improvement was achieved with adjustment, as shown on Page C-299. The maximum centering deviations at the 0.4 and 0.8 of full-scale sensitivity settings were less than the RTCA maximum acceptable level of 5% of the standard deflection, Page C-300. Adjustment of 2 units improved the deflection characteristic at the high sensitivity setting, but impaired that at the low setting, as shown on Page C-300. The sensitivity and deflection characteristics at the sensitivity range 0.4 and 0.8 of full-scale settings, shown on Page C-301, were similar to those on Page C-287. The deflection was acceptable over the 200 to 30,000 microvolt input range for both sensitivity settings, but failed to meet the RTCA limits in the 40 to 200 microvolt range at both settings. From Page C-302 it is seen that adjustment of equipments produced no significant changes. Deflection linearity was poor at both indicator sensitivity settings, Page C-303, with In-Use linearity particularly poor at the 0.4 of full-scale setting. Improvement of deflection linearity with adjustments is evident on Page C-304 at both sensitivity settings.

Deviation indicator deflection of RFI units exceeded the RTCA maximum acceptable deflection of 4.5 microamperes by about 2.5 microamperes, as shown on Page C-305. The deviations for New and In-Use units were satisfactory.

c. Interference Tests - The GS-1 subjected to interference tests failed only to meet the cable conducted interference test in which emission greater than 200 microvolts was found at 23.4 mc on the +28 volt line, Pages C-306 and C-307.

d. Temperature Variation Tests - The shift in center response frequency and the deflection obtained with centering and deviation signals met the RTCA requirements satisfactorily at both extreme temperatures (-55°C and +55°C) of the temperature variation test, as shown on Page C-308.

2. GS-2.

a. Reduced and Weighted Data - Pages C-310 and C-311 show failure of the GS-2's to meet the requirements for the following weighted characteristics:

Selectivity - New (at the point 60 kc above the center frequency).

Deflection Linearity.

90 and 150 cps Phase Characteristics - In-Use (RFI was marginal).

Alarm Signal - RFI (marginal performance at some test conditions).

Deviation Indicator Stability with Changes in Frequency of 90 and 150 cps - In-Use and RFI.

The weighted performance, shown on Page C-312, indicates In-Use performance is less than that of New equipment. From the percent performance graphs, it may be seen that most of the degradation is due to the 90 and 150 cps phase characteristics, alarm signal data, and deviation indicator stability with changes in frequency.

b. Basic Data - Centering characteristics, Page C-313, and frequency channel selection deviations, Page C-314, were satisfactory, although the standard deviations for the frequency deviations on Page C-314 indicated a large scattering of data. Sensitivity and deflection characteristics were satisfactory both before and after adjustment, as shown on Page C-315. The selectivity data, shown on Page C-316, met the requirements except at 60 kc above the test frequency, where the average response variation for New units exceeded the RTCA maximum allowable variation of 6 db about 1/2 db. The response at $\pm$230 kc and $\pm$450 kc was considerably more than the minimum of 40 db-down required. The response at 530 kc below 329.3 mc and at 530 kc above 335.0 mc were also considerably more than 60 db below the response at center response frequency.

The deflection linearity, Page C-317, did not meet the RTCA requirements. The average maximum error for In-Use units was twice that allowed by the RTCA standards. Adjustment to one unit improved the linearity considerably. New equipments performed perfectly under the condition of the 90 and 150 cps phase characteristics test, Page C-318, but In-Use equipments

had an average deflection corresponding to about 3.7 microamperes above the RTCA maximum acceptable deviation equivalent to 4.5 microamperes.

Alarm signal requirements were met under all the test variations, Page C-319, except for marginal RFI performance with one frequency modulation at zero and the other at 45%. Again, large standard deviations, especially for In-Use results, indicate a large scattering of data. Adjustment made on one unit with low flag-alarm current flow increased the current in all instances except in the absence of RF signal or of 90 and 150 cps modulating frequencies, Page C-320. Indicator stability was found satisfactory, as shown on Page C-321.

The average deflection for New units with standard deviation signal input failed to meet the RTCA deflection requirement under the various combinations of modulating frequencies, as shown on Page C-322. The deflection with centering signal was beyond the RTCA maximum limit for RFI units at the high and low frequency extremes and for In-Use units with the combination of high frequencies. Page C-323 shows the considerable improvement achieved in one In-Use with adjustment.

The deviation indicator sensitivity control permitted adjustment of the indicator from zero to over 130% of full scale. The centering characteristics at 0.4 and 0.8 of full-scale indicator sensitivity adjustments were satisfactory, as shown on Page C-325, although In-Use performance was poorest. The figure also shows the extent of improvement achieved with adjustment of In-Use units. Sensitivity and deflection characteristics were found to be satisfactory, Page C-326, at the two indicator sensitivity settings. Adjustment according to the manufacturer's recommended procedures actually impaired the sensitivity and deflection characteristics at both sensitivity settings, as shown on Page C-327.

Deflection linearity at the sensitivity settings of 0.4 and 0.8 of full-scale did not meet the RTCA requirements, except for RFI units at the 0.8 of full-scale setting, Page C-328. Adjustment to one unit improved the deflection linearity, but not enough to meet the RTCA requirement.

Only two of the In-Use and two of the RFI units tested used an alternating current power source. The average deviation for these four units was well under the RTCA maximum acceptable deviation over the power source frequency range from 320 to 1000 cps, Page C-329.

c. Interference Tests - The interference requirements were met except as follows, Pages C-330 and C-331:

Cable Conducted Interference: Emission greater than 200 microvolts at 12.8 mc.

Antenna Conducted Interference: Emission greater than 400 micromicrowatts at 26, 310, and 1032 mc.

d. Temperature Variation Test - One unit was subjected to temperatures of -55°C and +55°C in the temperature variation test. The frequency shift and indicator deflections were found to be within the prescribed RTCA limits, as shown on Page C-332.

3. GS-3.

a. Reduced and Weighted Data - The GS-3 failed to meet the requirements for the following weighted characteristics, Pages C-334 and C-335:

Sensitivity and Deflection Characteristics - 200 to 30,000 microvolt range.

Deflection Linearity - In-Use and RFI (Marginal).

90 and 150 cps Phase Characteristic - In-Use and RFI.

Alarm Signal - New and RFI (Marginal).

Deviation Indicator Stability with changes in Frequency of 90 and 150 cps - New (one condition only).

The weighted performance, Page C-336, indicates the performance of In-Use units to be about the same as that of New units.

b. Basic Data - The deviations obtained in the centering characteristics test, shown on Page C-337, were less than the RTCA maximum acceptable level. The maximum average displacement of the center response

frequency from the nominal channel frequency was found to be less than 6 kc, considerably less than the RTCA limit of 45 kc, Page C-338. The indicator deflection with standard deviation signal applied was within the RTCA limits for input voltages between 40 and 200 microvolts, as shown on Page C-339, but was greater than the maximum negative limit of -10% for input voltages between 200 and 30,000 microvolts, Page C-339. The excessive deviations at the latter conditions occurred at the high end of the input voltage range.

The db variations at the ±60 kc test points with respect to the center response frequency, Page C-340, were less than the RTCA maximum acceptable variation of 6 db. At the ±230 kc test points, the response in all cases was more than 50 db-down from the response at the frequency of maximum response; at ±450 kc test points the response was down more than 80 db. Checks at 328.77 mc with the receiver tuned to 329.2 mc, and at 335.53 mc with the receiver tuned to 335.0 mc, showed the response at those points to be more than 80 db below the response at center frequency. The deflection errors for New units just met the RTCA maximum error limits, Page C-341; In-Use and RFI units had linearity errors which were only slightly greater than the maximum acceptable error. The In-Use and RFI deflections under the conditions of the 90 and 150 cps phase characteristics test, Page C-342, were greater than the maximum acceptable deflection of 4.5 microamperes.

Flag-alarm currents, Page C-343, were satisfactory with respect to the selected reference of 250 microamperes except for New and RFI units, which had high currents with the modulating signals adjusted for 0% for one and 45% for the other. Indicator stability was satisfactory, as shown on Page C-344. Deflection errors with deviation signal input for the various combinations of the modulating frequency limits, Page C-345, were within the RTCA acceptable limits. New units had an unacceptable deflection error with centering signal applied and both modulation frequencies at the high end of the prescribed frequency ranges. The large standard deviation for the latter test denotes widely scattered data for the individual units.

The range of adjustment of the deviation indicator deflection sensitivity was from about 0.18 to 0.98 of full-scale deflection with a standard deviation signal of 200 microvolts, Page C-346. This was better than the RTCA minimum adjustment range of from 0.4 to 0.8 of full-scale.

The centering characteristics at the 0.4 and 0.8 sensitivity settings were satisfactory, the average deviations ranging from about 0.3% to 1.8% of the reference deflection over the specified imput voltage ranges,

Page C-347. The sensitivity and deflection characteristics at the specified sensitivity settings, Page C-348, were similar to those obtained in the basic sensitivity and deflection characteristic test, Page C-339: the deflection errors over the input voltage range of 40 to 200 microvolts were within the RTCA limits, but the errors over the range of 200 to 30,000 microvolts were not acceptable. The RFI units met the deflection linearity test at the sensitivity setting of 0.8, Page C-349: the other linearity errors ranged from 1.2 to 4 times the maximum acceptable error.

New and In-Use indicator deflection errors were less than the RTCA maximum acceptable error of 5% of standard deflection with a 200 microvolt standard centering signal, as shown on Page C-350. The RFI units had an average error of about 6.3%.

c. Interference Tests - The GS-3 failed to meet the following interference tests, Pages C-351 and C-352:

Cable Conducted Interference: Emission greater than 200 microvolts at 11.5 mc on the +28 volt line and on the 115 volt, 400 cps line.

Antenna Conducted Interference: Emission greater than 400 micro-microwatts at 1233 mc.

All other interference tests were met satisfactorily.

d. Temperature Variation Test - The temperature variation test was performed with temperature extremes of -55°C and +55°C. The maximum frequency shift, shown on Page C-253, was about 7 kc (the RTCA acceptable shift is 45 kc). The indicator deflection errors with centering and deviation signals applied were also less than the maximum acceptable deflection errors of 5% and 15% of standard deflection, respectively.

(e). Survey of Field Conditions - The information obtained about the various maintenance facilities (test, equipment, personnel, records, etc.) is summarized in Table 2, Pages C-447 through C-449. As expected, the data indicates that the commercial air lines maintain the best facilities, keep adequate spare parts, keep the best records, have the more experienced men, and employ better maintenance and checkout procedures. Most military facil-

ities visited kept few or no records. General Aviation Fleet equipment was serviced in shops which might be compared with ordinary TV and radio repair shops. Because of the diversity of equipments handled, few spare parts are kept. Maintenance records are almost never kept.

The commercial air lines give their repaired equipment installation, pre-flight, and ramp checks. The General Aviation Fleet equipment is usually repaired only to remedy the cause of failure, and receives no further check. Military facilities ran the gamut between the extremes. Because of this, RFI equipment performance cannot always be used as a gauge of the extent to which In-Use equipment performance may be improved. At some facilities, the RFI equipment could be considered as virtually New equipment, at others as In-Use equipment. Where repaired equipments had been re-aligned or adjusted, performance often approached or exceeded that of New equipment.

d. Conclusions - The general lack or unavailability of maintenance and overhaul records did not permit a statistical evaluation of the factors contributing to degradation of equipment performance. However, from the data collected in the field survey of the activities visited in the test program, it is possible to list the following factors as the most important contributing to equipment failures:

(1). TUBES (Variously estimated between 40% and 90% as the cause of failure.)

(2). MECHANICAL PARTS (Tuner devices, blower motors, dynamotors etc.)

(3). MISALIGNMENT (Observed principally by military personnel.)

(4). UNKNOWN (Equipment reported defective is found to be satisfactory in bench checks - observed principally by air lines personnel.)

An examination of the weighted performance graphs for the 16 equipment functions tested reveals that 9 showed at least some degradation between New and In-Use characteristics; one, a localizer receiver, actually showed better performance of the In-Use units; 4 showed no change; and 2 were unavailable for In-Use and RFI tests.

The poorest overall performance and the greatest degradation showed up among the General Aviation Fleet equipments. Although comparison of the equipments within a function (marker beacon, VOR, etc.) is difficult, because of the many differences in design features and intended performance, the following ratings may be generally applied on a category basis:

(1). Commercial Air Lines.

(2). Military - a close second.

(3). General Aviation Fleet - a poor third.

A check of the confidence limit intervals for all the test data obtained showed that no statistical significance could be assigned to the general equipment degradation observed in the weighted data, which is based only on average values. Out of a total of 368 comparisons of the limits for New and In-Use measurements, only 53 showed separation of data with a confidence level of 80% (not considered high), and 23 of these showed improvement rather than degradation. In the vast majority of comparisons, the paired sets of data (New versus In-Use) showed overlap of the limits. Since the confidence value is based on the probability that the mean of the population from which the sample is taken lies between certain limits, any overlap of the limits of two samples means possible overlap of the means. Any restriction of the limits to find some which do not overlap reduces the confidence that the population mean falls between the restricted limits. The inability to derive statistical significance which can be applied to the apparent general degradation of equipment performance is related to the relatively large standard deviations found in the measurements, usually for In-Use equipment.

The results of the tests made after re-adjustment of some of the In-Use units showed that most characteristics could be improved. A few, however, showed no change in performance and some actually showed degradation. This effect is considered to be attributable to the reciprocal influence of the various adjustments.

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Page 42 Intentionally Left Blank

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

2. Laboratory and Field Test Data

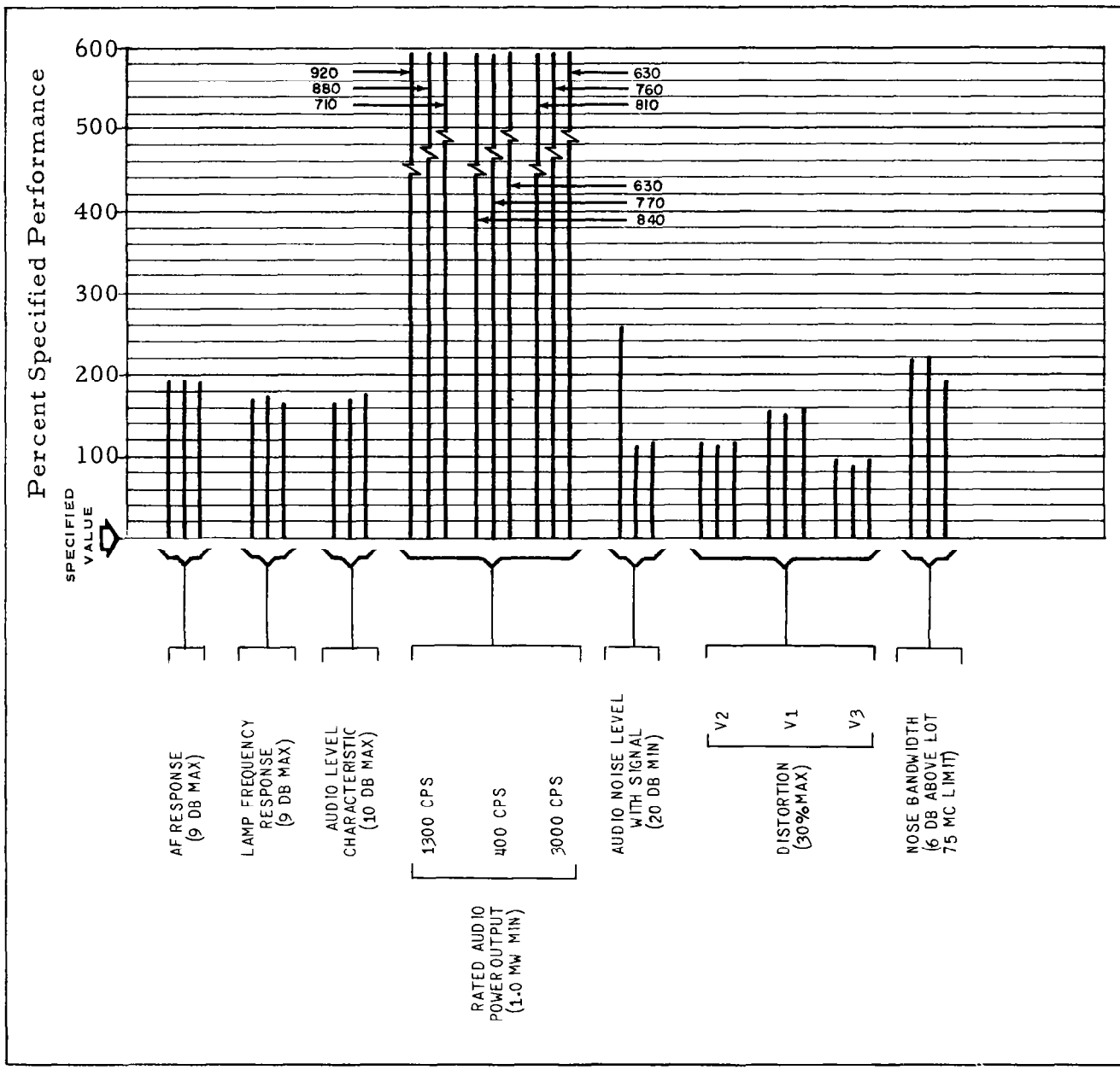
a. MB-1, Marker Beacon Receiver

General:

Frequency Range:	Fixed, 75 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	1
Number of Channels Available at Operator's Position:	1
Means of Frequency Selection:	None

Technical:

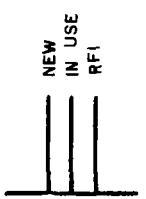
	Page
Percent Specified Performance	C-44
Weighted Performance	C-45
Audio Frequency Response	C-46
Lamp Frequency Response	C-47
Audio Level Characteristics	C-48
Rated Audio Power Output	C-49
Audio Noise Level With Signal	C-50
Audio Noise Level Without Signal	C-51
Distortion	C-52
Input Operating Differential	C-53
Nose Bandwidth	C-54
Interference Tests	C-55-56
Temperature Variation Test	C-57
Audio Output Regulation and Distortion	C-58



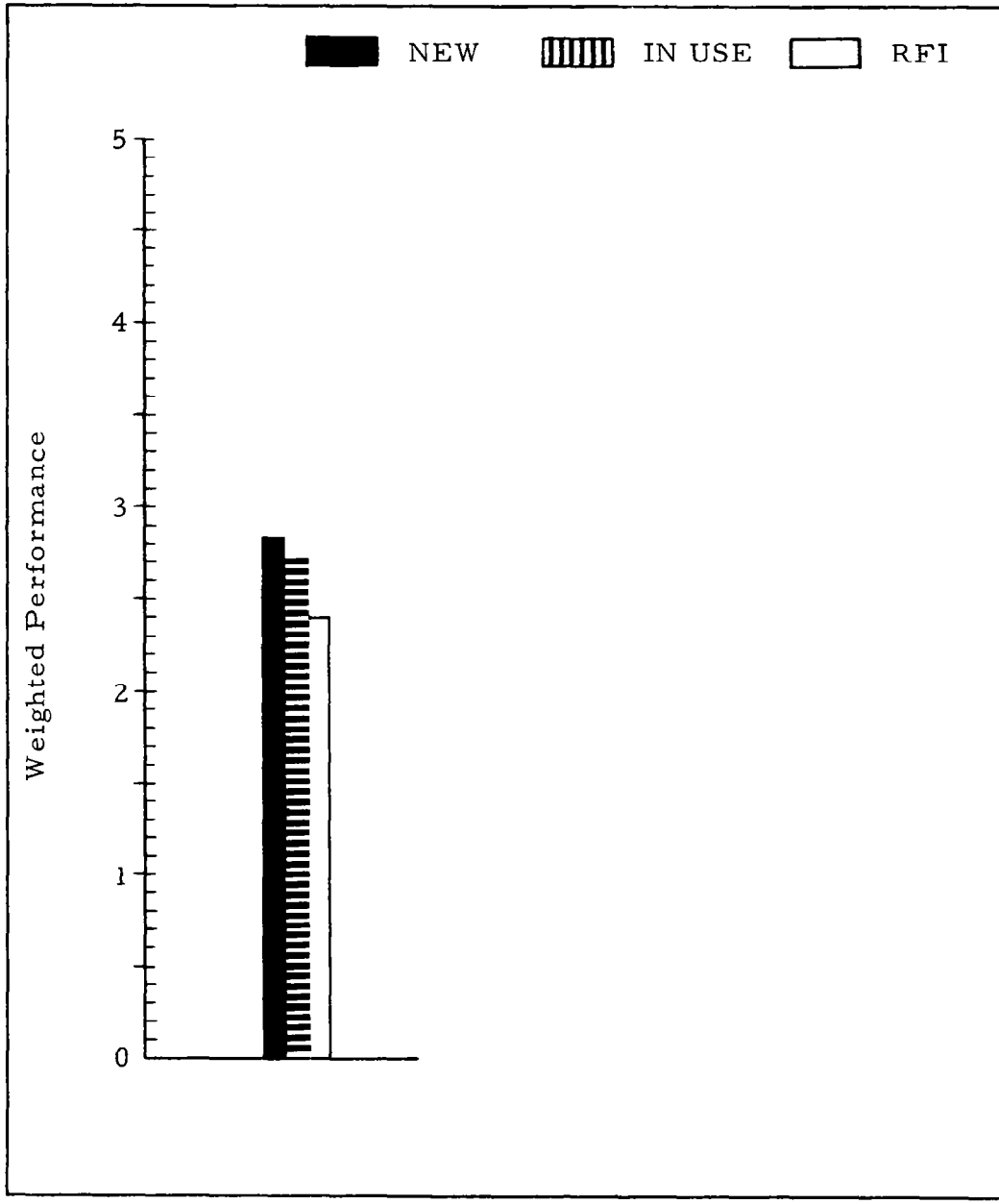
PERCENT
SPECIFIED PERFORMANCE
Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



PERCENT SPECIFIED PERFORMANCE - MARKER BEACON RECEIVER - MB-1



WEIGHTED PERFORMANCE

Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2

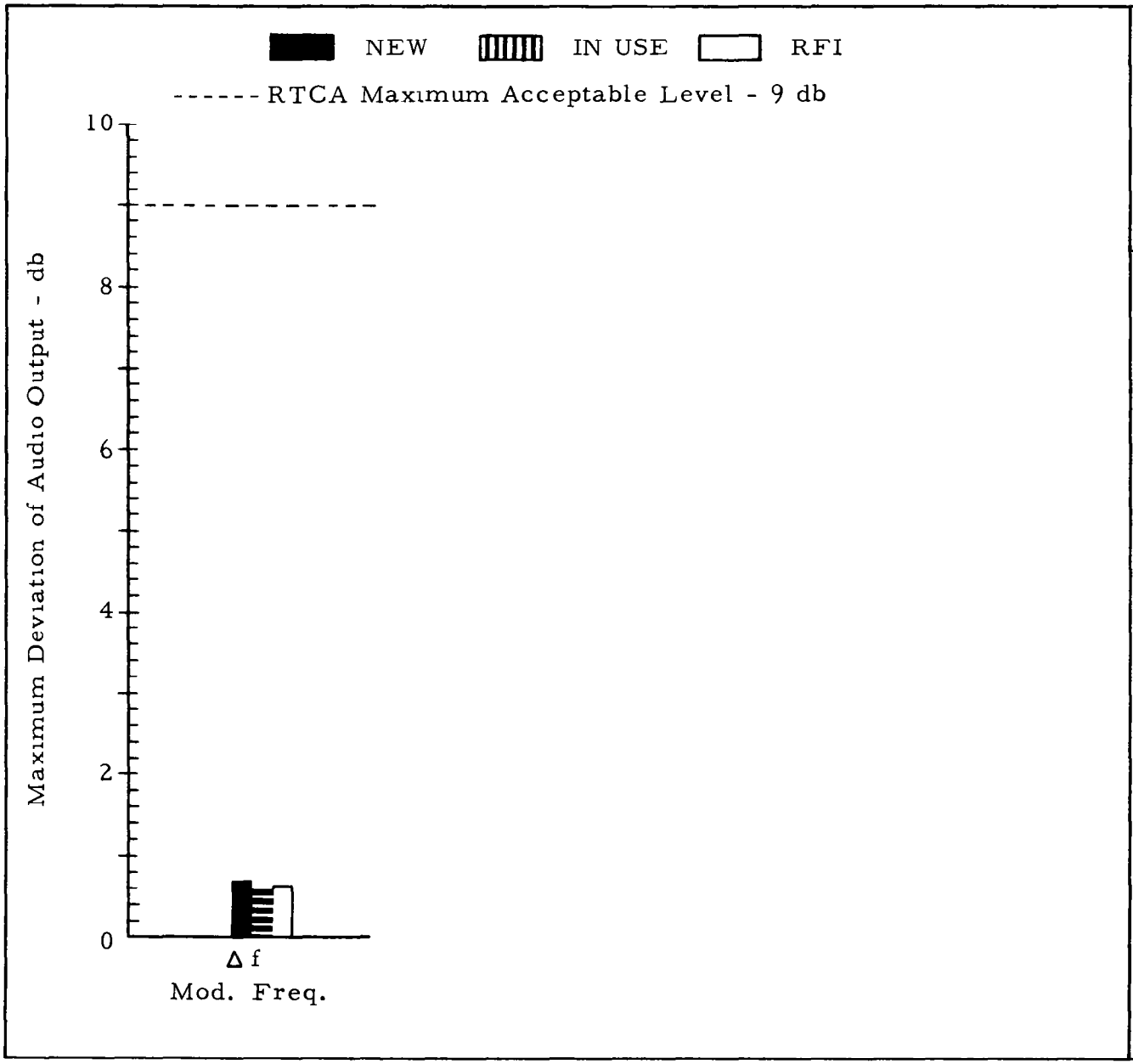
WEIGHTING FACTORS

Nose Bandwidth:	3/10
Lamp Frequency Response:	1/4
Audio Level Characteristics:	1/10
Audio Frequency Response:	1/10
Rated Audio Power Output: f_1, f_2, f_3	1/20 ea.
Lamp Operate Selectivity:	N/A
Audio Noise Level with Signal:	1/20
Audio Output Distortion: f_1, f_2, f_3	1/60 ea.

Note:
1. Graph based on arithmetic mean for above characteristics.

WEIGHTED PERFORMANCE - MARKER BEACON RECEIVER - MB-1

Figure C-1(a)



AUDIO FREQ. RESPONSE

Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.1

LEGEND

Δ f - 380 - 3150 cps

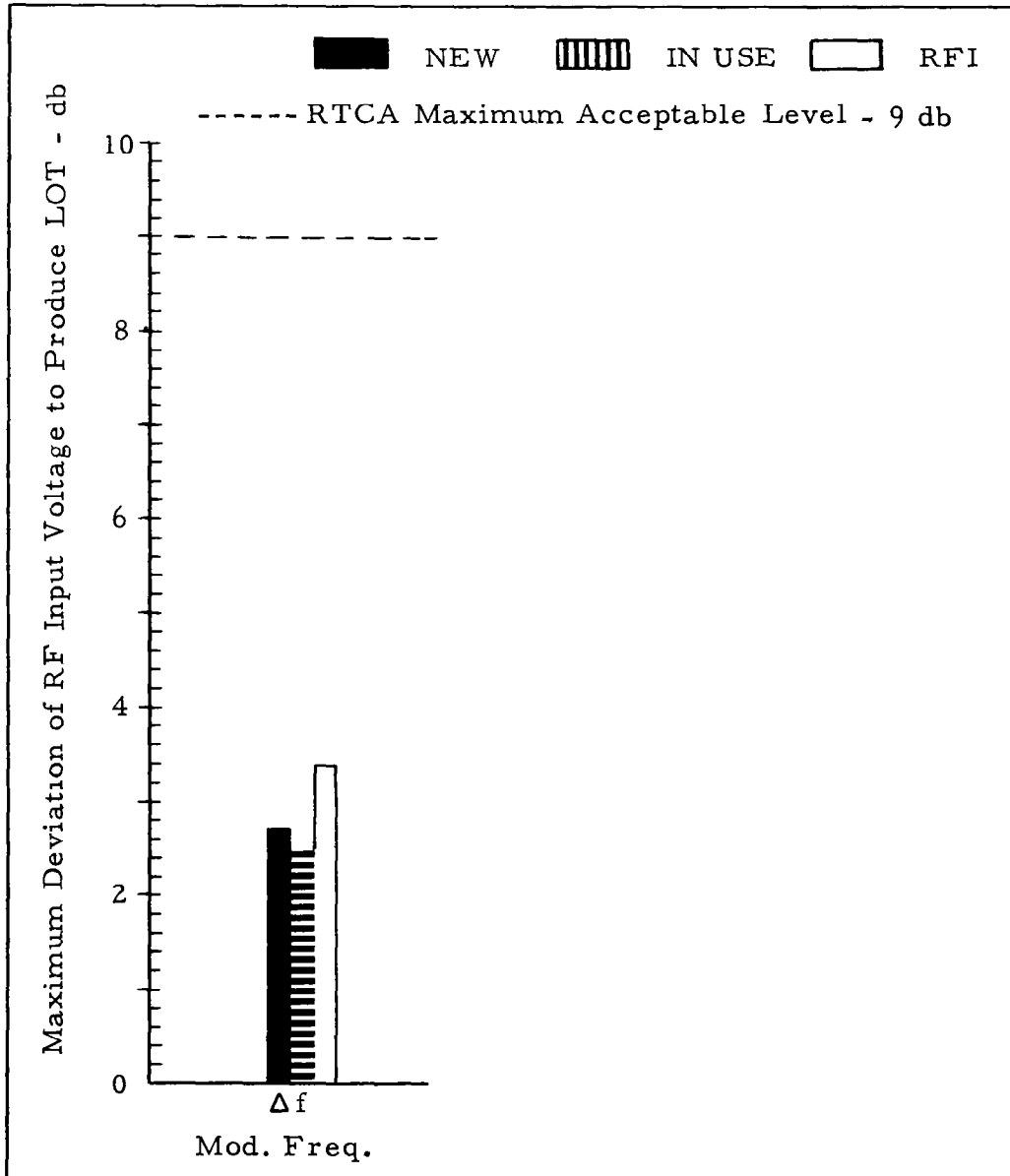
Standard Deviation

New	In Use	RFI
0.1	0.2	0.1

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 db.

Figure C-1 (a)

AUDIO FREQUENCY RESPONSE - MARKER BEACON RECEIVER - MB-1



LAMP FREQUENCY RESPONSE

Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 2.2

LEGEND

Δf - 380 - 3150 cps
LOT - Lamp Operate Threshold

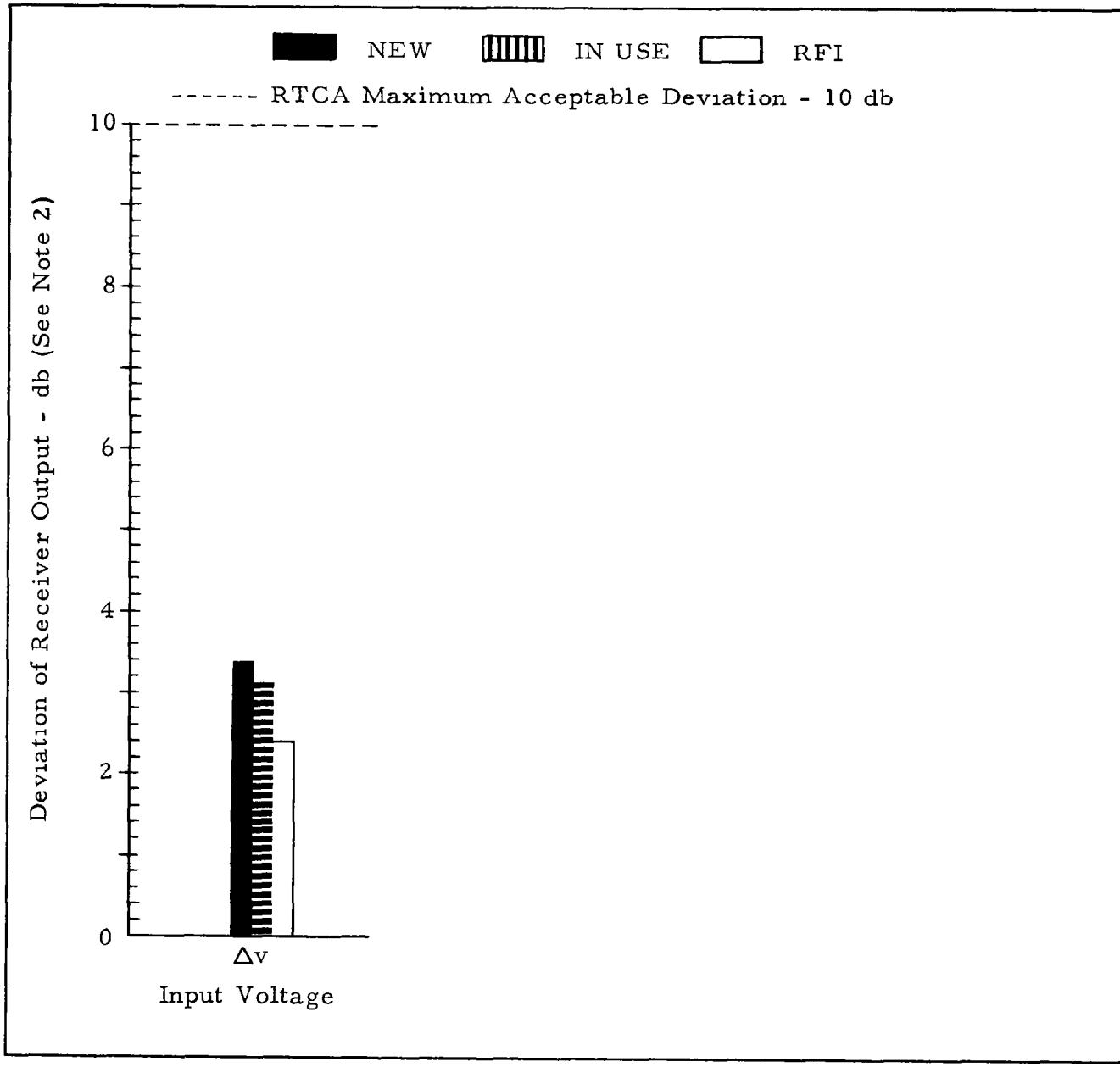
Standard Deviation

New	In Use	RFI
0.8	2.0	2.1

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 db.

LAMP FREQUENCY RESPONSE - MARKER BEACON RECEIVER - MB-1

Figure C-1(a)



AUDIO LEVEL CHARACTERISTIC
Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.3

LEGEND

Δv - LOT to 200,000 uv
LOT - Lamp Operate Threshold

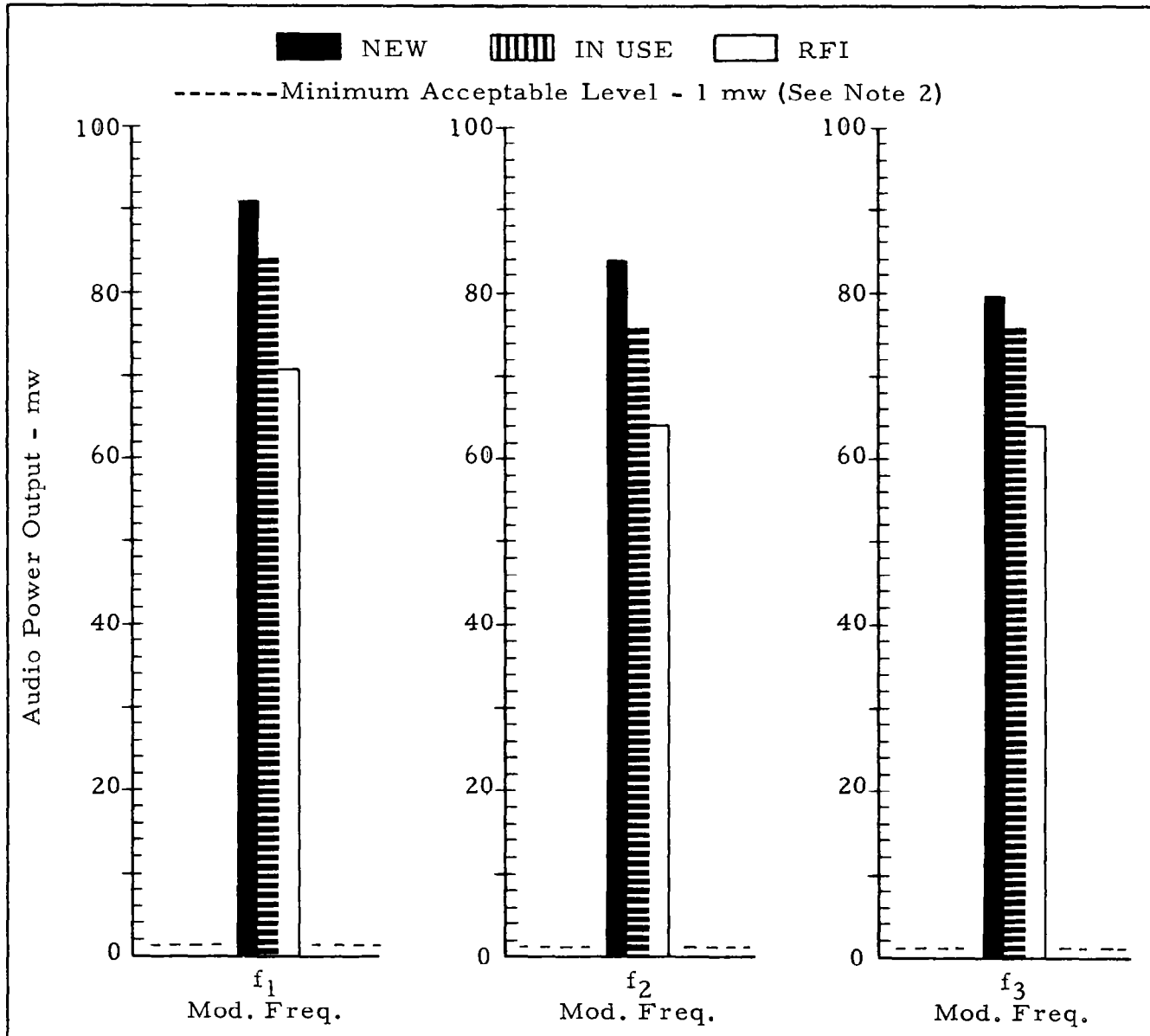
Standard Deviation

New	In Use	RFI
0.2	0.6	1.0

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. Maximum deviation of receiver output when RF signal level is varied over range from lamp operate threshold to 200,000 uv, using data of combined modulating frequencies.
3. RTCA maximum acceptable deviation - 10 db.

Figure C-1(a)

AUDIO LEVEL CHARACTERISTIC - MARKER BEACON RECEIVER - MB-1



RATED AUDIO POWER OUTPUT
Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 2.4

LEGEND

f_1 - 1300 cps
f_2 - 400 cps
f_3 - 3000 cps

Standard Deviation

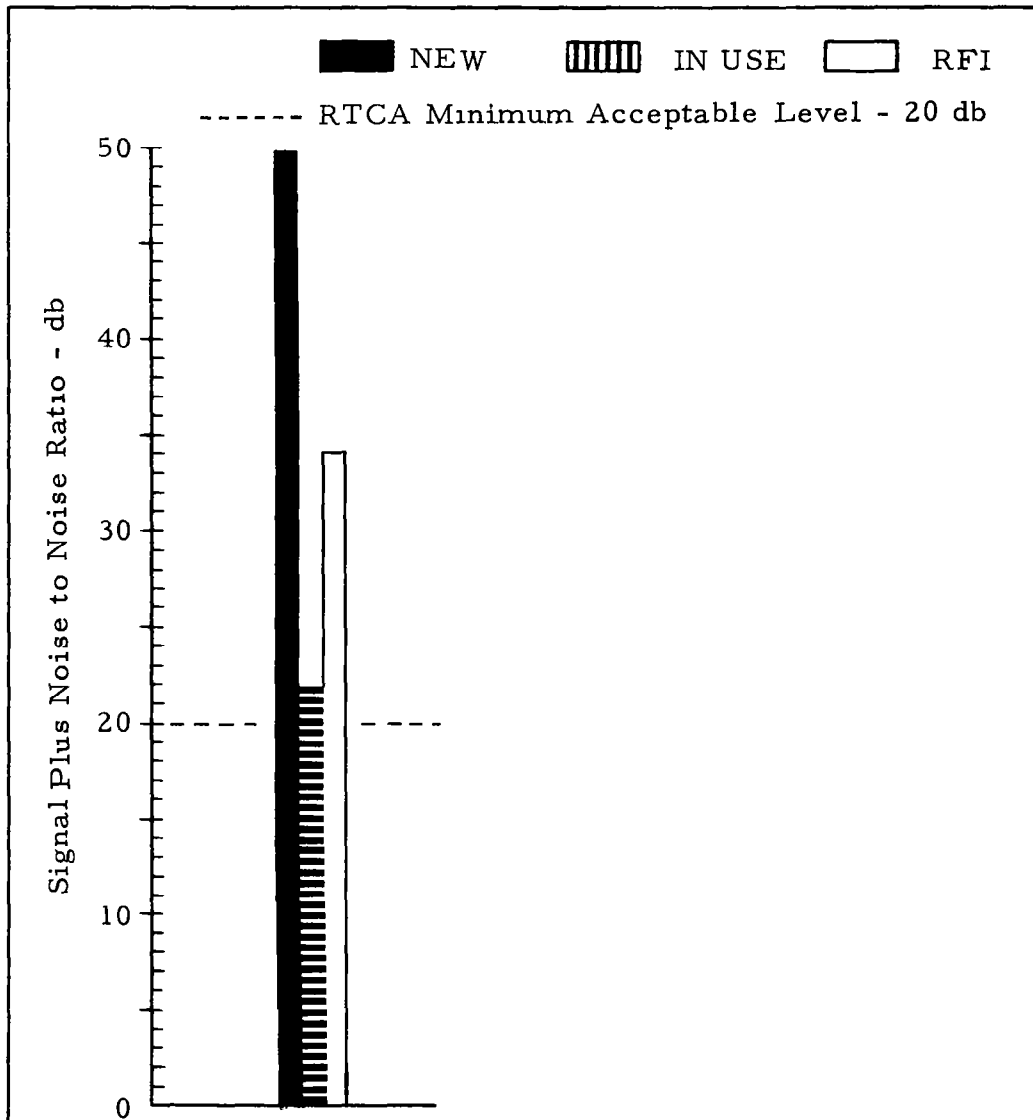
Test	New	In Use	RFI
f_1	7.90	8.70	9.10
f_2	5.44	9.72	8.19
f_3	7.94	6.82	8.34

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Minimum manufacturer's performance standards not less than 1 mw output power.
3. RF input signal level 10 times that producing lamp operate threshold.

RATED AUDIO POWER OUTPUT - MARKER BEACON RECEIVER - MB-1

Figure C-1(a)



AUDIO NOISE LEVEL - WITH SIGNAL

Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 2.6(a)

Standard Deviation

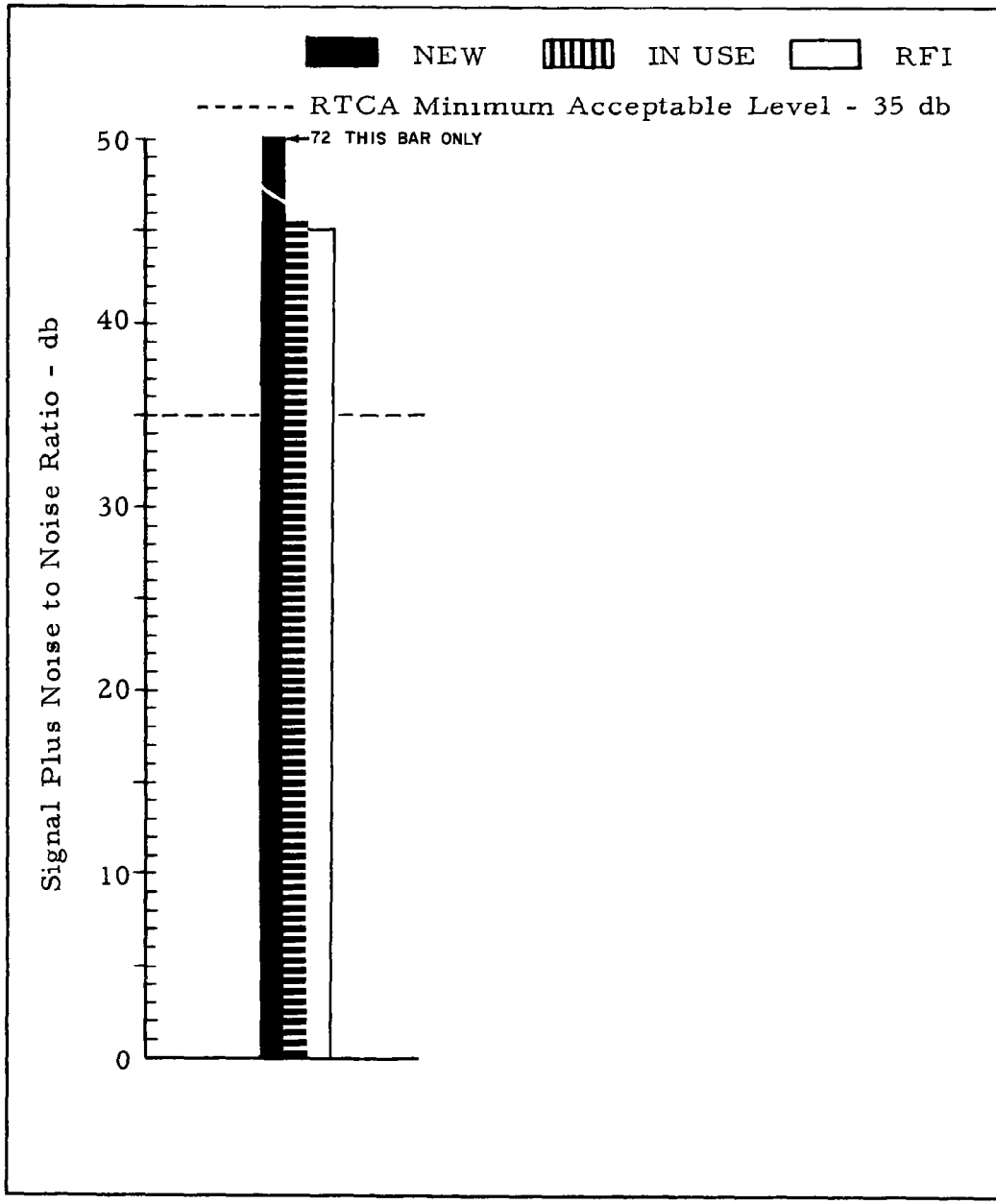
New	In Use	RFI
17.0	1.4	10.9

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 20 db.
3. Based on an RF input signal varied from that level producing lamp operate threshold to 200,000 uv.

Figure C-1(a)

AUDIO NOISE LEVEL - WITH SIGNAL - MARKER BEACON RECEIVER - MB-1



AUDIO NOISE LEVEL - WITHOUT SIGNAL
Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.5(a)

Standard Deviation

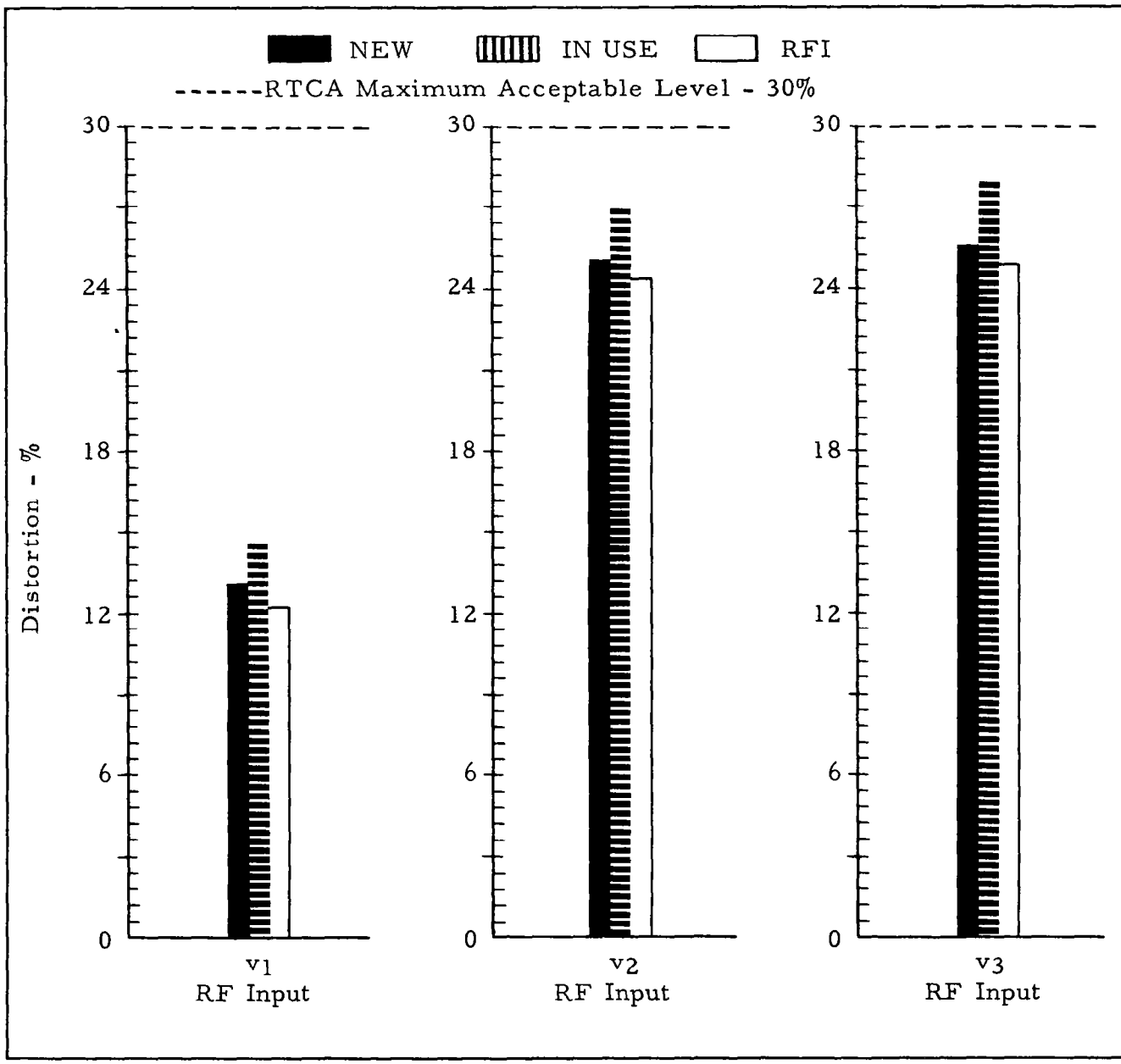
New	In Use	RFI
8.7	5.2	12.9

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 35 db.
3. Based on an RF input signal level 10 times that producing lamp operate threshold.

Figure C-1(a)

AUDIO NOISE LEVEL - WITHOUT SIGNAL - MARKER BEACON RECEIVER - MB-1



DISTORTION

Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.7

LEGEND

v_1 - LOT
v_2 - LOT X 10
v_3 - 200,000 uv
LOT - Lamp Operate Threshold

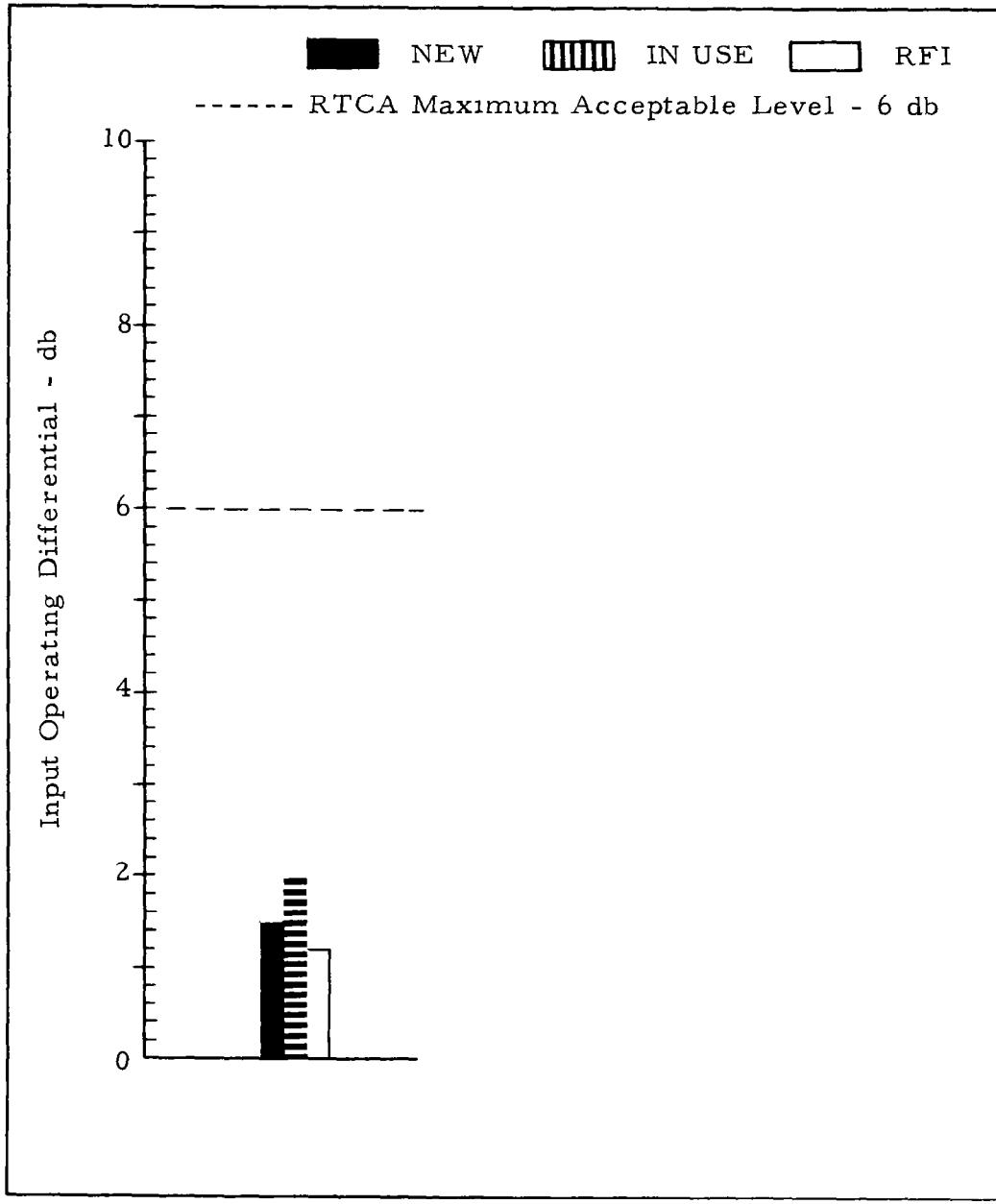
Standard Deviation

Test	New	In Use	RFI
v_1	1.5	3.0	2.6
v_2	0.4	3.1	1.0
v_3	2.0	2.5	0.6

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 30%.

DISTORTION - MARKER BEACON RECEIVER - MB-1

Figure C-1(a)



INPUT OPERATING DIFFERENTIAL
Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.11

Standard Deviation

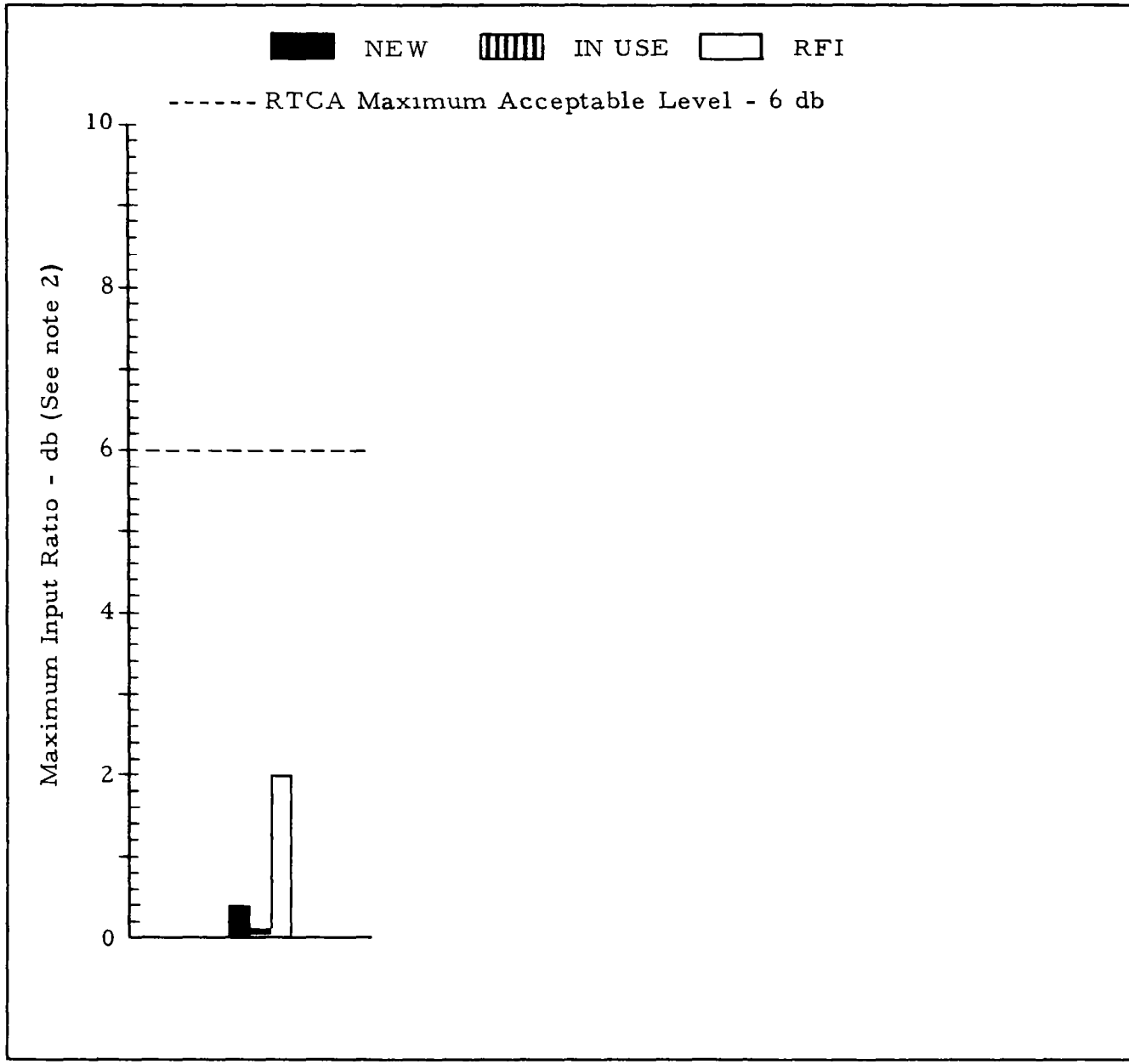
New	In Use	RFI
0.8	1.4	0.1

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Differential is defined as: the ratio of RF input signal level required to produce lamp operate threshold when the RF input signal level is increasing/to the RF input signal level required to produce lamp operate threshold when the RF input signal level is decreasing.
3. RTCA maximum acceptable level - 6 db.

INPUT OPERATING DIFFERENTIAL - MARKER BEACON RECEIVER - MB-1

Figure C-1(a)



NOSE BANDWIDTH

Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.15

Standard Deviation

New	In Use	RFI
0.5	0.2	1.9

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Maximum input ratio is defined as: maximum ratio of input signal levels required to produce lamp operate threshold over the frequency range 75 mc ± 10 kc/to that required to produce lamp operate threshold at 75 mc.
3. RTCA maximum acceptable level - 6 db.

NOSE BANDWIDTH - MARKER BEACON RECEIVER - MB-1

Figure C-1(a)

INTERFERENCE TESTS

Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57

Test	Frequency (mc)		RTCA Performance Standards	Results	Performance Standards Met
Spurious Response (A.M. Signals) RTCA Para: 2.14(a)	.19 to 1500		Acceptable level excluding band from 65 to 85 mc: ≤ LOT (27.5 volts). ≤ 1/2 manufacturer's rated output (90 mw).	Actual Level: <27.5 volts <90 mw	Yes
Spurious Response (F.M. Signals) RTCA Para: 2.14(b)	72.02 to 74.58 and 75.42 to 75.98		Acceptable Level: ≤ LOT (27.5 volts) ≤1/2 manufacturer's rated output (90 mw).	Actual Level: <27.5 volts <90 mw	Yes
Spurious Response (T.V. Modulated Signals) RTCA Para: 2.14(c)	55.25,61.25, 67.25, and 83.25 mc. (Channel 2 through 6)		Acceptable Level: ≤LOT (27.5 volts) ≤1/ 2 manufacturer's rated output (90 mw).	Actual Level: <27.5 volts <90 mw	Yes
Cross Modulation (T.V. Signal) RTCA Para: 2.13(a)	55.25,61.25, 67.25,77.25, and 83.25. (Channel 2 through 6)		Acceptable Level: ≤LOT (27.5 volts) ≤1/2 manufacturer's rated output (90 mw).	Actual Level: <27.5 volts <90 mw	Yes

INTERFERENCE TESTS - MARKER BEACON RECEIVER - MB-1

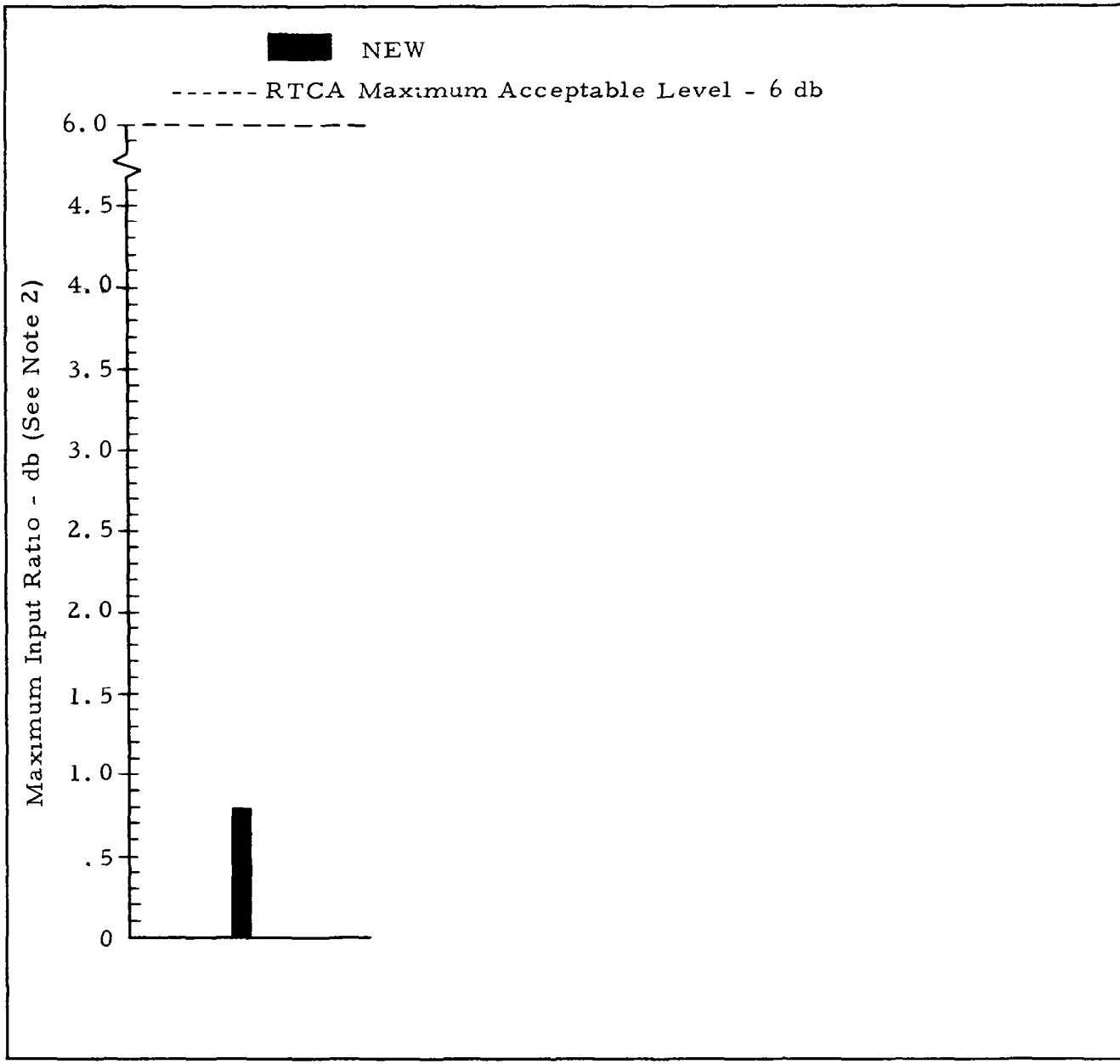
(continued on Page C-56)

Test	Frequency (mc)		RTCA Performance Standards	Results	Performance Standards Met
Cross Modulation (F.M. Signal) RTCA Para: 2.13(b)	72.02to74.58 and 75.42to75.98		Acceptable Level: ≤LOT (27.5 volts) ≤1/2 manufacturer's rated output (90 mw).	Actual Level: <27.5 volts <90 mw	Yes
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25		Acceptable Emission: ≤200 microvolts	Actual Emission: On+28 volt line: < 200 microvolts. All frequencies within performance standards.	Yes
Antenna Conducted Interference RTCA Para: 2.9(b)	90 kc to 1500 mc		Acceptable Emission:≤400 micro-microwatts	Actual Emission:< 400 micro-microwatts on+28 v. line except at 68.1 mc. All other frequencies within performance standards.	Partially
Sensitivity Depression (T.V. Signal) RTCA Para:2.10(a)	67.25 and 77.25 (Channel 4 and 5)		Acceptable Level: ≤ 4 db	Actual Level: < 4 db	Yes
Sensitivity Depression(F.M.Sig) RTCA Para: 2.10 (b)	72.02to74.58 and 75.42to75.98		Acceptable Level: ≤ 4 db	Actual Level:<4 db except at 74.35,74.6, 75.4,75.68,and 75.98 mc. All others within perf. std	Partially

Test	RTCA Para.		Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals	None		None	(Not Applicable)

Figure C-1(a)

INTERFERENCE TESTS - MARKER BEACON RECEIVER - MB-1



TEMPERATURE VARIATION TEST
(Nose Bandwidth)
Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61 Task-2
RTCA Paper 87-54/DO-57, Para 3 1

Notes:

1 Bar represents one "New" unit.

2. Maximum input ratio is defined as: Maximum ratio of input signal levels required to produce lamp operate threshold over the frequency range 75 mc±10 kc/to that required to produce lamp operate threshold at 75 mc.

3. Maximum input ratio occurred at:
Frequency: 74.99 mc
Temperature: +55°C

4. RTCA maximum acceptable level - 6 db.

5. This unit is designed to operate above 15,000 feet.

TEMPERATURE VARIATION TEST - MARKER BEACON RECEIVER - MB-1

Figure C-1(a)

OUTPUT REGULATION

Marker Beacon Rcvr: MB-1
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57
Para 2.8

Equipment Status	% Distortion @ 400 cps			% Distortion @ 1300 cps			% Distortion @ 3000 cps		
	50% Z	100% Z	200% Z	50% Z	100% Z	200% Z	50% Z	100% Z	200% Z
New Equipment	26.7	26.3	27.2	26.7	26.8	29.2	24.0	23.0	28.0
In Use Equipment	28.2	28.0	29.0	26.5	27.4	29.0	25.2	24.7	27.4
RFI Equipment	25.8	25.3	26.0	25.3	25.7	27 6	23.0	24 2	25 7

Equipment Status	Audio Output - Volts @ 400 cps			Audio Output - Volts @ 1300 cps			Audio Output - Volts @ 3000 cps		
	50% Z	100% Z	200% Z	50% Z	100% Z	200% Z	50% Z	100% Z	200% Z
New Equipment	2.2	3.5	5.1	2.2	3.6	5.3	2.2	3.5	5.3
In Use Equipment	2.2	3.4	4.9	2.4	3.7	5.2	2.3	3.5	5.2
RFI Equipment	2.0	3.1	4.6	2.1	3.3	4.9	1.9	3.1	4.9

Notes:

1. Each value represents the arithmetic mean for 3 units.
2. RTCA acceptable limits - The distortion in the output shall not exceed 30%. The output voltage level shall be within 2:1 of the level at design impedance.
3. Z represents design impedance of 150 ohms.

OUTPUT REGULATION - MARKER BEACON RECEIVER - MB-1

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

2. Laboratory and Field Test Data

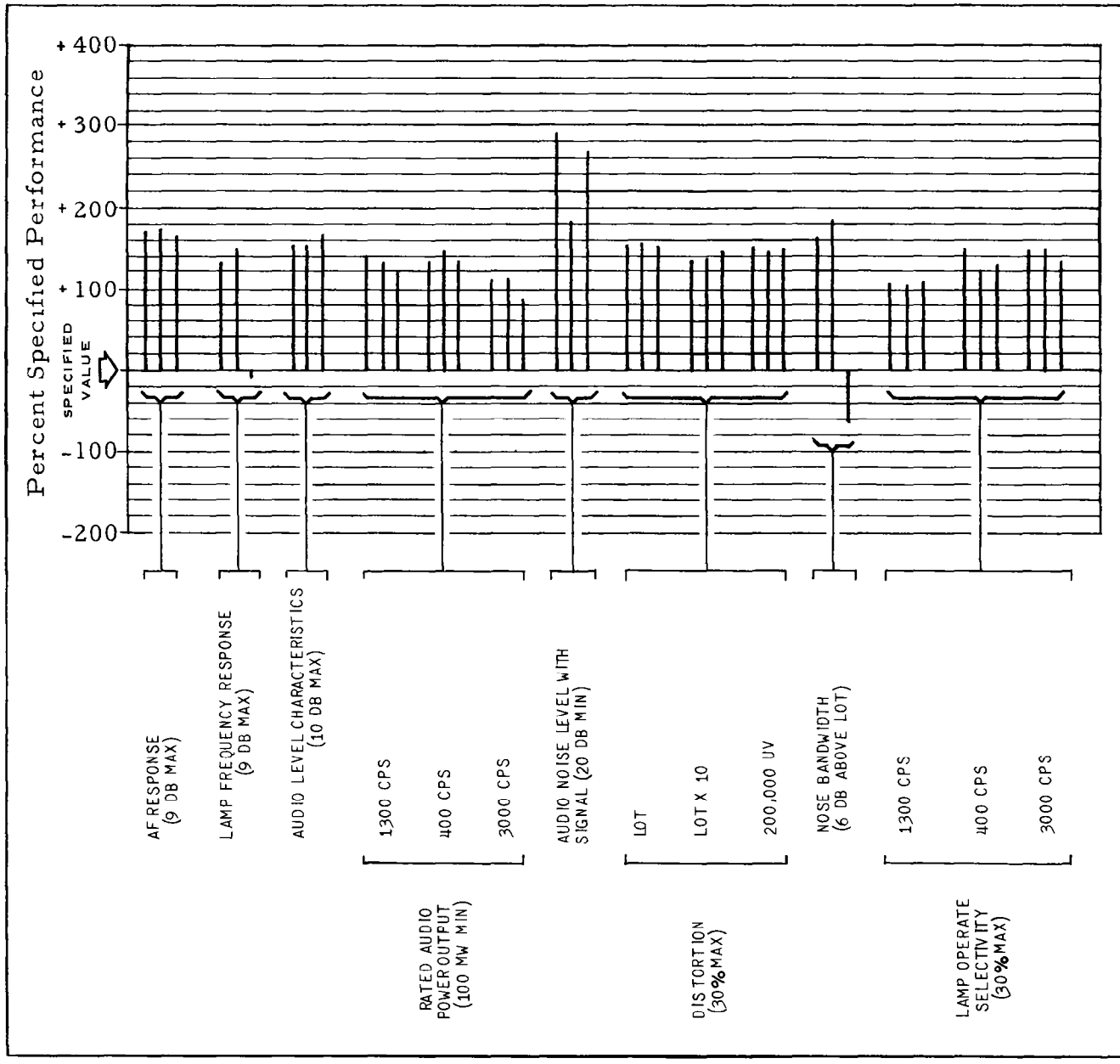
b. MB-2, Marker Beacon Receiver

General:

Frequency Range:	Fixed, 75 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	1
Number of Channels Available at Operator's Position:	1
Means of Frequency Selection:	None

Technical:

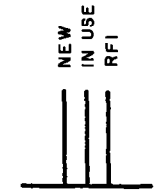
	Page
Percent Specified Performance	C-60
Weighted Performance	C-61
Audio Frequency Response	C-62
Lamp Frequency Response	C-63
Audio Level Characteristics	C-64
Rated Audio Power Output	C-65
Audio Noise Level With Signal	C-66
Audio Noise Level Without Signal	C-67
Distortion	C-68
Input Operating Differential	C-69
Nose Bandwidth	C-70
Lamp Operate Selectivity	C-71
Interference Tests	C-72-C-73
Temperature Variation Test	C-74
Output Regulation	C-75



PERCENT
SPECIFIED PERFORMANCE
Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57

Notes:

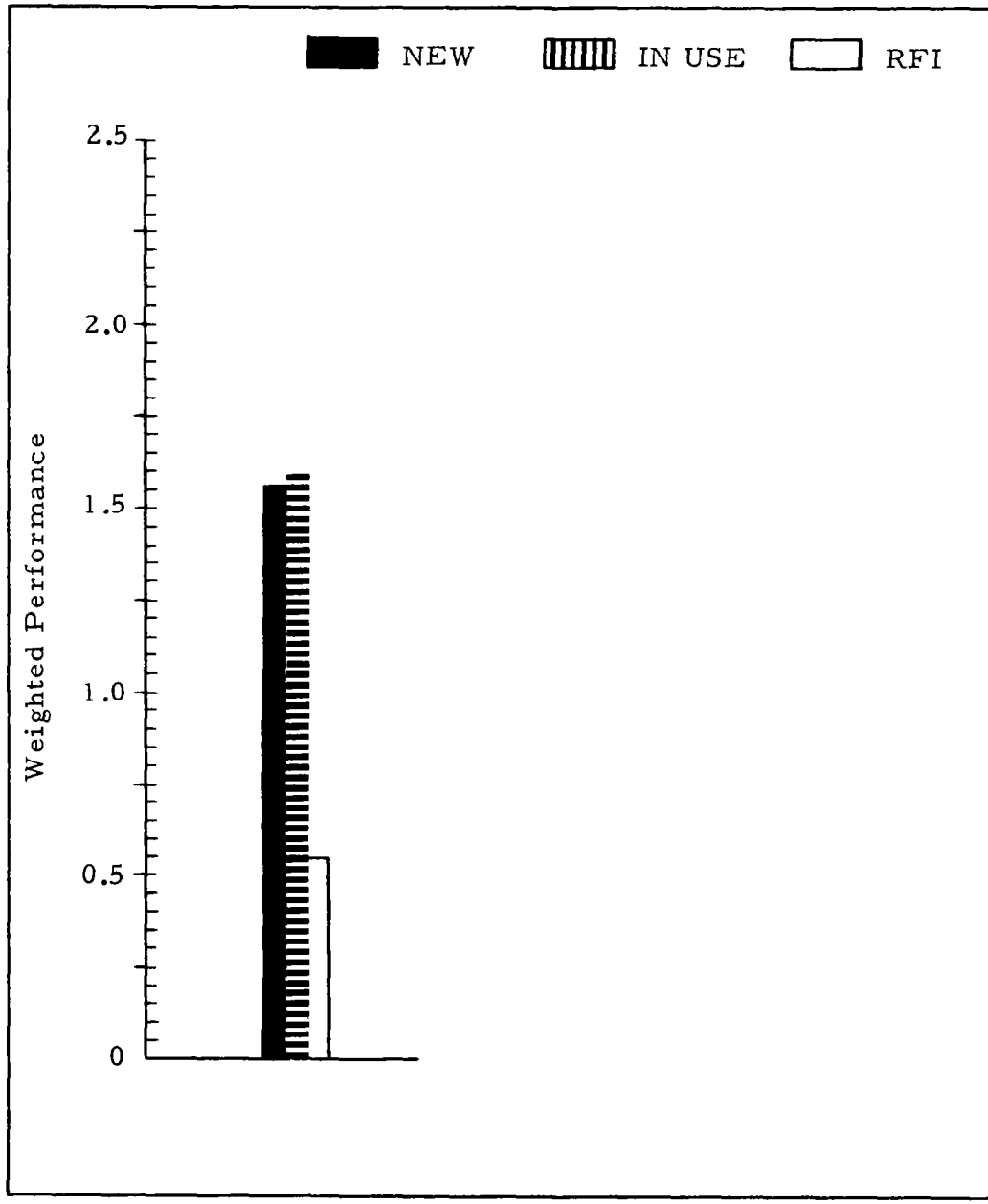
1. Each bar representes the arithmetic mean for 3 units
2. Equipment status represented by bars.



3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - MARKER BEACON RECEIVER - MB-2

Figure C-1(b)



WEIGHTED PERFORMANCE

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2

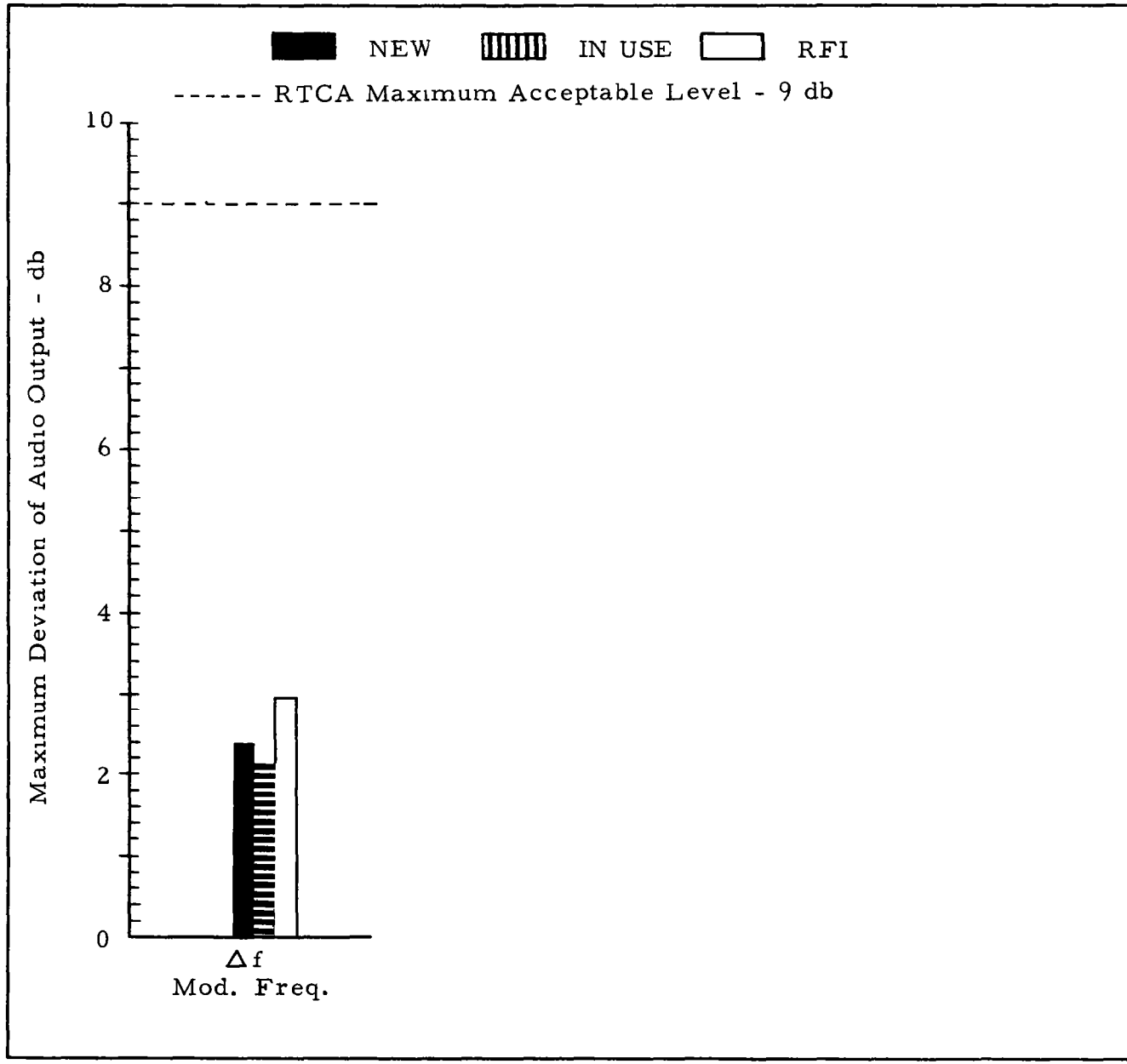
WEIGHTING FACTORS

Nose Bandwidth:	3/10
Lamp Frequency Response:	1/5
Audio Level Characteristics:	1/10
Audio Frequency Response:	1/10
Rated Audio Power Output:	
f_1, f_2, f_3	1/30 ea.
Lamp Operate Selectivity:	
f_1, f_2, f_3	1/30 ea.
Audio Noise Level with Signal:	1/20
Audio Output Distortion:	
f_1, f_2, f_3	1/60 ea.

Note:
1. Graph based on arithmetic mean for above characteristics.

WEIGHTED PERFORMANCE - MARKER BEACON RECEIVER - MB-2

Figure C-1(b)



AUDIO FREQ. RESPONSE

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.1

LEGEND

Δf - 380 - 3150 cps

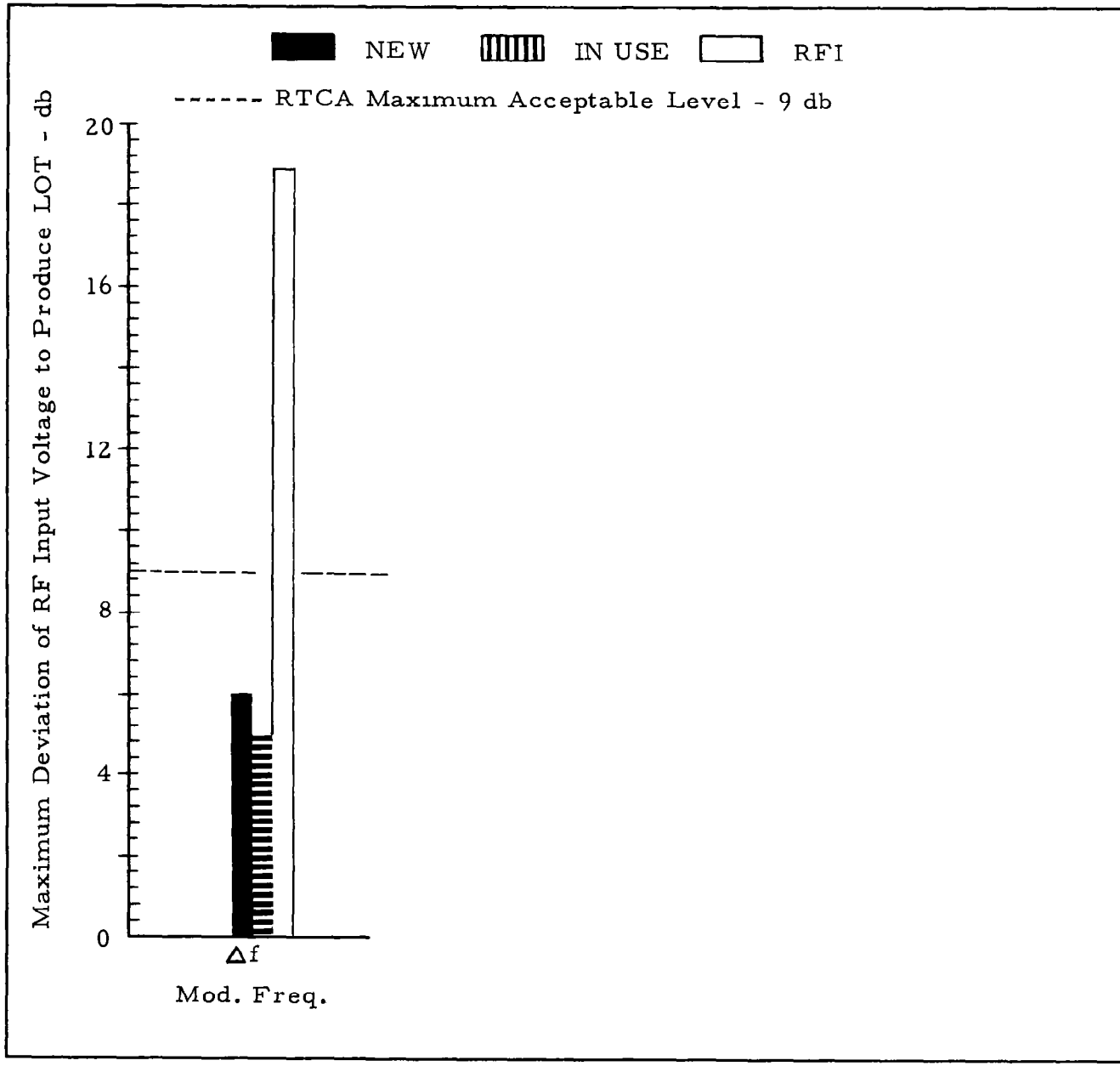
Standard Deviation

New	In Use	RFI
0.4	0.52	1.85

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 db.

Figure C-1 (b)

AUDIO FREQUENCY RESPONSE - MARKER BEACON RECEIVER - MB-2



LAMP FREQUENCY RESPONSE

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 2.2

LEGEND

Δf - 380 - 3150 cps
LOT - Lamp Operate Threshold

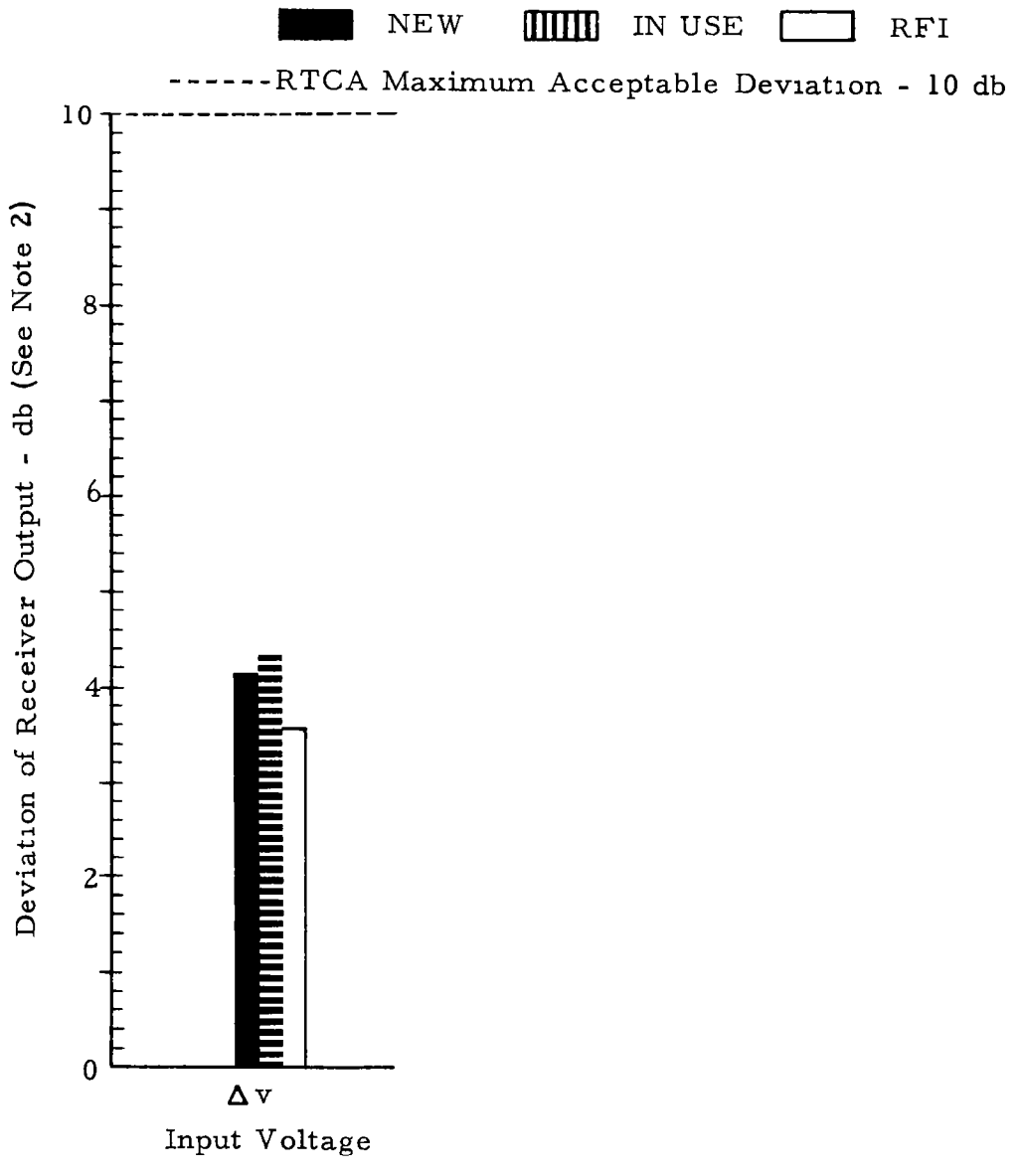
Standard Deviation

New	In Use	RFI
1.4	0.31	18.9

Notes:
1. Each bar represents the arithmetic mean for 3 "New" and "In Use" units and 2 "RFI" units.
2. RTCA maximum acceptable level - 9 db.

Figure C-1(b)

LAMP FREQUENCY RESPONSE - MARKER BEACON RECEIVER - MB-2



AUDIO LEVEL CHARACTERISTIC
Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.3

LEGEND

Δv - LOT to 200,000 uv
LOT - Lamp Operate Threshold

Standard Deviation

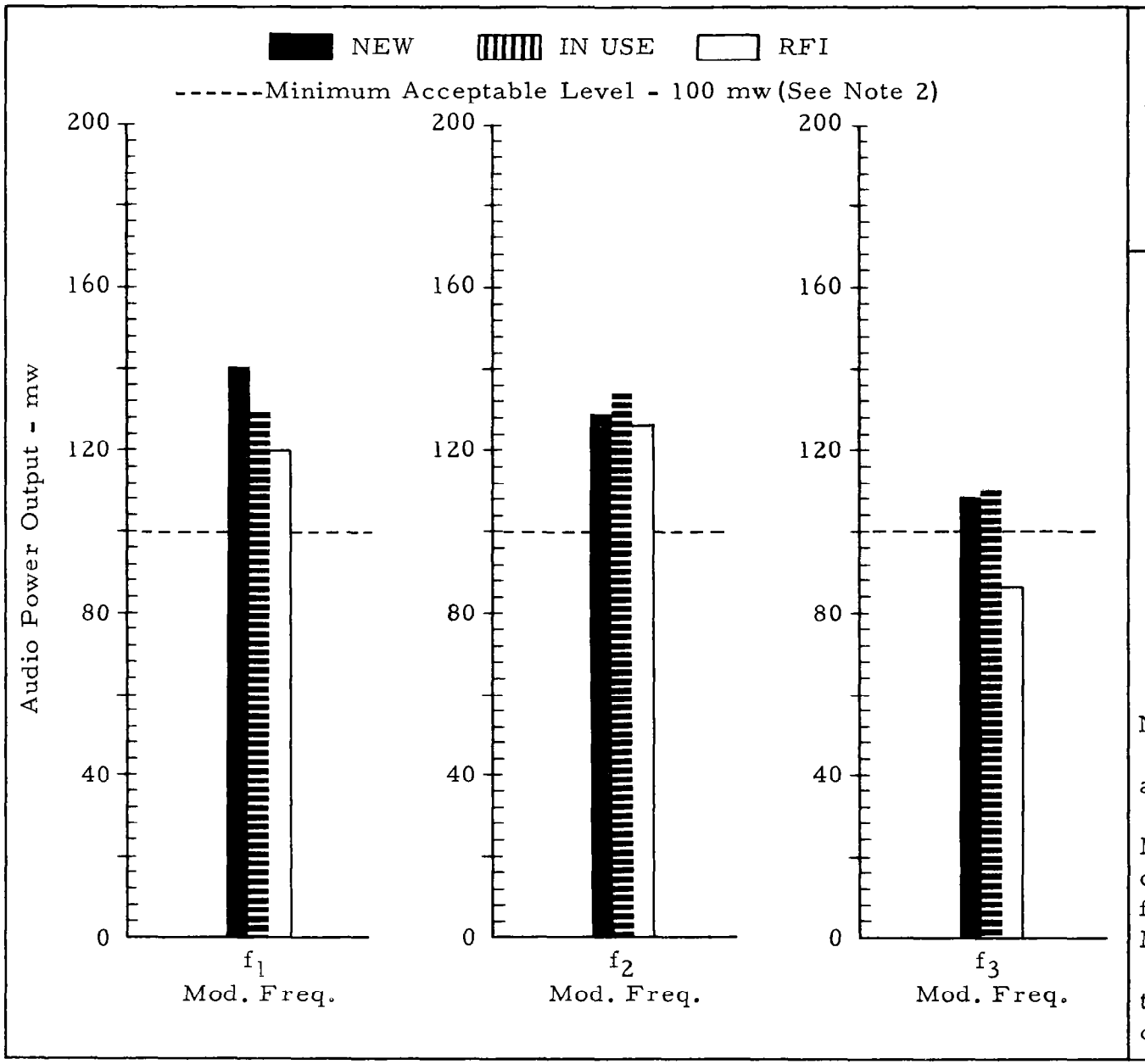
New	In Use	RFI
0.32	0.4	1.0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Maximum deviation of receiver output when RF signal level is varied over range from lamp operate threshold to 200,000 uv, using data of combined modulating frequencies.
3. RTCA maximum acceptable deviation - 10 db.

Figure C-1(b)

AUDIO LEVEL CHARACTERISTIC - MARKER BEACON RECEIVER - MB-2



RATED AUDIO POWER OUTPUT

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 2.4

LEGEND

f_1 - 1300 cps
f_2 - 400 cps
f_3 - 3000 cps

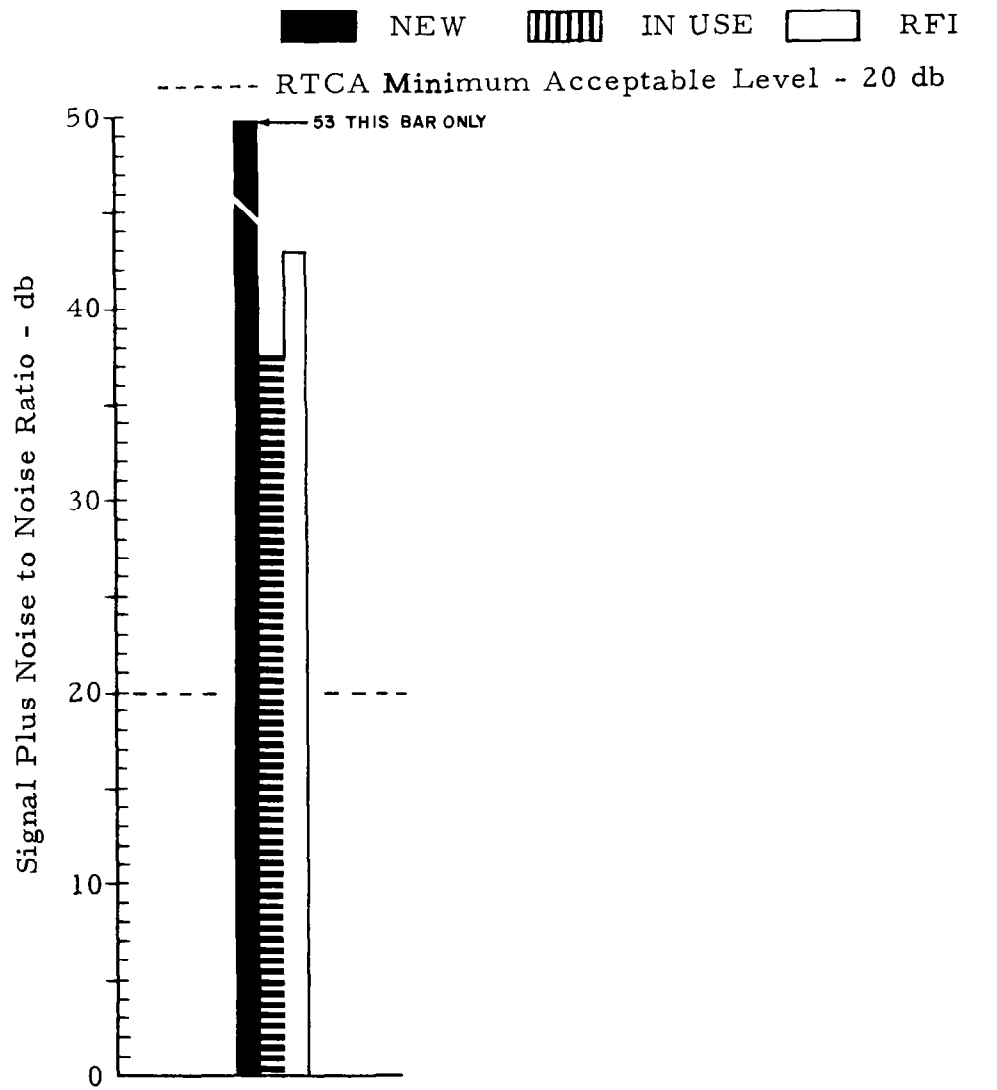
Standard Deviation

Test	New	In Use	RFI
f_1	38.5	16.1	6.6
f_2	38.5	11.6	6.0
f_3	29.3	10.0	31.4

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Manufacturer's rating on MB-2 not given. 100 mw acceptable level based on manufacturer's rating on 51Z-2 Marker Beacon receiver.
3. RF input signal level 10 times that producing lamp operate threshold.

RATED AUDIO POWER OUTPUT - MARKER BEACON RECEIVER - MB-2



AUDIO NOISE LEVEL - WITH SIGNAL

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.6(a)

Standard Deviation

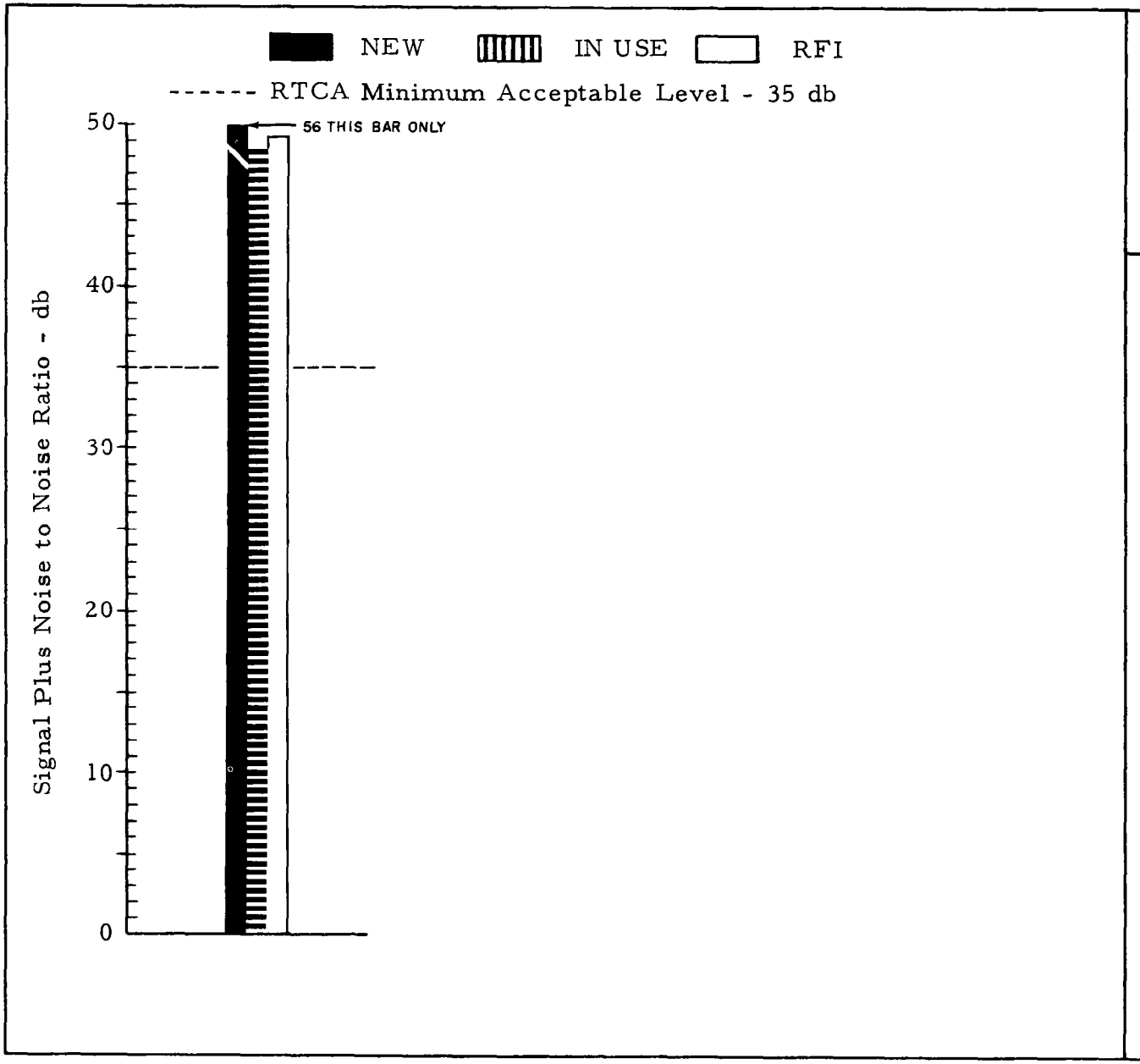
New	In Use	RFI
3.1	3.8	6.0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 20 db.
3. Based on an RF input signal varied from that level producing lamp operate threshold to 200,000 uv.

AUDIO NOISE LEVEL - WITH SIGNAL - MARKER BEACON RECEIVER - MB-2

Figure C-1(b)



AUDIO NOISE LEVEL - WITHOUT SIGNAL

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.5(a)

Standard Deviation

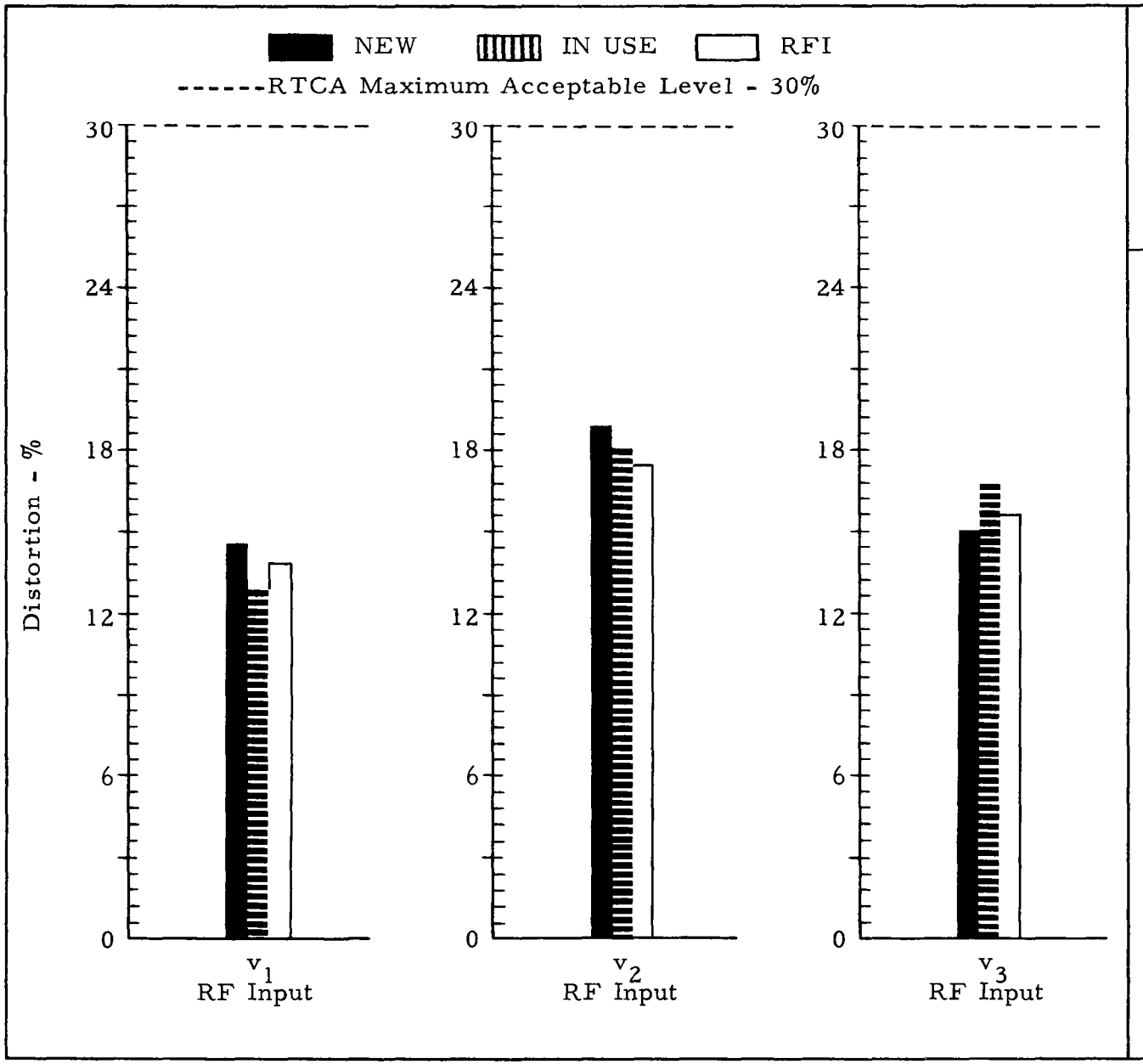
New	In Use	RFI
3.6	1.5	2.6

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 35 db.
3. Based on an RF input signal level 10 times that producing lamp operate threshold.

AUDIO NOISE LEVEL - WITHOUT SIGNAL - MARKER BEACON RECEIVER - MB-2

Figure C-1(b)



DISTORTION

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.7

LEGEND

v_1 - LOT
v_2 - LOT X 10
v_3 - 200,000 uv
LOT - Lamp Operate Threshold

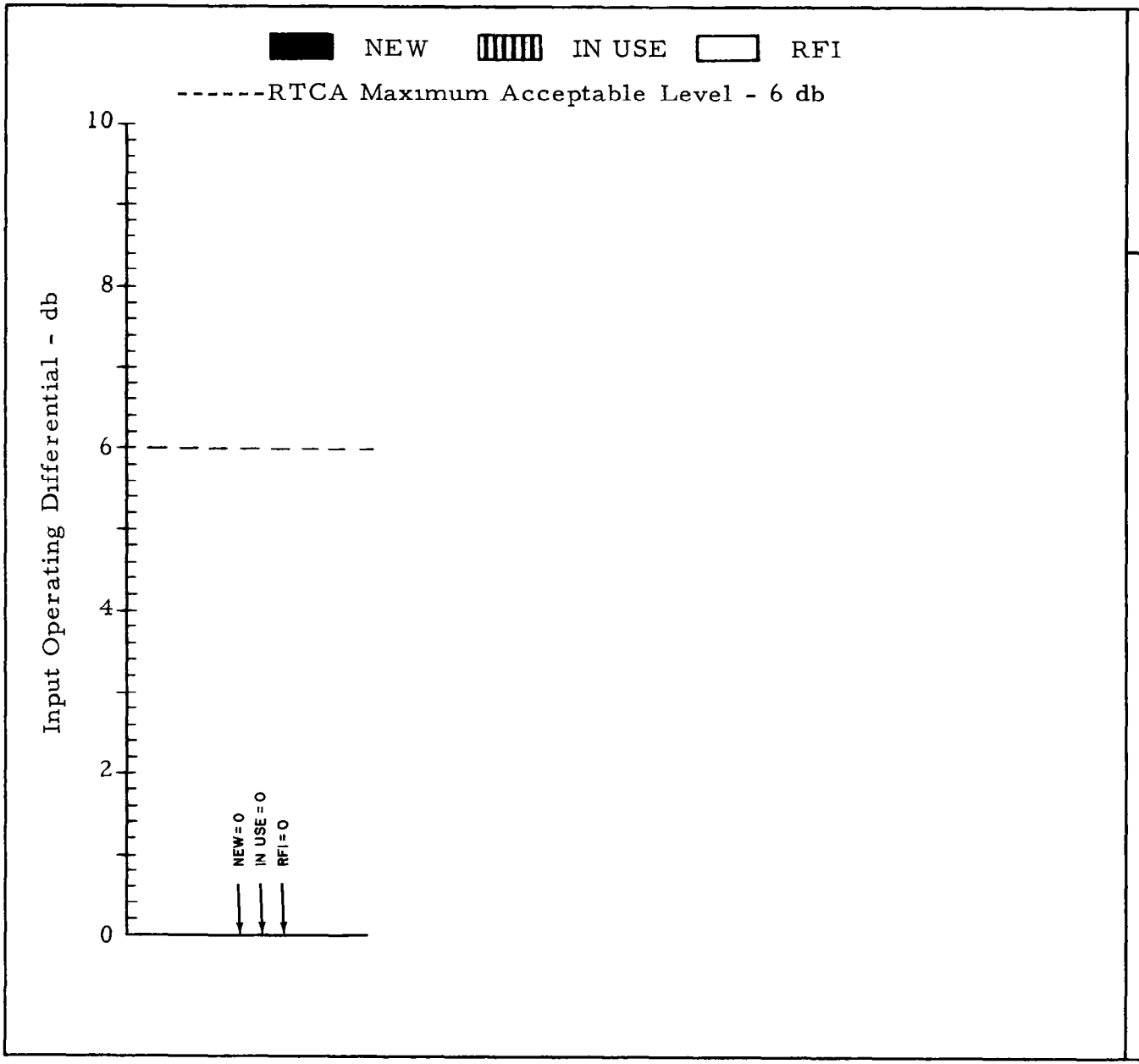
Standard Deviation

Test	New	In Use	RFI
v_1	0.3	1.4	1.8
v_2	0.8	0.6	0.4
v_3	0.9	1.4	1.0

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 30%.

DISTORTION - MARKER BEACON RECEIVER - MB-2

Figure C-1(b)



INPUT OPERATING DIFFERENTIAL

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.11

Standard Deviation

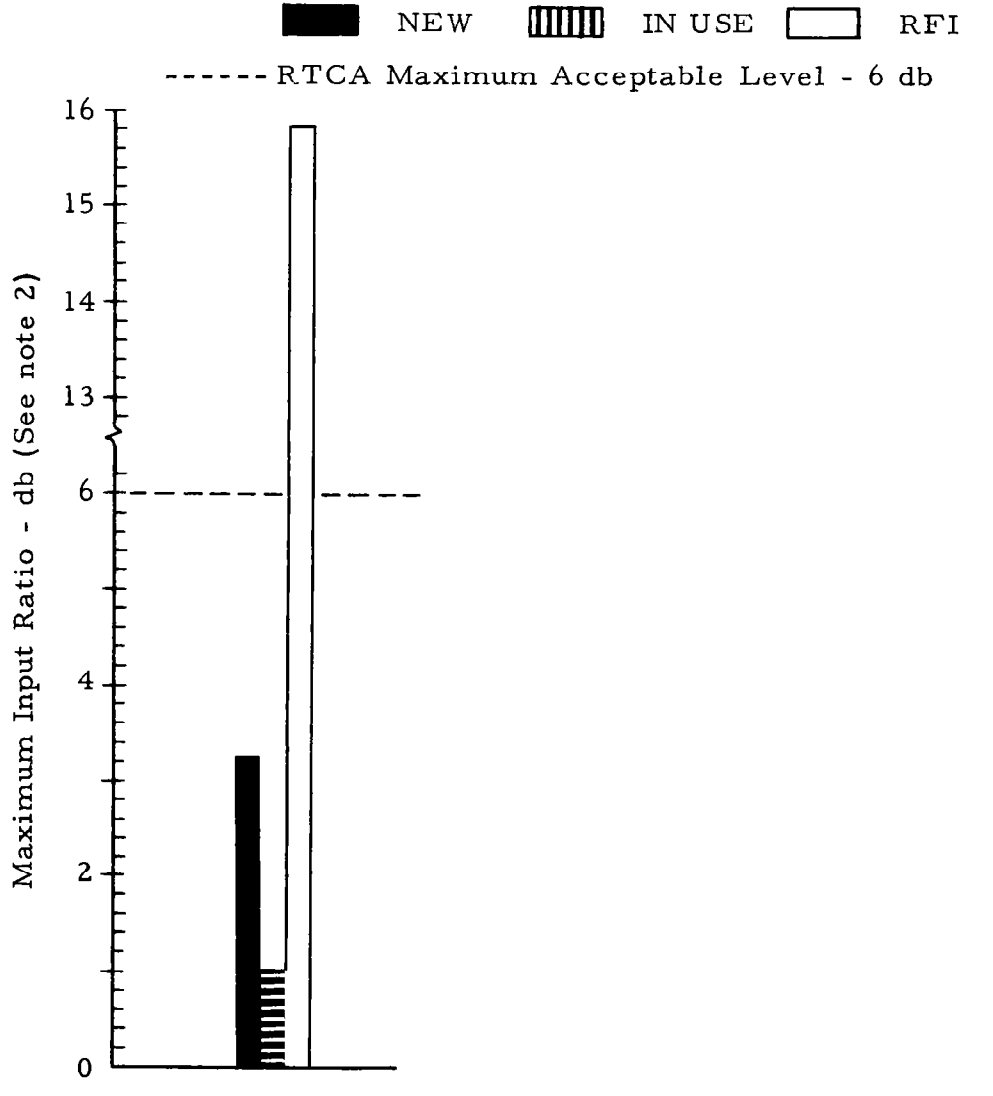
New	In Use	RFI
0	0	0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Differential is defined as: the ratio of RF input signal level required to produce lamp operate threshold when the RF input signal level is increasing/to the RF input signal level required to produce lamp operate threshold when the RF input signal level is decreasing.
3. RTCA maximum acceptable level - 6 db.

Figure C-1(b)

INPUT OPERATING DIFFERENTIAL - MARKER BEACON RECEIVER - MB-2



NOSE BANDWIDTH

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.15

Standard Deviation

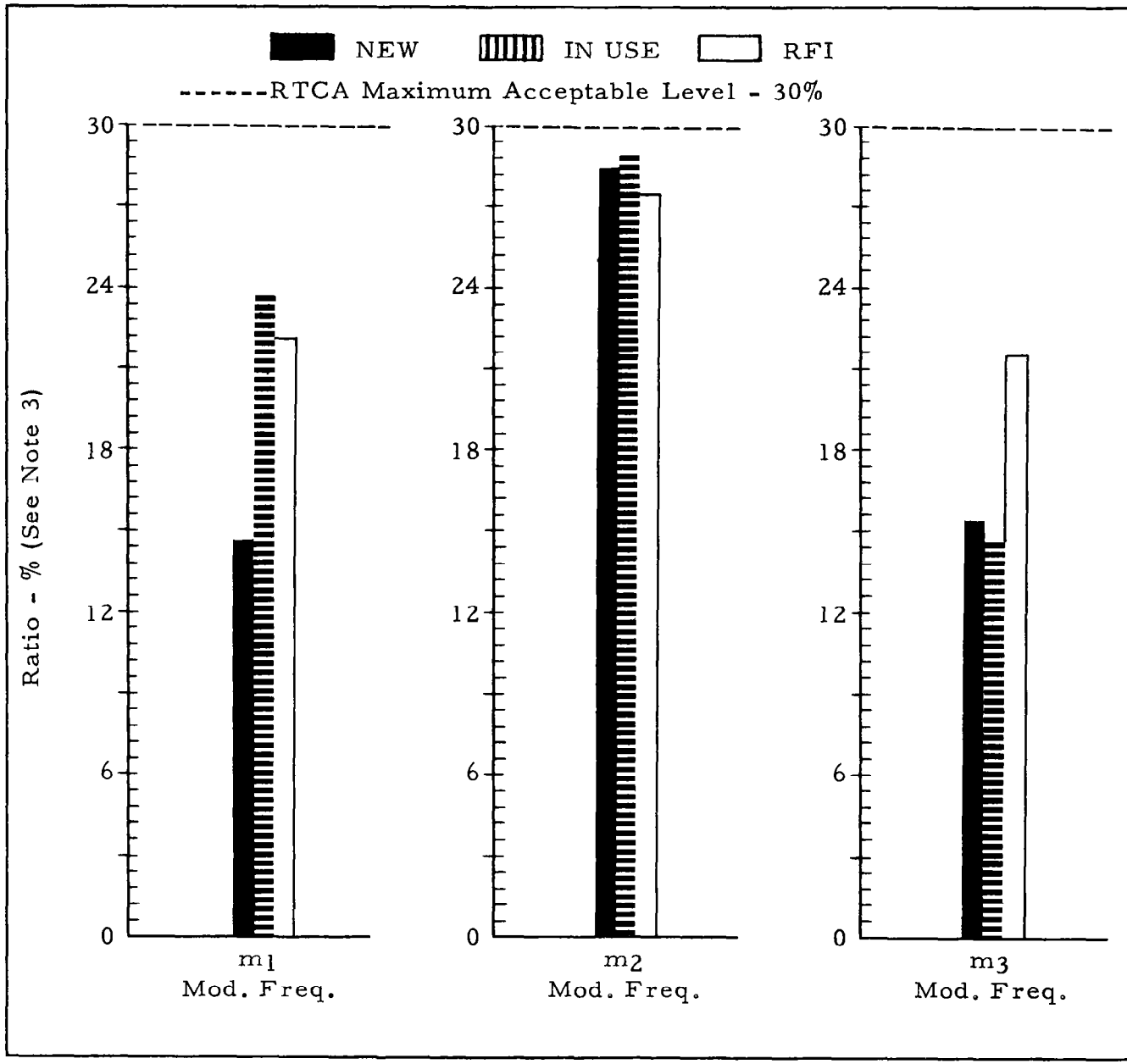
New	In Use	RFI
1.6	1.3	10.9

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Maximum input ratio is defined as: maximum ratio of input signal levels required to produce lamp operate threshold over the frequency range 75 mc ± 10 kc/ to that required to produce lamp operate threshold at 75 mc.
3. RTCA maximum acceptable level - 6 db.

NOSE BANDWIDTH - MARKER BEACON RECEIVER - MB-2

Figure C-1(b)



LAMP OPERATE SELECTIVITY

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.16

LEGEND

m_1 - 400 cps
m_2 - 1300 cps
m_3 - 3000 cps

Standard Deviation

Test	New	In Use	RFI
m_1	3.40	1.80	4.8
m_2	2.00	1.20	3.7
m_3	0.38	1.43	11.7

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 30%.
3. Maximum ratio of voltage across the two lamps not intended to be operated/to rated lamp voltage at lamp operate threshold.

Figure C-1(b)

LAMP OPERATE SELECTIVITY - MARKER BEACON RECEIVER - MB-2

INTERFERENCE TESTS

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57

Test	Frequency (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response (A.M. Signals) RTCA Para: 2.14(a)	.19 to 1500	Acceptable level excluding band from 65 to 85 mc: ≤ LOT (3.0 volts) ≤ 1/2 manufacturer's rated output.	Actual Level: < 3.0 volts < 1.2 manufacturer's rated output.	Yes
Spurious Response (F.M. Signals) RTCA Para: 2.14(b)	72.02 to 74.58 mc and 75.42 to 75.98 mc.	Acceptable Level: ≤ LOT (3.0 volts) ≤ 1/2 manufacturer's rated output.	Actual Level: < 3.0 volts < 1/2 manufacturer's rated output.	Yes
Spurious Response (T.V. Modulated Signals) RTCA Para: 2.14(c)	55.25, 61.25, 67.25, 77.25 and 83.25 mc. (Channel 2 through 6)	Acceptable Level: ≤ LOT (3.0 volts) ≤ 1/2 manufacturer's rated output.	Actual Level: <3.0 volts <1/2 manufacturer's rated output.	Yes
Cross Modulation (T.V. Signal) RTCA Para: 2.13(a)	55.25, 61.25, 67.25, 77.25, and 83.25 mc. (Channel 2 through 6)	Acceptable Level: ≤ LOT (3.0 volts) ≤ 1/2 manufacturer's rated output.	Actual Level: <3.0 volts <1/2 manufacturer's rated output.	Yes

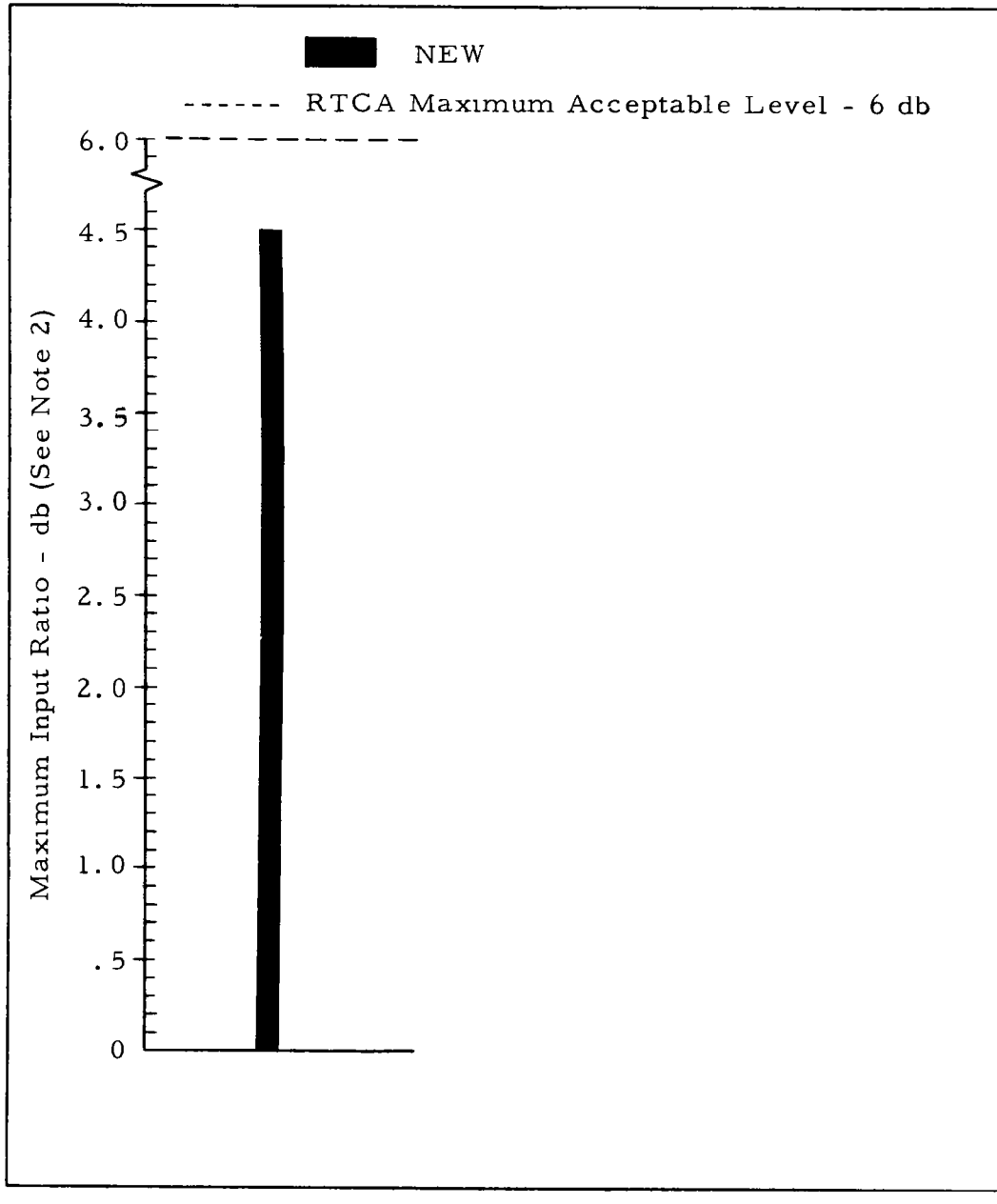
INTERFERENCE TESTS - MARKER BEACON RECEIVER - MB-2

(continued on Page C-73)

Test	Frequency (mc)	RTCA Performance Standards	Results	Performance Standards Met
Cross Modulation (F.M. Signal) RTCA Para: 2.13(b)	72.02 to 74.58 mc and 75.42 to 75.98 mc.	Acceptable Level: ≤ LOT (3 volts) ≤ 1/2 manufacturer's rated output.	Actual Level: < 3 volts < 1/2 manufacturer's rated output.	Yes
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25	Acceptable Emission: ≤ 200 microvolts.	Actual Emission: < 200 microvolts on +28 v. line except at 15.25 and 23 mc. All other frequencies within performance standards.	Partially
Antenna Conducted Interference RTCA Para: 2.9(b)	90 kc to 1500 mc	Acceptable Emission: ≤400 micro-microwatts.	Actual Emission: < 400 micro-microwatts. All frequencies within performance standards.	Yes
Sensitivity Depression (T.V. Sig) RTCA Para: 2.10(a)	67.25 and 77.25 mc (Channel 4 and 5)	Acceptable Level: ≤ 4 db	Actual Level: < 4 db	Yes
Sensitivity Depression (F.M. Signal) RTCA Para: 2.10(b)	72.02 to 74.58 mc and 75.42 to 75.98 mc.	Acceptable Level: ≤ 4 db	Actual Level: < 4 db. All frequencies within performance standards.	Yes

Test	RTCA Para.	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals	None	None	(Not Applicable)

INTERFERENCE TESTS - MARKER BEACON RECEIVER - MB-2



TEMPERATURE VARIATION TEST
(Nose Bandwidth)
Marker Beacon Rcvr. MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 3.1

Notes:

1. Bar represents one "New" unit.
2. Maximum input ratio is defined as: Maximum ratio of input signal levels required to produce lamp operate threshold over the frequency range 75 mc±10 kc/to that required to produce lamp operate threshold at 75 mc.
3. Maximum input ratio occurred at:
   Frequency: 74.99 mc
   Temperature: -55°C
4. RTCA maximum acceptable level - 6 db.
5. This unit is designed to operate above 15,000 feet.

TEMPERATURE VARIATION TEST - MARKER BEACON RECEIVER - MB-2

Figure C-1(b)

OUTPUT REGULATION

Marker Beacon Rcvr: MB-2
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.8

Equipment Status	% Distortion @ 400 cps			% Distortion @ 1300 cps			% Distortion @ 3000 cps		
	50% Z	100% Z	200% Z	50% Z	100% Z	200% Z	50% Z	100% Z	200% Z
New Equipment	28.6	28.8	29.0	17.5	17.7	17.6	11.0	10.8	10.2
In Use Equipment	26.5	26.8	26.5	18.7	18.7	18.3	9.2	9.2	8.7
RFI Equipment	25.6	25.4	25.6	18.5	18.2	18.0	7.9	7.7	7.3

Equipment Status	% Distortion @ 400 cps			% Distortion @ 1300 cps			% Distortion @ 3000 cps		
	50% Z	100% Z	200% Z	50% Z	100% Z	100% Z	50% Z	100% Z	200% Z
New Equipment	4.7	7.3	11.1	5.0	7.7	11.6	4.5	6.8	10.4
In Use Equipment	5.9	9.0	12.3	5.9	9.0	12.3	5.6	8.5	11.5
RFI Equipment	5.8	9.1	11.1	5.7	8.7	11.7	4.8	7.4	10.0

Notes:

1. Each value represents the arithmetic mean for 3 units.
2. RTCA acceptable limits - The distortion in the output shall not exceed 30%. The output voltage level shall be within 2:1 of the level at design impedance.
3. Z represents design impedance of 600 ohms.

OUTPUT REGULATION - MARKER BEACON RECEIVER - MB-2

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

2. Laboratory and Field Test Data

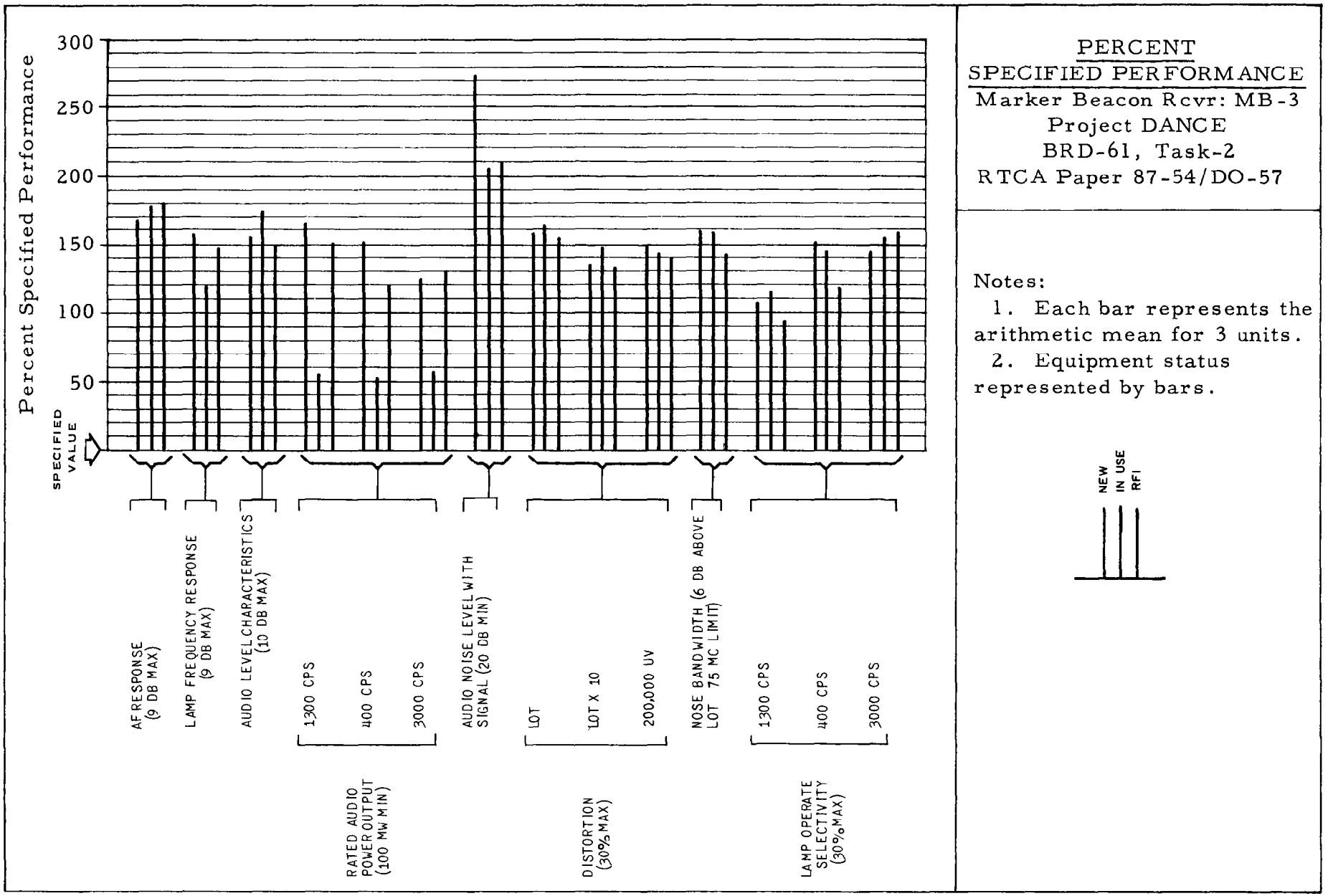
c. MB-3, Marker Beacon Receiver

General:

Frequency Range:	Fixed, 75 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	1
Number of Channels Available at Operator's Position:	1
Means of Frequency Selection:	None

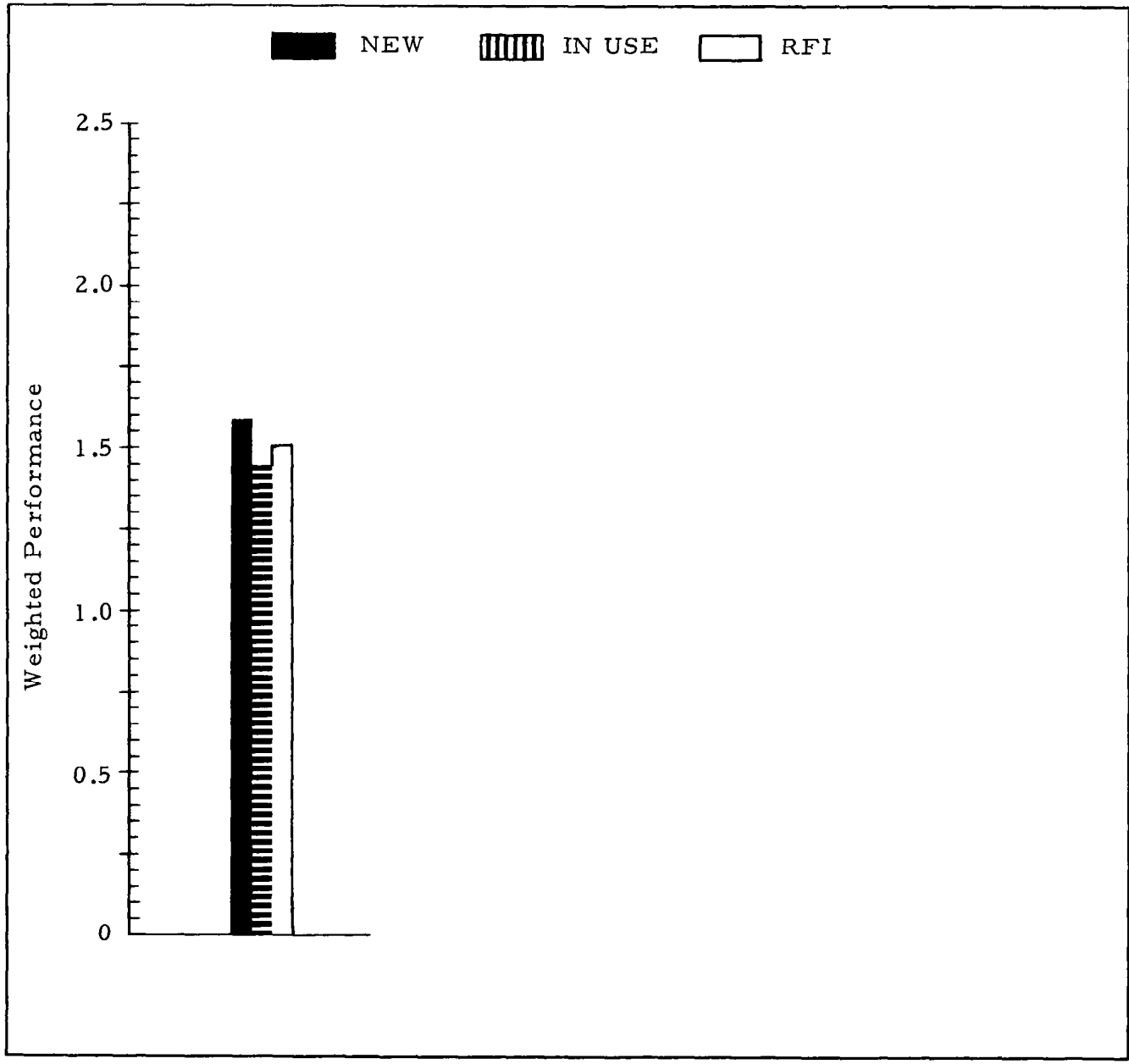
Technical:

	Page
Percent Specified Performance	C-78
Weighted Performance	C-79
Audio Frequency Response	C-80
Lamp Frequency Response	C-81
Audio Level Characteristics	C-82
Rated Audio Power Output	C-83
Audio Noise Level With Signal	C-84
Audio Noise Level Without Signal	C-85
Distortion	C-86
Input Operating Differential	C-87
Nose Bandwidth	C-88
Lamp Operate Selectivity	C-89
Interference Tests	C-90-C-91
Temperature Variation Test	C-92
Output Regulation	C-93



PERCENT SPECIFIED PERFORMANCE - MARKER BEACON RECEIVER - MB-3

Figure C-1(c)



WEIGHTED PERFORMANCE

Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2

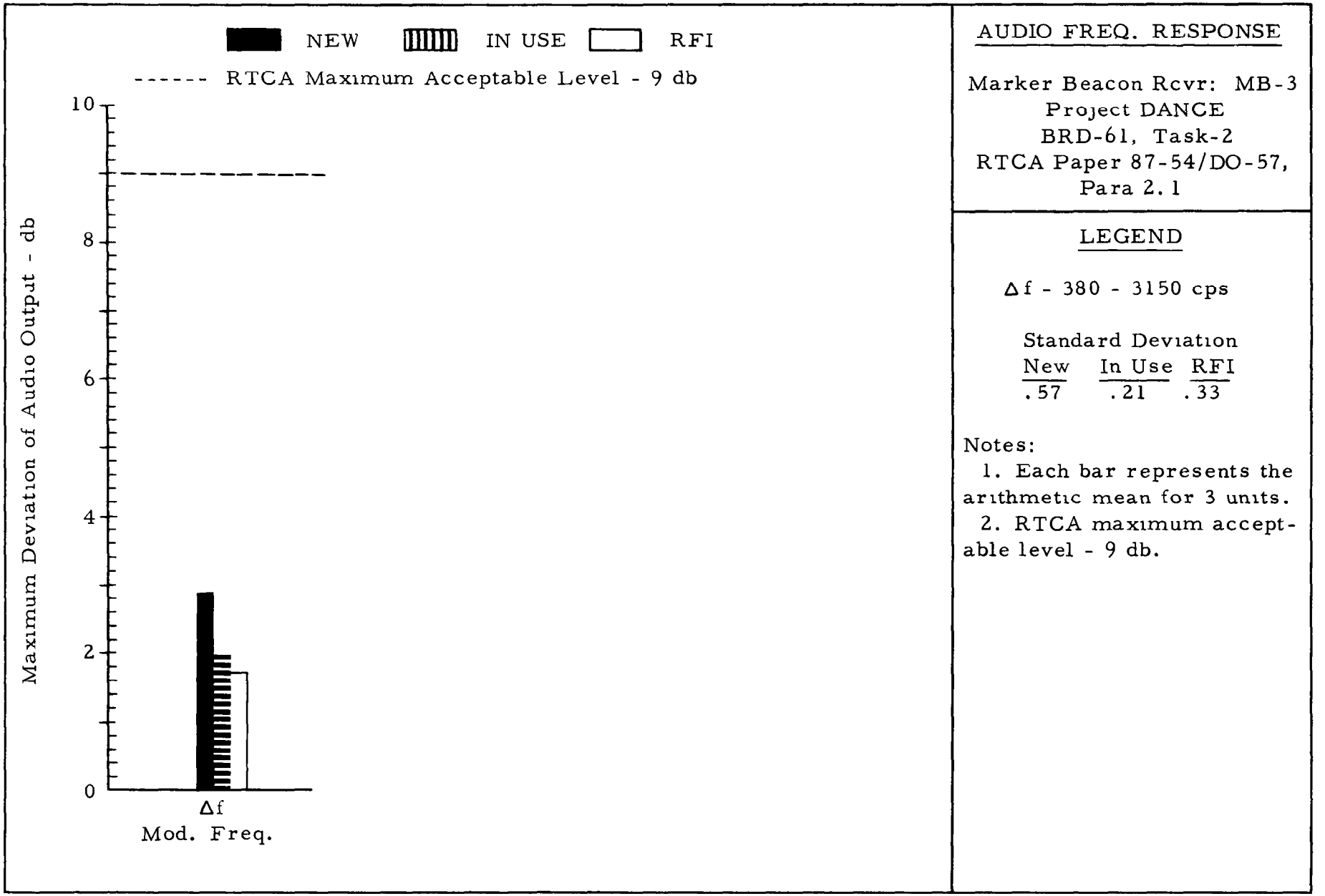
WEIGHTING FACTORS

Nose Bandwidth	3/10
Lamp Frequency Response:	1/5
Audio Level Characteristic:	1/10
Audio Frequency Response:	1/10
Rated Audio Power Output:	
f_1, f_2, f_3	1/30 ea.
Lamp Operate Selectivity:	
f_1, f_2, f_3	1/30 ea.
Audio Noise Level with Signal:	1/20
Audio Output Distortion:	
f_1, f_2, f_3	1/60 ea.

Note:
1. Graph based on arithmetic mean for above characteristics.

WEIGHTED PERFORMANCE - MARKER BEACON RECEIVER - MB-3

Figure C-1(c)



AUDIO FREQ. RESPONSE

Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.1

LEGEND

Δf - 380 - 3150 cps

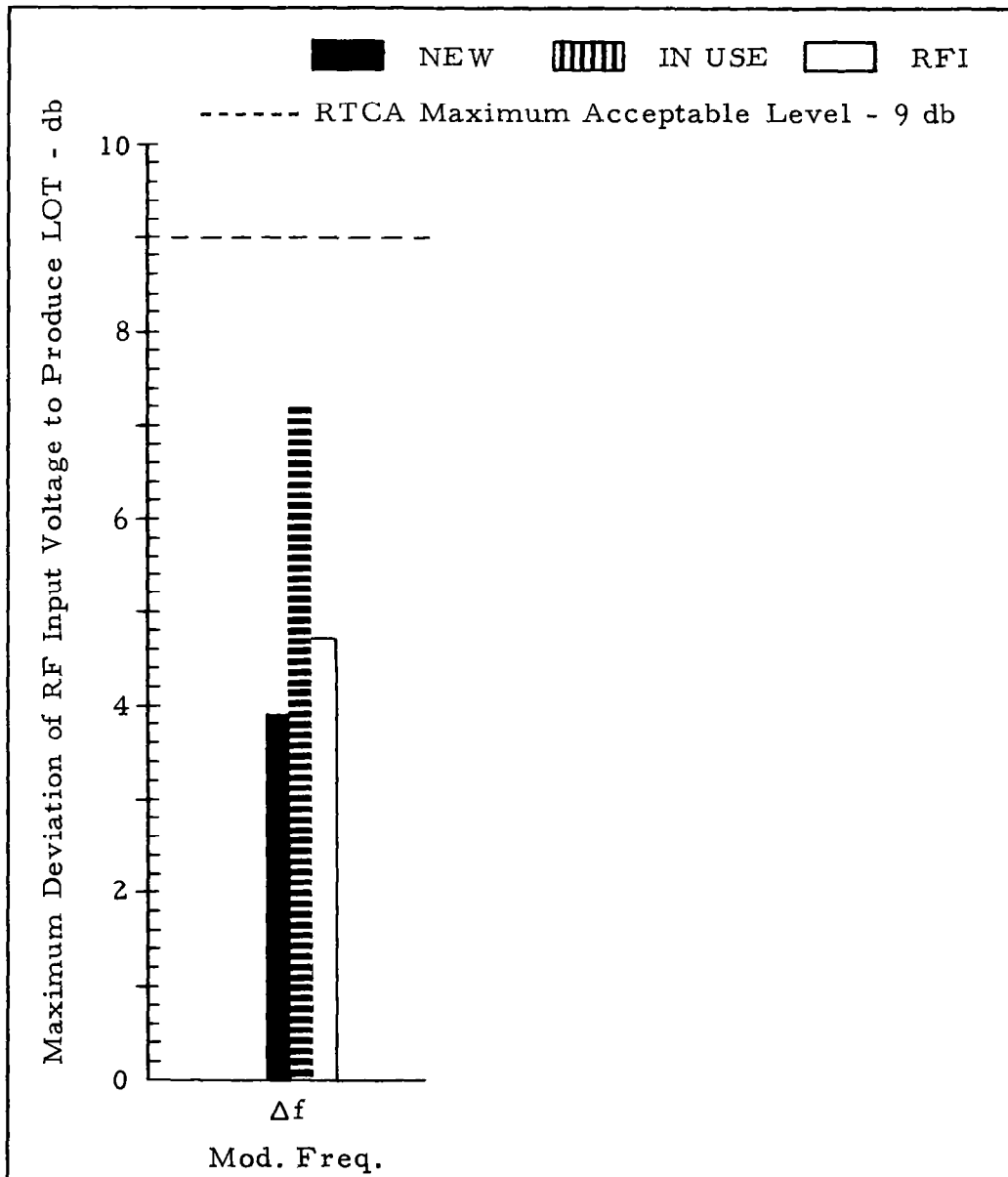
Standard Deviation

New	In Use	RFI
.57	.21	.33

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 db.

Figure C-1(c)

AUDIO FREQUENCY RESPONSE - MARKER BEACON RECEIVER - MB-3



LAMP FREQUENCY RESPONSE
Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 2.2

LEGEND

Δf - 380 - 3150 cps
LOT - Lamp Operate Threshold

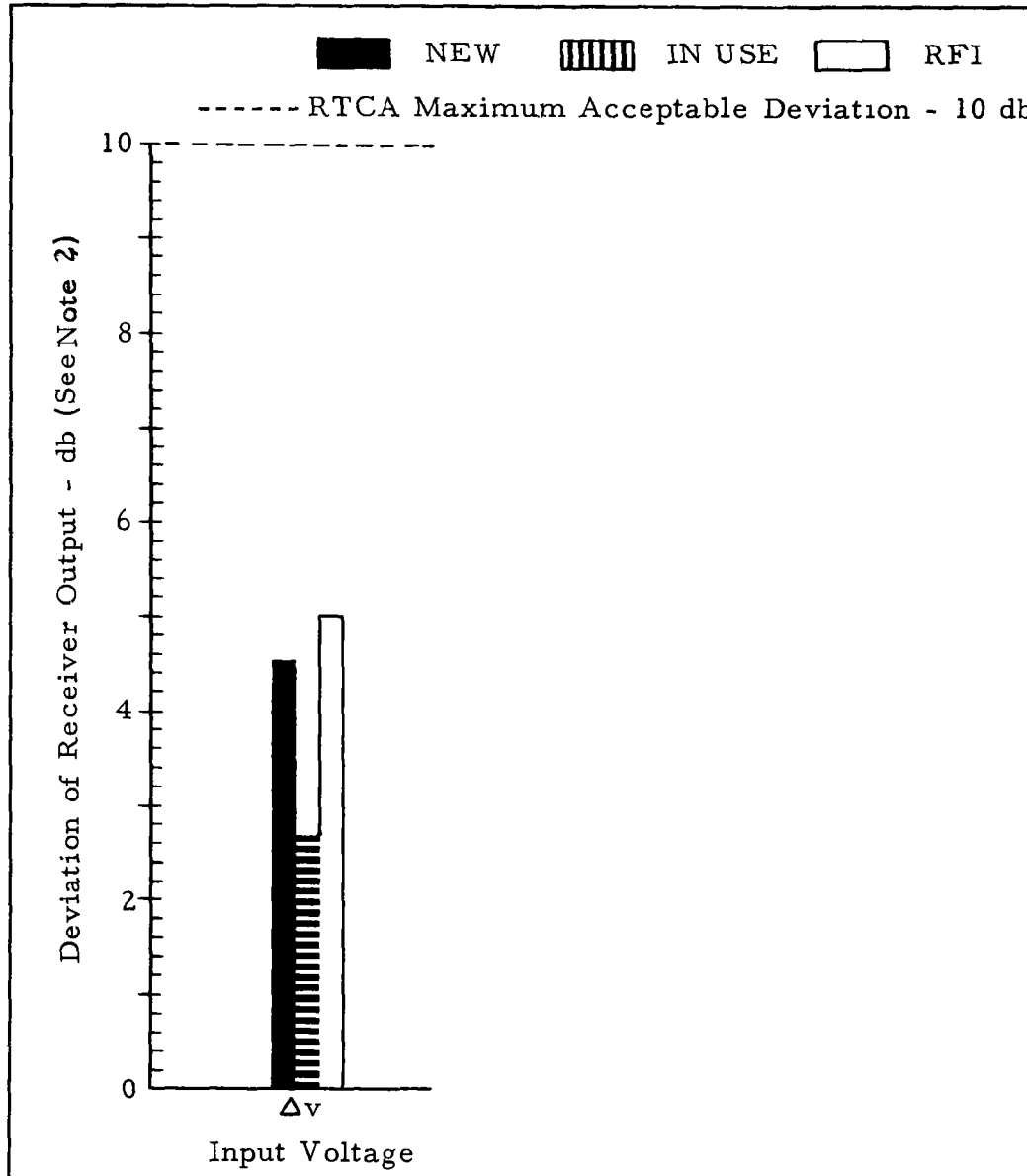
Standard Deviation

New	In Use	RFI
2.1	3.0	1.7

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 db.

Figure C-1(c)

LAMP FREQUENCY RESPONSE - MARKER BEACON RECEIVER - MB-3



AUDIO LEVEL CHARACTERISTIC
Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.3

LEGEND

Δv - LOT to 200,000 uv
LOT - Lamp Operate Threshold

Standard Deviation

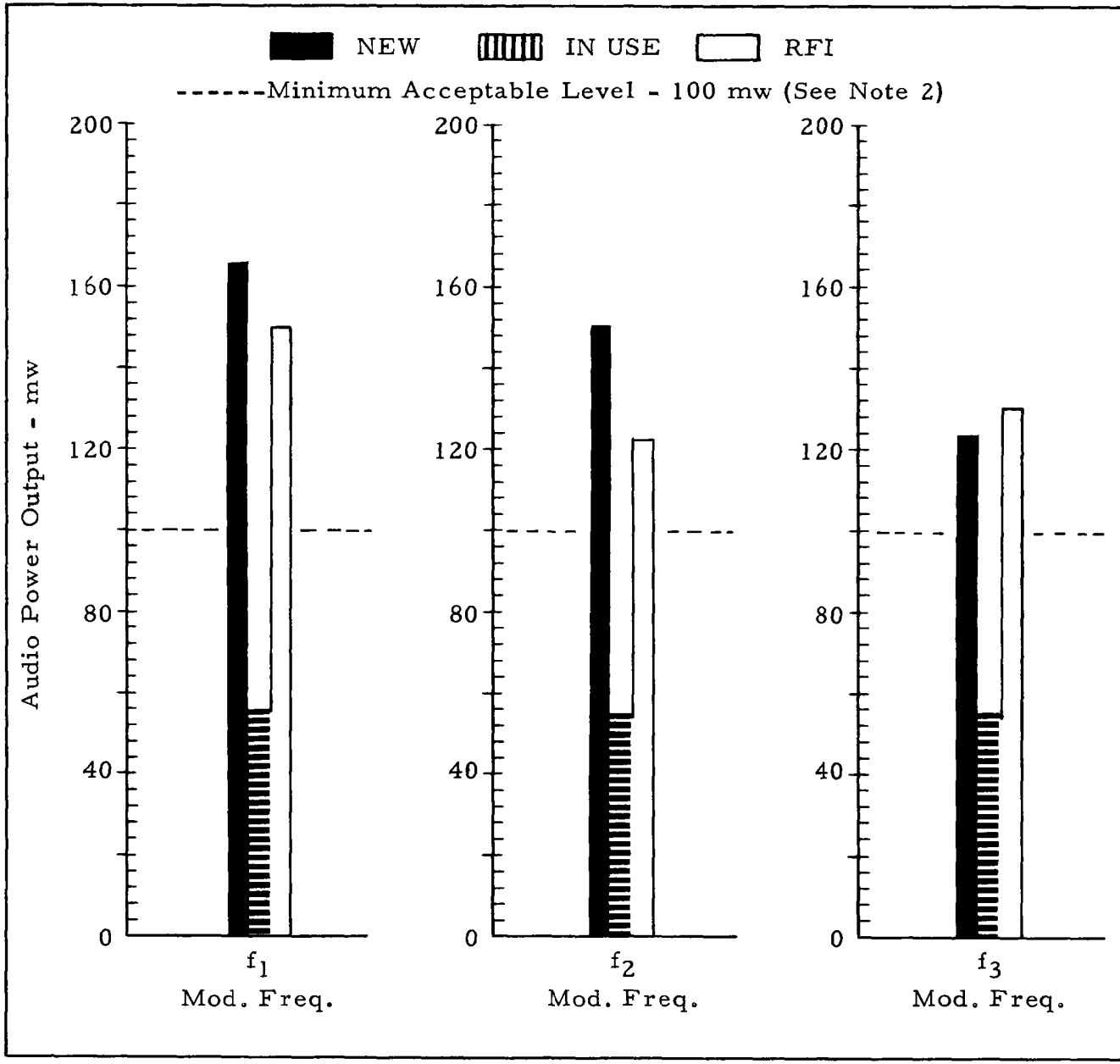
New	In Use	RFI
.36	.63	.49

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Maximum deviation of receiver output when RF signal level is varied over range from lamp operate threshold to 200,000 uv, using data of combined modulating frequencies.
3. RTCA maximum acceptable deviation - 10 db.

Figure C-1(c)

AUDIO LEVEL CHARACTERISTIC - MARKER BEACON RECEIVER - MB-3



RATED AUDIO POWER OUTPUT
Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 2.4

LEGEND

f_1 - 1300 cps
f_2 - 400 cps
f_3 - 3000 cps

Standard Deviation

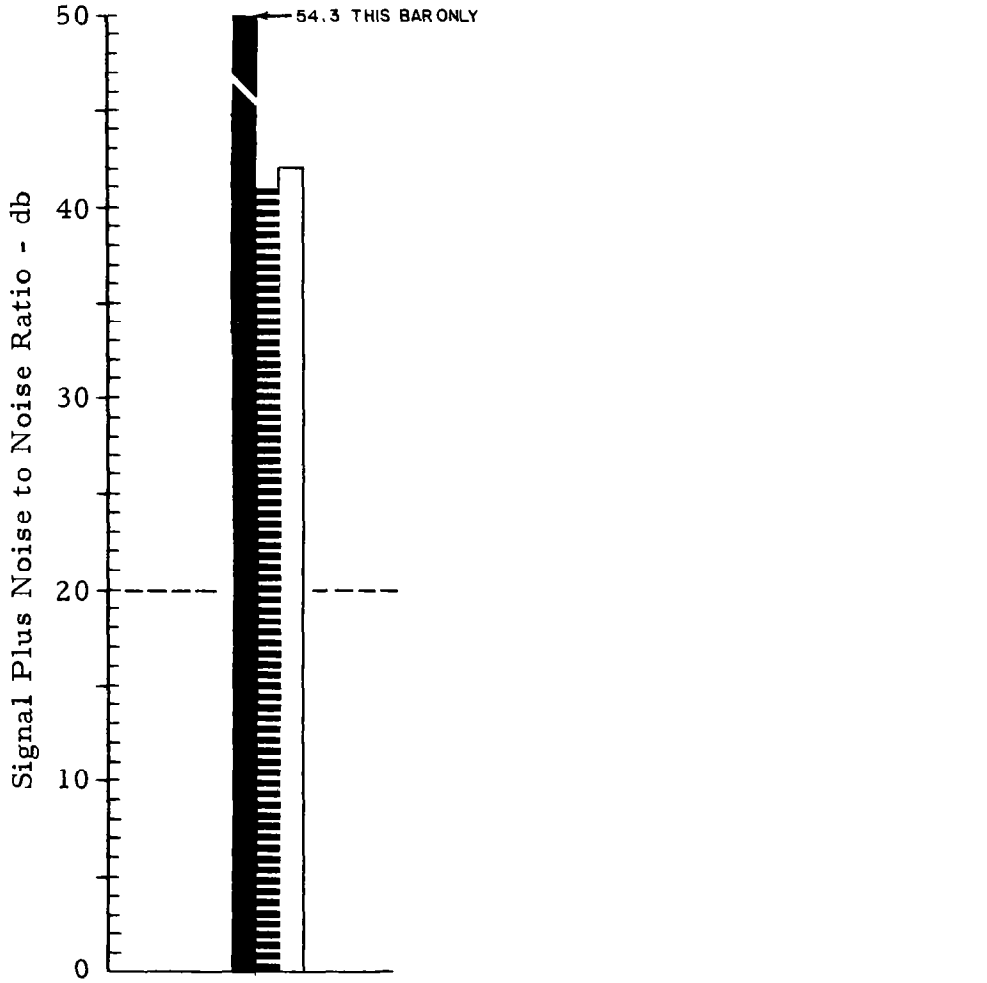
Test	New	In Use	RFI
f_1	5.73	72.2	22.6
f_2	10.00	73.0	10.2
f_3	10.10	69.2	15.0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Manufacturer's rating on MB-3 not given. 100 mw acceptable level based on manufacturer's rating on 51Z-2 Marker Beacon receiver.
3. RF input signal level 10 times that producing lamp operate threshold.

RATED AUDIO POWER OUTPUT - MARKER BEACON RECEIVER - MB-3

Figure C-1(c)



AUDIO NOISE LEVEL - WITH SIGNAL
Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.6(a)

Standard Deviation

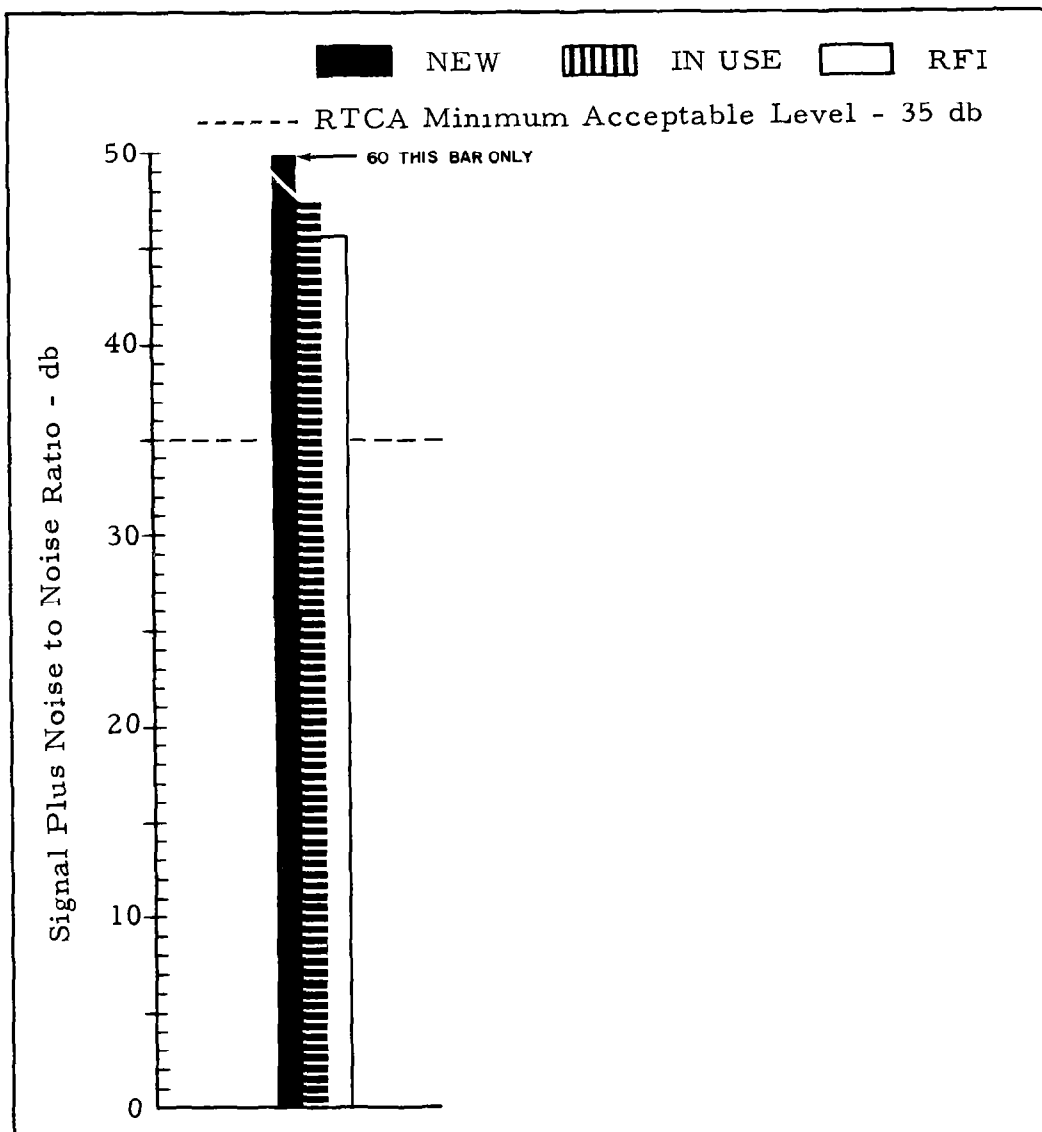
New	In Use	RFI
5.2	1.3	2.8

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 20 db.
3. Based on RF input signal varied from that level producing lamp operate threshold to 200,000 uv.

AUDIO NOISE LEVEL - WITH SIGNAL - MARKER BEACON RECEIVER - MB-3

Figure C-1(c)



AUDIO NOISE LEVEL - WITHOUT SIGNAL
Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.5(a)

Standard Deviation

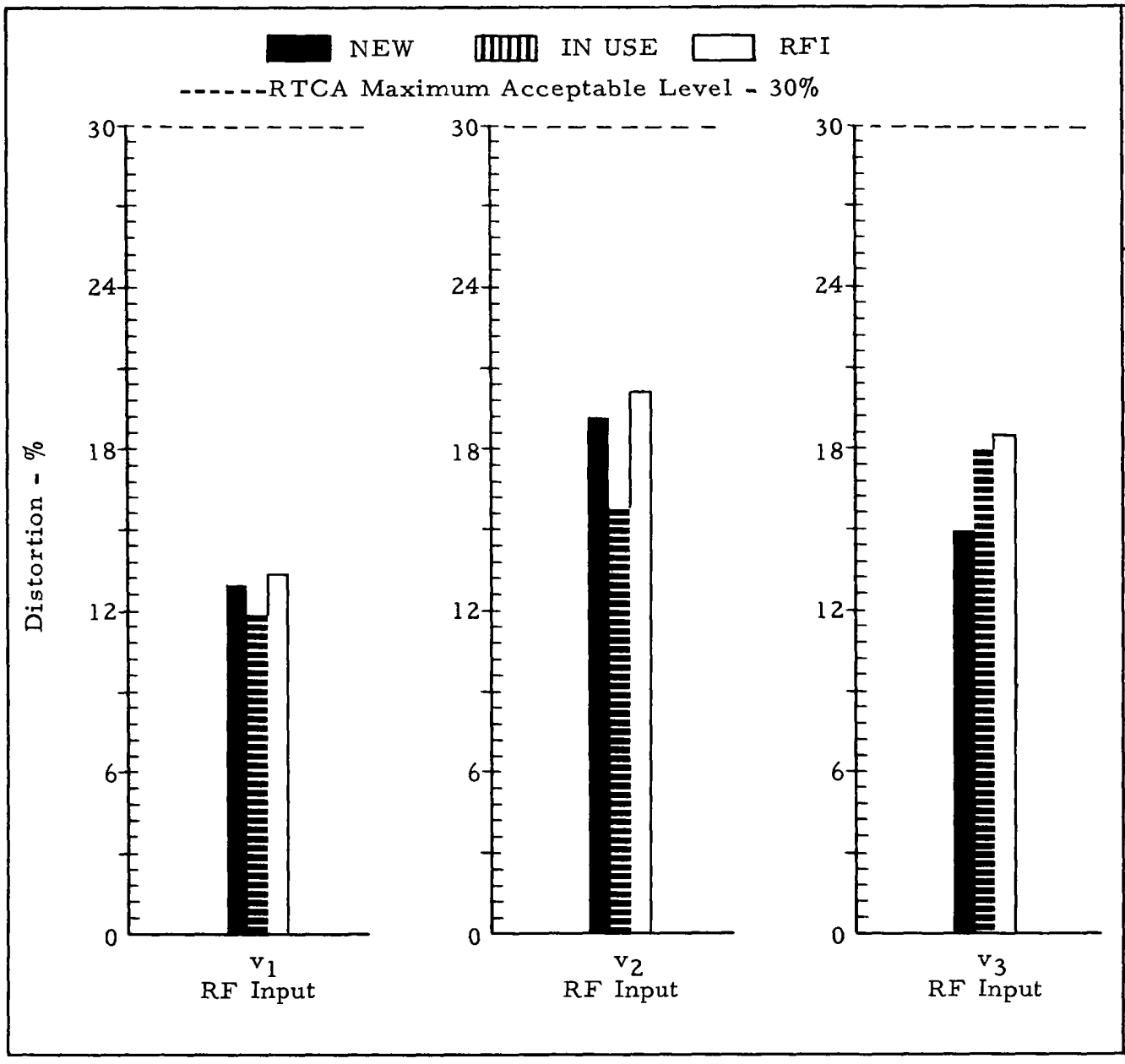
New	In Use	RFI
.78	1.9	2.3

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 35 db.
3. Based on an RF input signal level 10 times that producing lamp operate threshold.

Figure C-1(c)

AUDIO NOISE LEVEL - WITHOUT SIGNAL - MARKER BEACON RECEIVER - MB-3



DISTORTION

Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.7

LEGEND

v_1 - LOT
v_2 - LOT X 10
v_3 - 200,000 uv
LOT - Lamp Operate Threshold

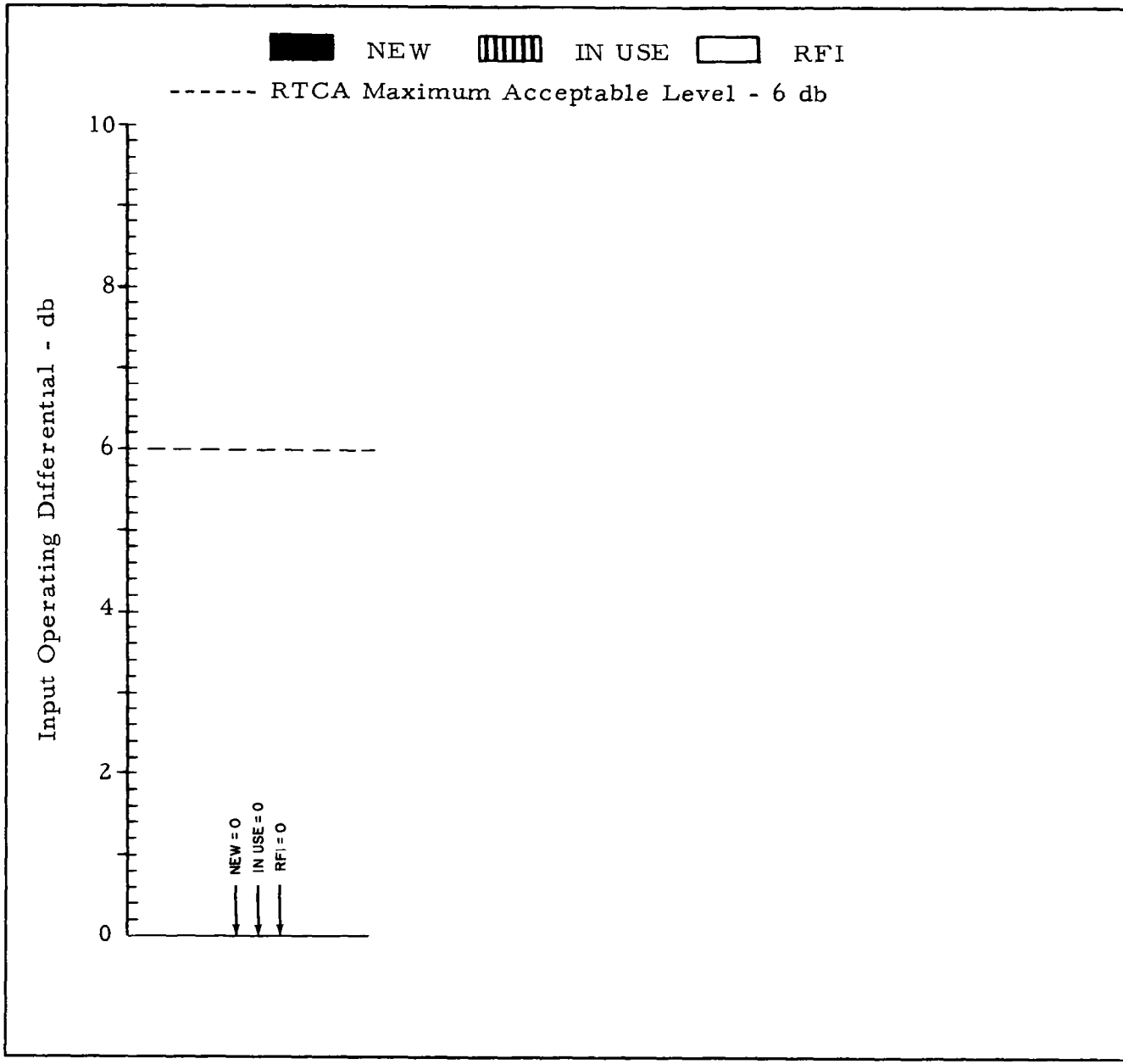
Standard Deviation

Test	New	In Use	RFI
v_1	1.30	2.10	2.20
v_2	0.26	1.60	1.20
v_3	0.20	2.50	0.42

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 30%.

DISTORTION - MARKER BEACON RECEIVER - MB-3

Figure C-1(c)



INPUT OPERATING DIFFERENTIAL
Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87/54/DO-57, Para 2.11

Standard Deviation

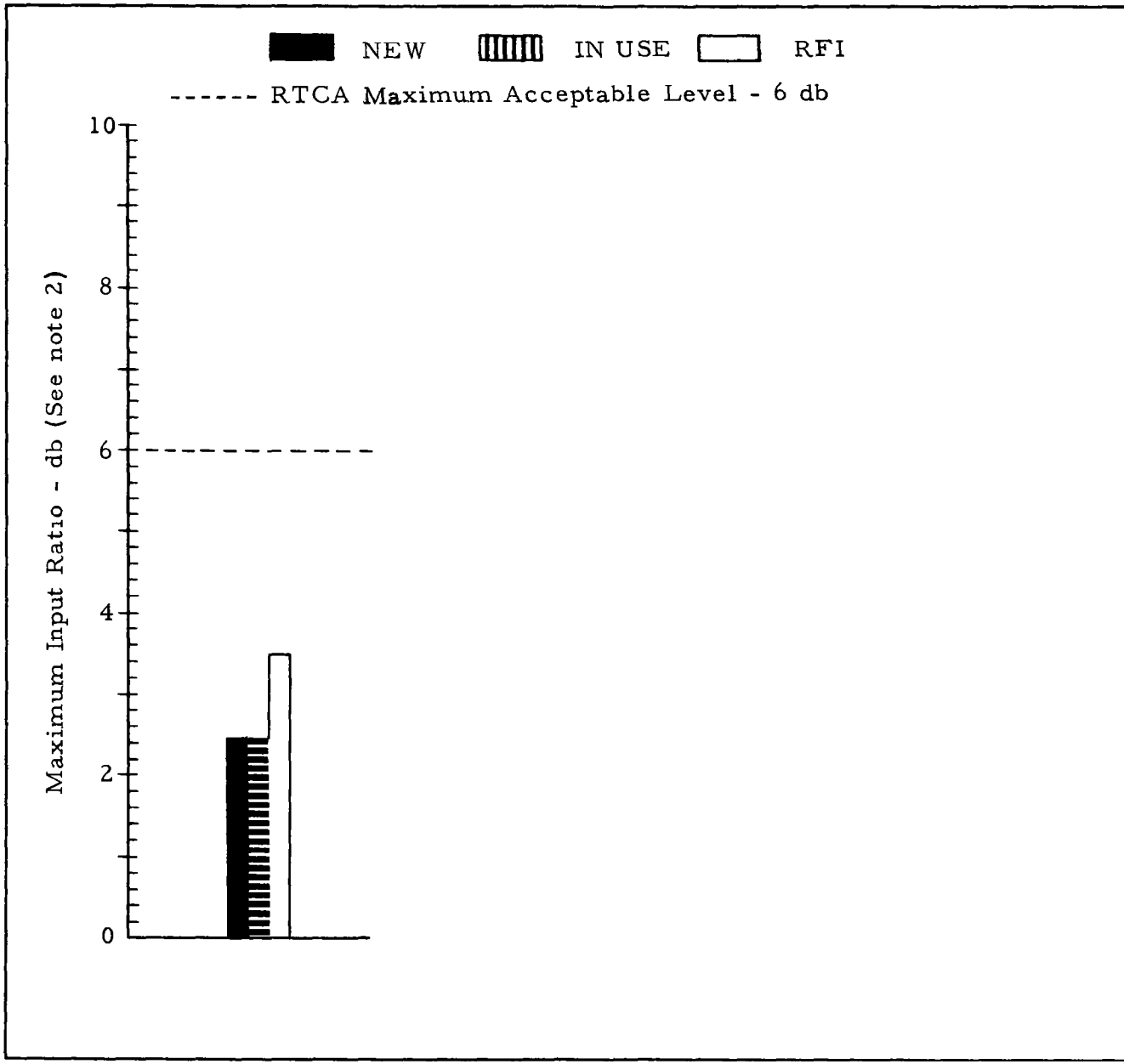
New	In Use	RFI
0	0	0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Differential is defined as: the ratio of RF input signal level required to produce lamp operate threshold when the RF input signal level is increasing/to the RF input signal level required to produce lamp operate threshold when the RF input signal level is decreasing.
3. RTCA maximum acceptable level - 6 db.

INPUT OPERATING DIFFERENTIAL - MARKER BEACON RECEIVER - MB-3

Figure C-1(c)



NOSE BANDWIDTH

Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.15

Standard Deviation

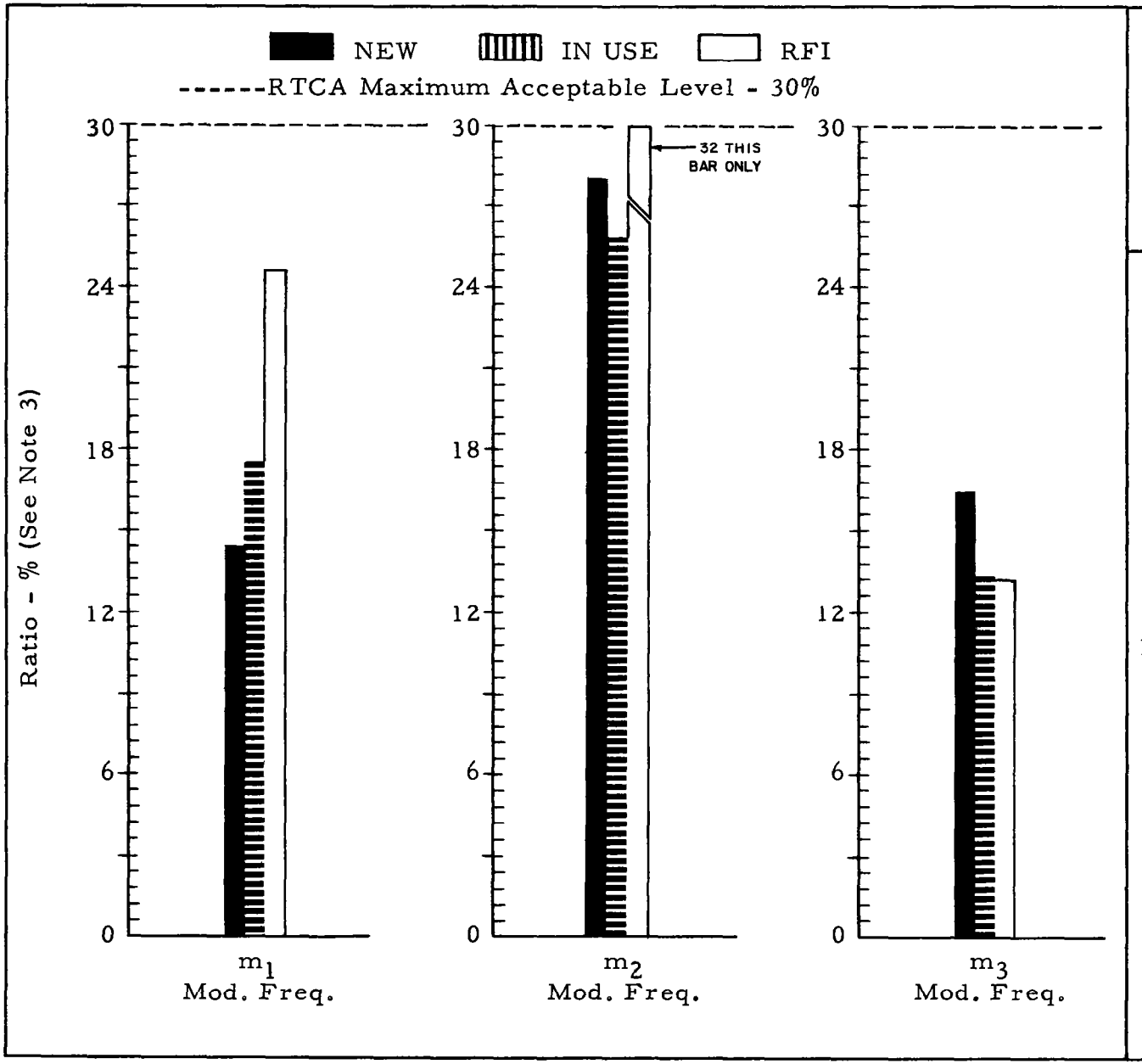
New	In Use	RFI
1.3	.12	1.8

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Maximum input ratio is defined as: maximum ratio of input signal levels required to produce lamp operate threshold over the frequency range 75 mc ± 10 kc/to that required to produce lamp operate threshold at 75 mc.
3. RTCA maximum acceptable level - 6 db.

NOSE BANDWIDTH - MARKER BEACON RECEIVER - MB-3

Figure C-1(c)



LAMP OPERATE SELECTIVITY
Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 2.16

LEGEND

m_1 - 400 cps
m_2 - 1300 cps
m_3 - 3000 cps

Standard Deviation

Test	New	In Use	RFI
m_1	1.60	1.0	3.40
m_2	1.50	1.1	4.50
m_3	0.87	1.2	0.65

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 30%.
3. Maximum ratio of voltage across the two lamps not intended to be operated/to rated lamp voltage at lamp operate threshold.

Figure C-1(c)

LAMP OPERATE SELECTIVITY - MARKER BEACON RECEIVER - MB-3

INTERFERENCE TESTS

Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57

Test	Frequency (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response (A.M. Signals) RTCA Para: 2.14(a)	.19 to 1500	Acceptable level excluding band from 65 to 85 mc: ≤ LOT (3.0 volts) ≤ 1/2 manufacturer's rated output.	Actual Level: <3.0 volts <1/2 manufacturer's rated output.	Yes
Spurious Response (F.M. Signals) RTCA Para: 2.14(b)	72.02 to 74.58 mc and 75.42 to 75.98 mc	Acceptable Level: ≤LOT (3.0 volts) ≤1/2 manufacturer's rated output.	Actual Level: <3.0 volts <1/2 manufacturer's rated output.	Yes
Spurious Response (T.V. Modulated Signal) RTCA Para: 2.14(c)	55.25, 61.25, 67.25, 77.25 and 83.25 mc. (Channel 2 through 6)	Acceptable Level: ≤LOT (3.0 volts) ≤1/2 manufacturer's rated output.	Actual Level: <3.0 volts <1/2 manufacturer's rated output.	Yes
Cross Modulation (T.V. Signal) RTCA Para: 2.13(a)	55.25, 61.25, 67.25, 77.25 and 83.25 mc. (Channel 2 through 6)	Acceptable Level: ≤LOT (3.0 volts) ≤1/2 manufacturer's rated output.	Actual Level: <3.0 volts <1/2 manufacturer's rated output.	Yes

INTERFERENCE TESTS - MARKER BEACON RECEIVER - MB-3

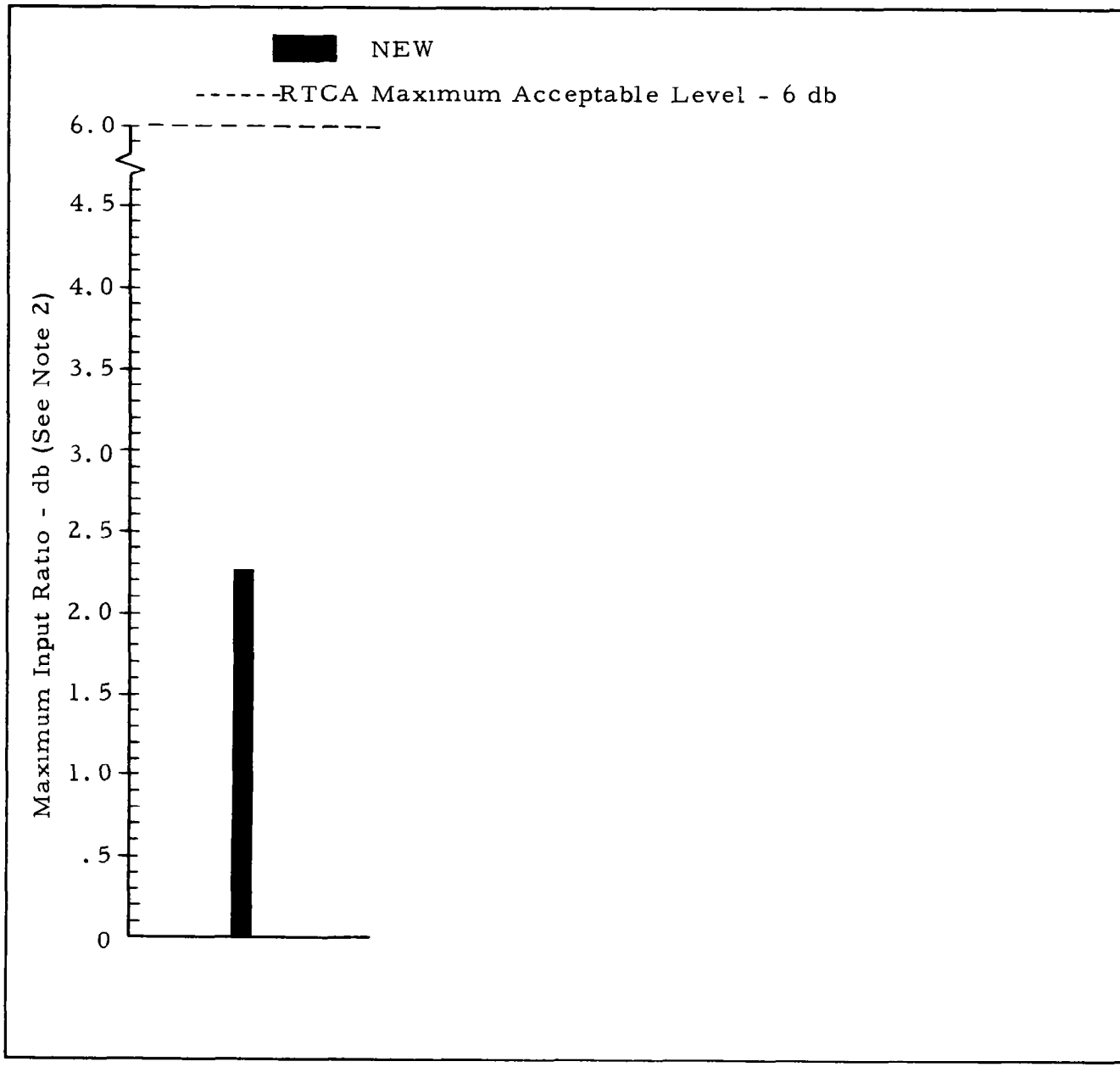
(continued on Page C-91)

Test	Frequency (mc)	RTCA Performance Standards	Results	Performance Standards Met
Cross Modulation (F.M. Signal) RTCA Para: 2.13(b)	72.02 to 74.58 mc and 75.42 to 75.98 mc.	Acceptable Level: ≤ LOT (3.0 volts) ≤ 1/2 manufacturer's rated output.	Actual Level: < 3.0 volts < 1/2 manufacturer's rated output.	Yes
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25	Acceptable Emission: ≤ 200 microvolts.	Actual Emission on +28v. line: <200 microvolts except at 23 mc. All other frequencies within performance standards.	Partially
Antenna Conducted Interference RTCA Para: 2.9(b)	90 kc to 1500 mc	Acceptable Emission: ≤ 400 micro-microwatts.	Actual Emission: ≤ 400 micro-microwatts except at 220 and 230 mc. All other frequencies within performance standards.	Partially
Sensitivity Depression (T.V. Sig.) RTCA Para: 2.10(a)	67.25 and 77.25 mc (Channel 4 and 5)	Acceptable Level: ≤ 4 db	Actual Level: < 4 db	Yes
Sensitivity Depression (F.M. Signal) RTCA Para: 2.10 (b)	72.02 to 74.58 mc and 75.42 to 75.98 mc.	Acceptable Level: ≤ 4 db	Actual Level: < 4 db All frequencies within performance standards.	Yes

Test	RTCA Para.	Probable Susceptibility	Realtion to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	None	(Not Applicable)

Figure C-1(c)

INTERFERENCE TESTS - MARKER BEACON RECEIVER - MB-3



TEMPERATURE VARIATION TEST
(Nose Bandwidth)
Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57, Para 3.1

Notes:

1. Bar represents one "New" unit.
2. Maximum input ratio is defined as: Maximum ratio of input signal levels required to produce lamp operate threshold over the frequency range 75 mc±10 kc/to that required to produce lamp operate threshold at 75 mc.
3. Maximum input ratio occurred at:
   Frequency: 74.99 mc
   Temperature: +55°C
4. RTCA maximum acceptable level - 6 db.
5. This unit is designed to operate above 15,000 feet.

Figure C-1(c)

TEMPERATURE VARIATION TEST - MARKER BEACON RECEIVER - MB-3

OUTPUT REGULATION

Marker Beacon Rcvr: MB-3
Project DANCE
BRD-61, Task-2
RTCA Paper 87-54/DO-57,
Para 2.8

Equipment Status	% Distortion @ 400 cps			% Distortion @ 1300 cps			% Distortion @ 3000 cps		
	50% Z	100% Z	200% Z	50% Z	100% Z	200% Z	50% Z	100% Z	200 % Z
New Equipment	29.8	29.6	30.0	18.2	18.3	18.0	12.6	11.9	11.2
In Use Equipment	20.5	20.6	20.7	18.3	18.7	18.5	6.5	6.6	6.5
RFI Equipment	29.7	30.0	29.7	19.3	19.2	18.7	11.7	11.2	10.7

Equipment Status	Audio Output - Volts @ 400 cps			Audio Output - Volts @ 1300 cps			Audio Output - Volts @ 3000 cps		
	50% Z	100% Z	200% Z	50% Z	100% Z	200% Z	50% Z	100% Z	200 % Z
New Equipment	6.4	9.8	12.8	6.4	9.8	12.7	5.6	8.5	11.0
In Use Equipment	3.1	4.7	6.2	3.1	4.6	6.3	4.8	6.1	7.2
RFI Equipment	5.4	8.3	11.3	6.0	9.1	12.6	5.7	8.6	11.7

Notes:

1. Each value represents the arithmetic mean for 3 units.
2. RTCA acceptable limits - The distortion in the output shall not exceed 30 %. The output voltage level shall be within 2:1 of the level at design impedance.
3. Z represents design impedance of 600 ohms.

OUTPUT REGULATION - MARKER BEACON RECEIVER - MB-3

Figure C-1(c)

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

3. Laboratory and Field Test Data

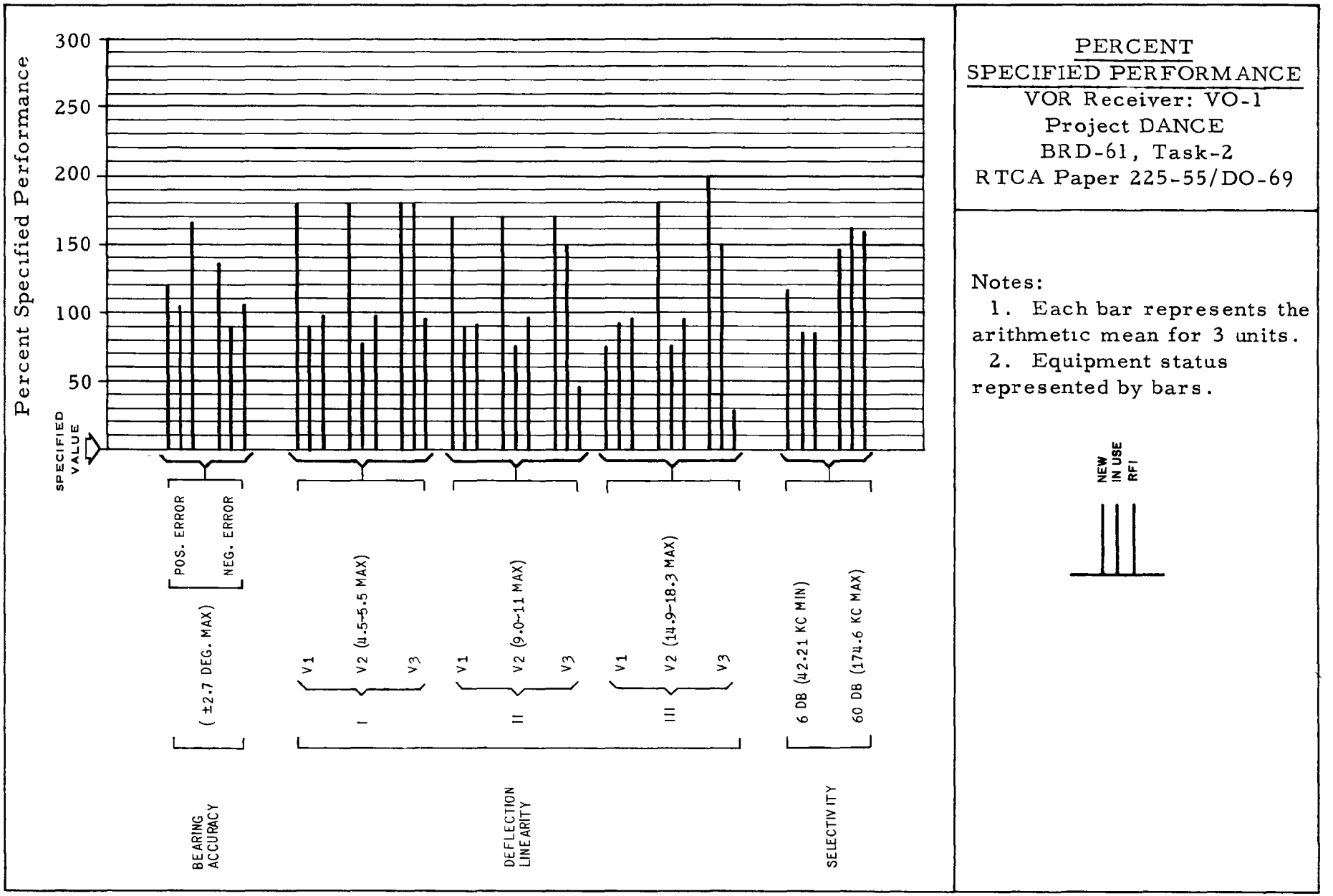
a. VO-1, VOR Receiver

General:

Frequency Range:	108.0 - 135.9 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	280
Number of Channels Available at Operator's Position:	280
Means of Frequency Selection:	Rotary Switch

Technical:

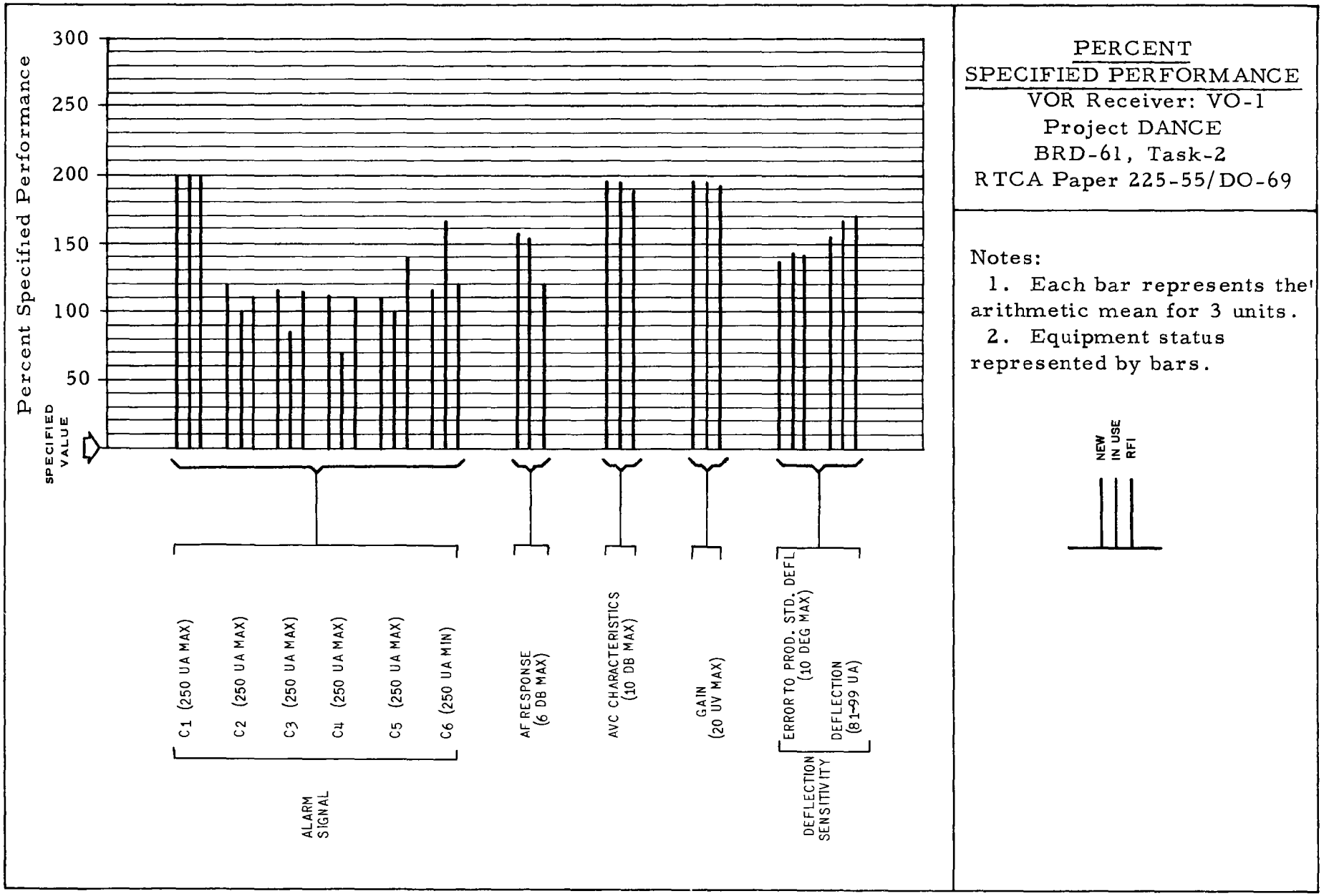
	Page(s)
Percent Specified Performance	C-96
Weighted Performance	C-97
Bearing Accuracy	C-98
Deflection Linearity	C-99-104
Deflection Sensitivity	C-105-106
Selectivity	C-107-108
Alarm Signal	C-109-110
Audio Frequency Response	C-111
AVC Characteristic	C-112
Gain	C-113
Noise Level	C-114
Interference Tests	C-115-116
Temperature Variation Test	C-117
Audio Output Regulation & Distortion	C-118



PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-1

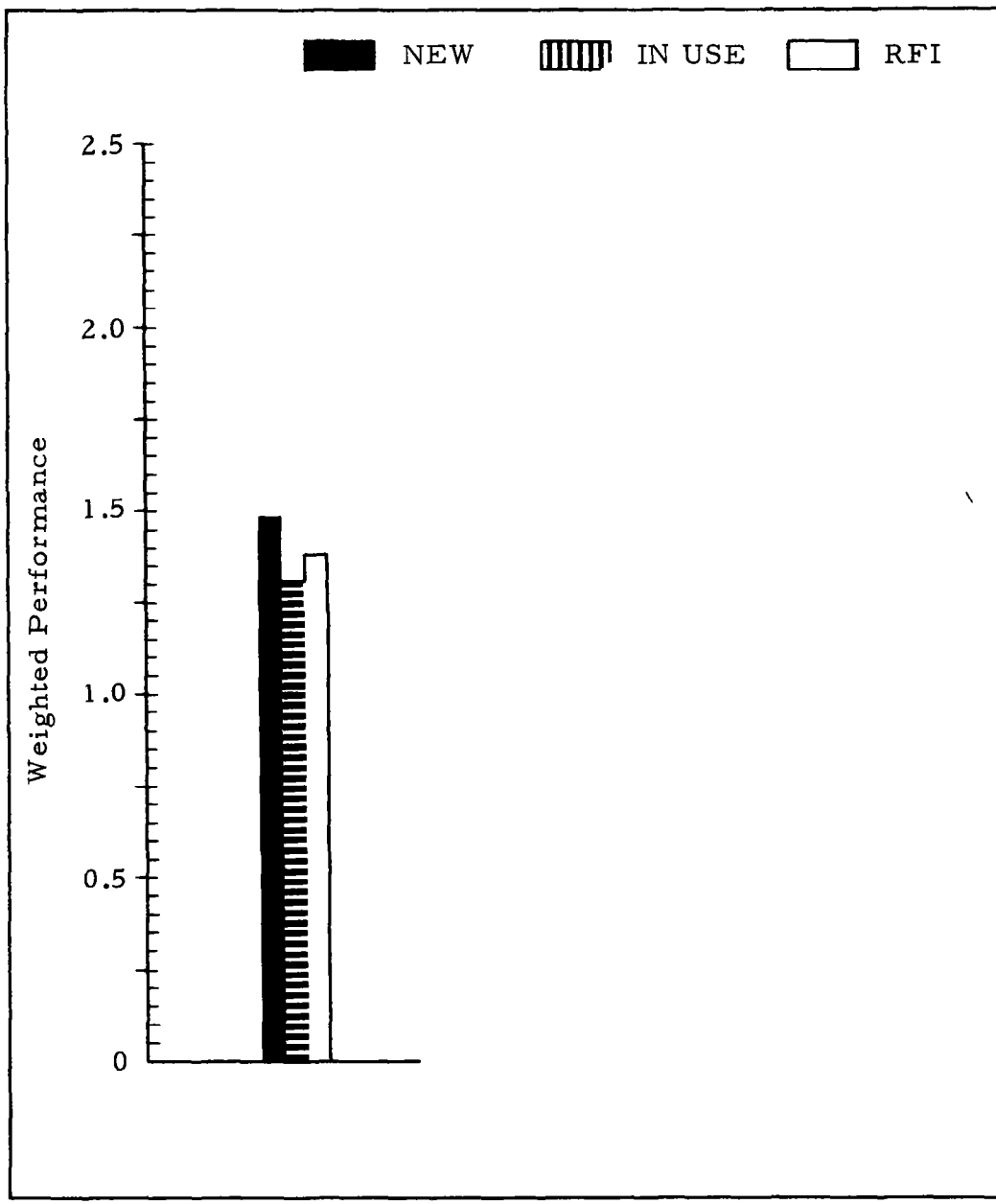
(continued on Page C-96a)

Figure C-2(a)



PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-1

Figure C-2(a)



WEIGHTED PERFORMANCE

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2

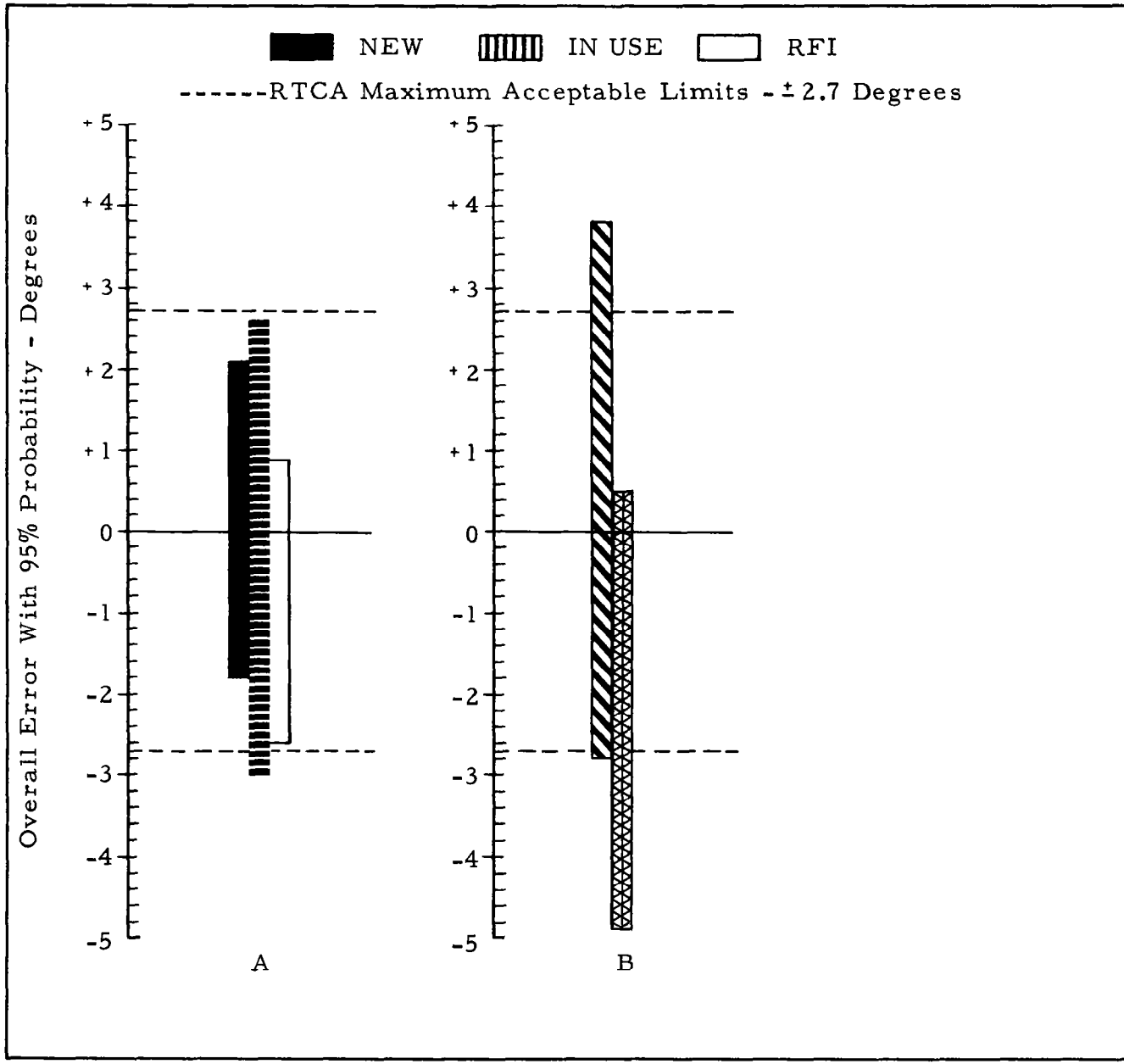
WEIGHTING FACTORS

Bearing Accuracy:	
± error	1/8 ea.
Deflection Linearity:	
(I) v_1, v_2, v_3	1/60 ea.
(II) v_1, v_2, v_3	1/60 ea.
(III) v_1, v_2, v_3	1/60 ea.
Deflection Sensitivity:	
(I), (II)	3/40 ea.
Selectivity:	
b_1, b_2	3/40 ea.
Alarm Signal:	
c_1, c_2, c_3, c_4, c_5, c_6	1/60 ea.
Audio Frequency Response:	1/20
AVC Characteristics:	1/20
Gain:	1/10

Note:
1. Graph based on arithmetic mean for above characteristics.

Figure C-2(a)

WEIGHTED PERFORMANCE - VOR RECEIVER - VO-1



BEARING ACCURACY

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.3

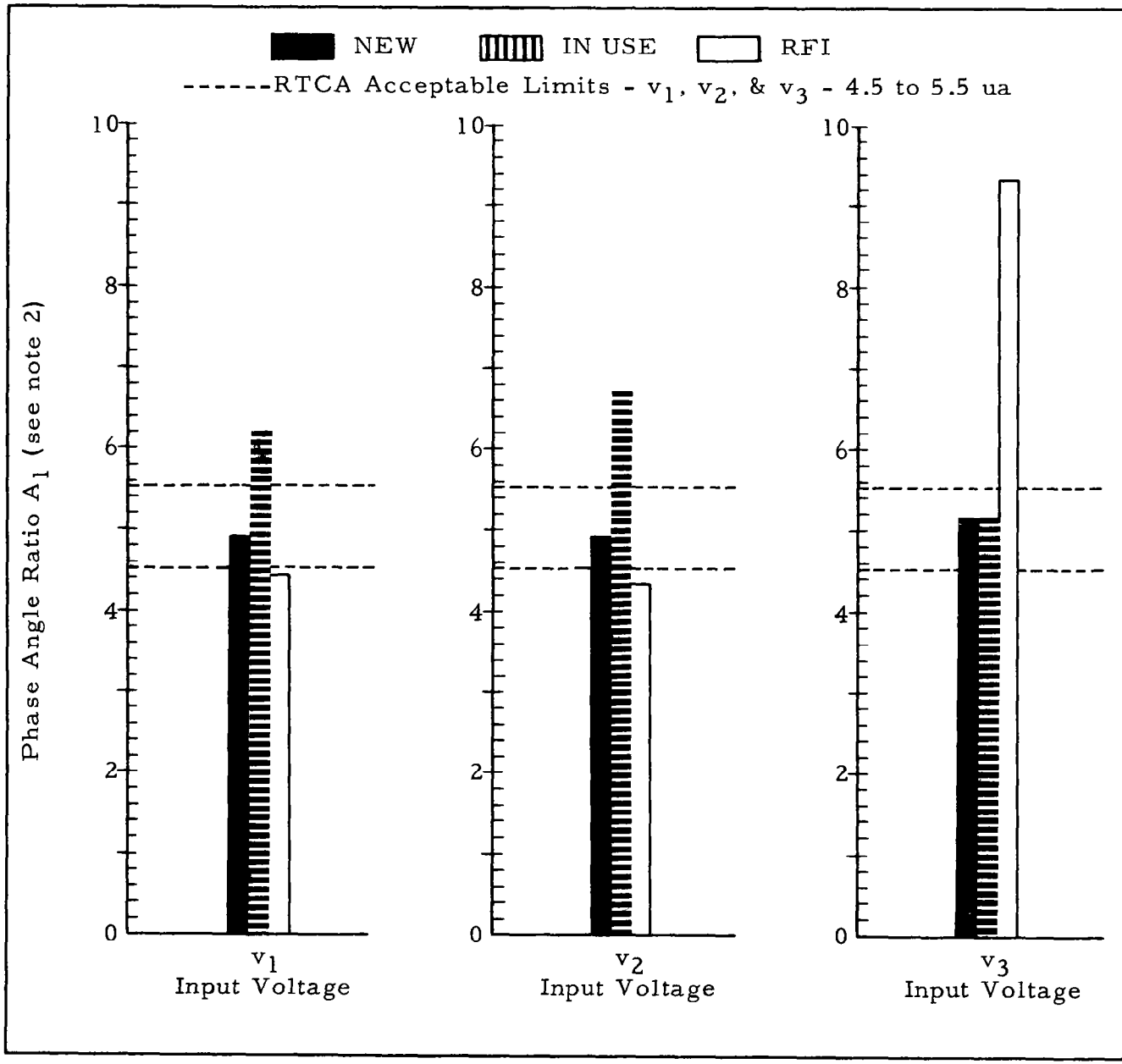
Test		Standard Deviation New	In Use	RFI
A	+error	0.5	2.6	0.9
	-error	0.8	0.5	2.0
B	+error		1.6	
	-error		0.6	
	+error		1.2	
	-error		3.7	

Notes:

1. Each bar in Graph A represents the arithmetic mean for 3 units. Each bar in Graph B represents the arithmetic mean for 2 units.
2. Each bar represents 95% statistical probability.
3. Graph B:
   - "In Use" units before adjustments.
   - "In Use" units after adjustments.
4. RTCA maximum acceptable limits - ± 2.7 degrees.
5. This unit is designed to operate above 15,000 feet.

Figure C-2(a)

BEARING ACCURACY - VOR RECEIVER - VO-1



DEFLECTION LINEARITY
(I)

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND

v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Half-Standard Deflection- 45 ua

Standard Deviation

Test	New	In Use	RFI
v_1	0.78	0.65	0.51
v_2	0.32	3.50	0.73
v_3	0.11	2.51	0.44

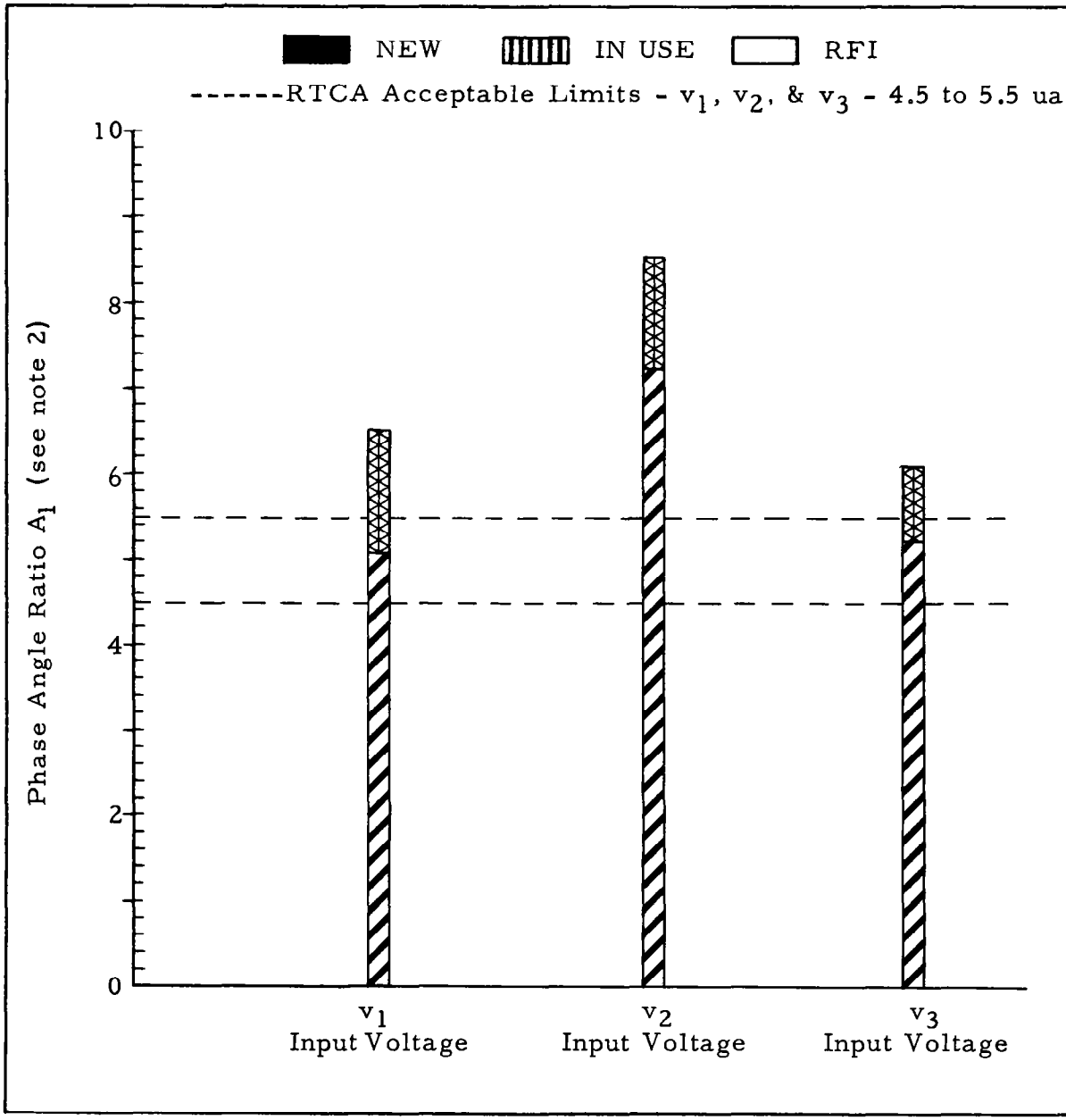
Notes:

1. Each bar represents the arithmetic mean for 3 units except v_1 "New" and v_3 "RFI." These represent the arithmetic mean for 2 units.
2. A_1 is the ratio of the angle which gives .5 standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA maximum limits: v_1, v_2, & v_3 - 4.5 to 5.5 ua.

Figure C-2(a)

(I) DEFLECTION LINEARITY - VOR RECEIVER - VO-1

(continued on Page C-100)



DEFLECTION LINEARITY
(I)
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69.
Para 2.4

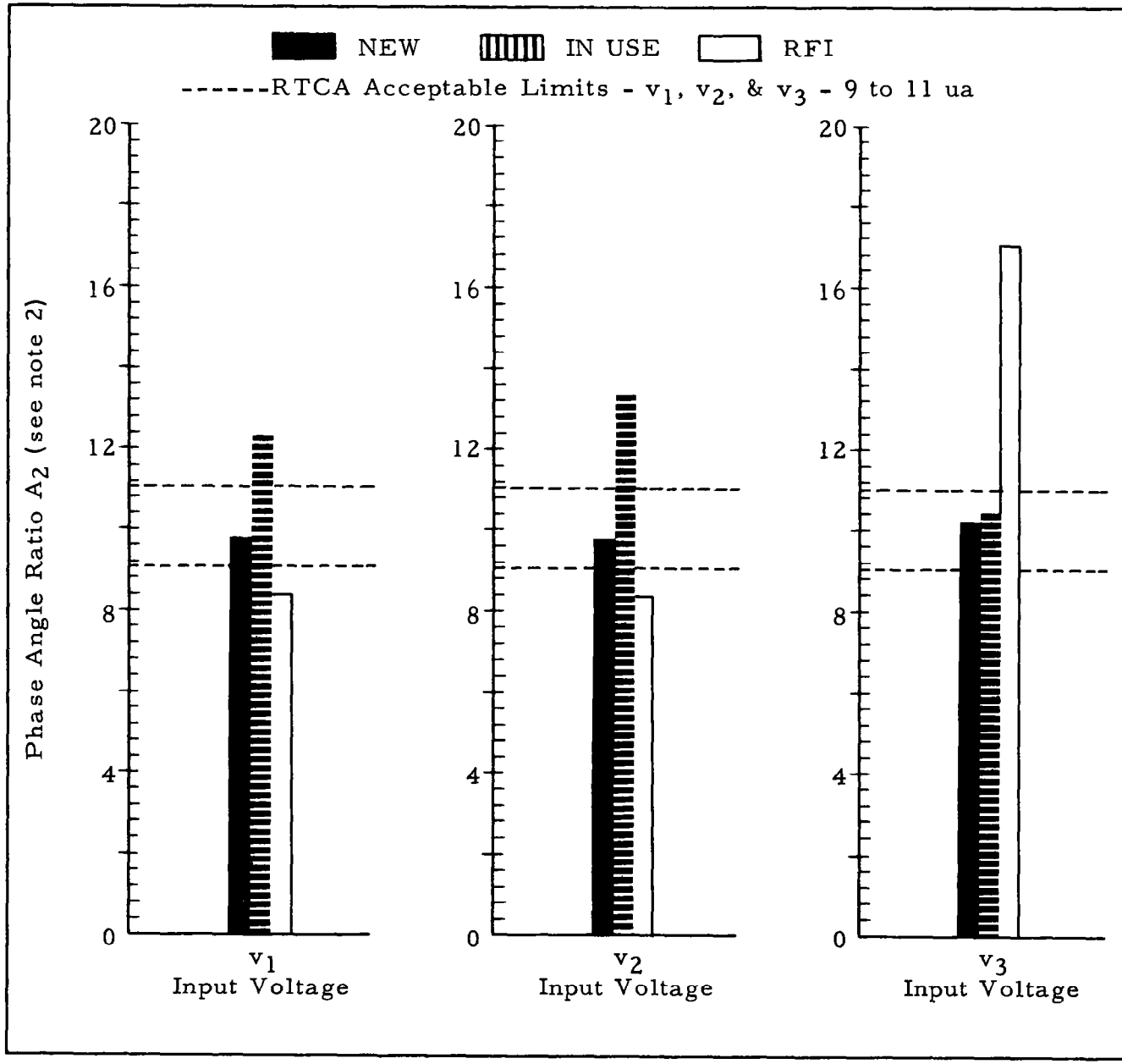
LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Half-Standard Deflection - 45 ua
Standard Deviation

Test	In Use	
	Before	After
v_1	0.71	2.12
v_2	2.12	4.75
v_3	2.61	0.56

Notes:
1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. A_1 is the ratio between the angle which gives .5 standard deflection/to the angle which gives 0.1 standard deflection.
3. "In Use" units before adjust.
"In Use" units after adjust.
4. RTCA maximum limits:
v_1, v_2, & v_3 - 4.5 to 5.5 ua.
5. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-2(a)

(I) DEFLECTION LINEARITY - VOR RECEIVER - VO-1



DEFLECTION LINEARITY
(II)
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Standard Deflection - 90 ua
Standard Deviation

Test	New	In Use	RFI
v_1	1.23	1.03	0.79
v_2	0.94	7.12	1.45
v_3	0.11	5.79	1.69

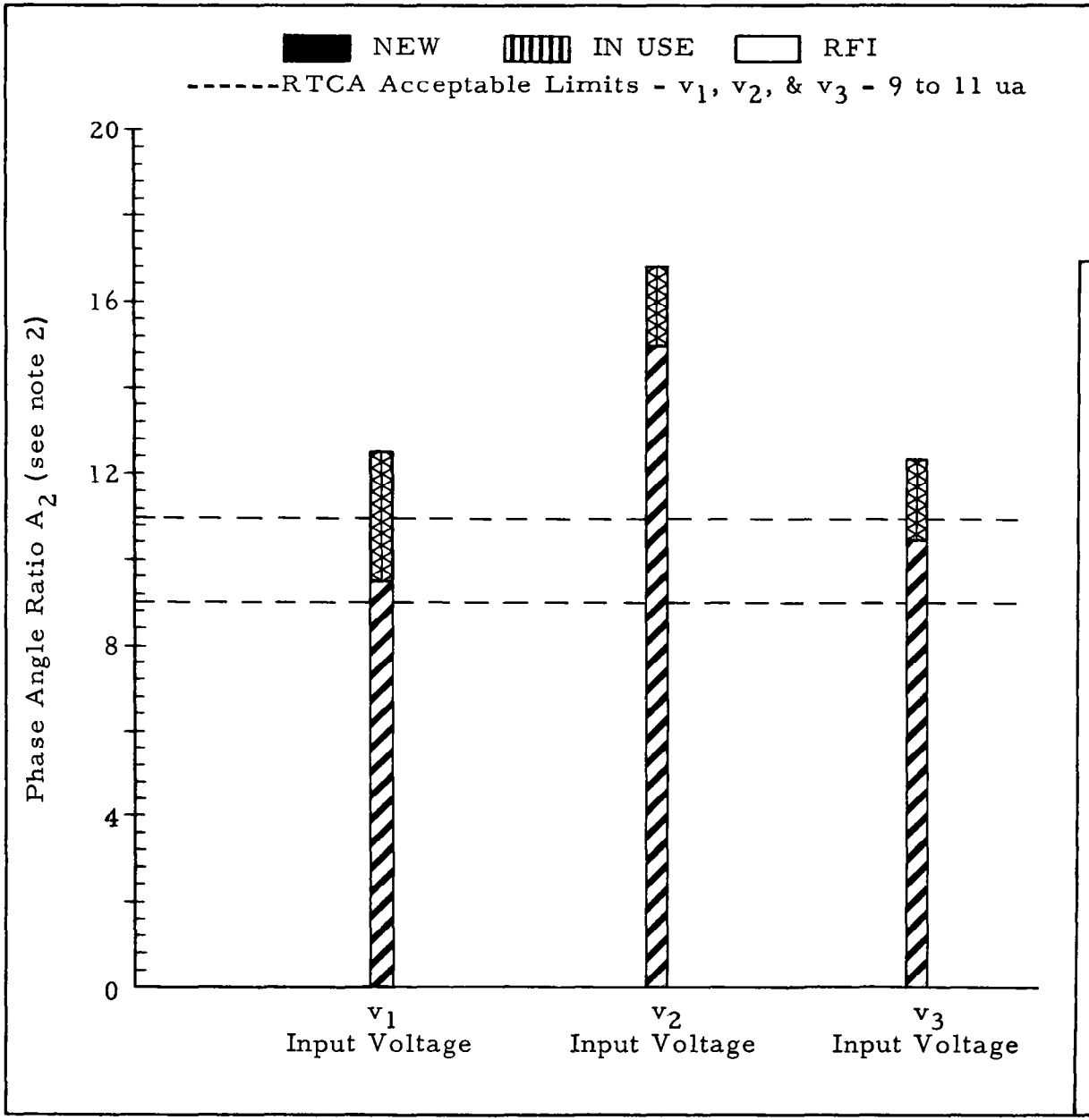
Notes:

1. Each bar represents the arithmetic mean for 3 units except v_1 "New" and v_3 "RFI" which represent the arithmetic mean for 2 units.
2. A_2 is the ratio of the angle which gives standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 9 to 11 ua.

Figure C-2(a)

(II) DEFLECTION LINEARITY - VOR RECEIVER - VO-1

(continued on Page C-102)



DEFLECTION LINEARITY
(II)
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

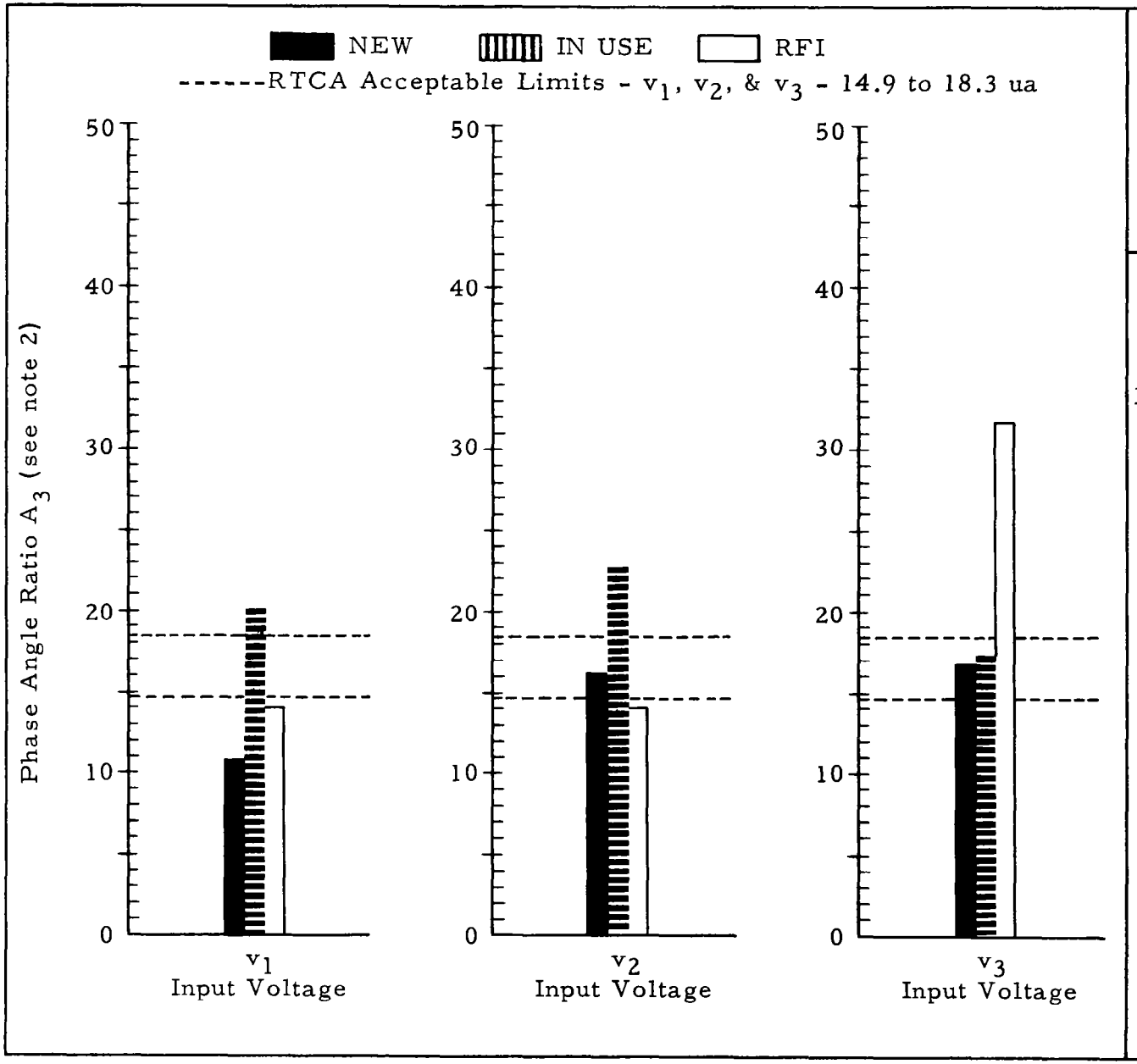
LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Standard Deflection - 90 ua

Test	In Use Standard Deviation	
	Before	After
v_1	1.41	3.89
v_2	4.15	2.35
v_3	5.50	1.90

Notes:
1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. A_2 is the ratio of the angle which gives standard deflection/to the angle which gives 0.1 standard deflection.
3. "In Use" units before adjust.
"In Use" units after adjust.
4. RTCA acceptable limits:
v_1, v_2, & v_3 - 9 to 11 ua.
5. Adjustments were made in accordance with manufacturer's recommended practices.

(II) DEFLECTION LINEARITY - VOR RECEIVER - VO-1

Figure C-2(a)



DEFLECTION LINEARITY
(III)
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Full Scale Deflection - 150 ua
Standard Deviation

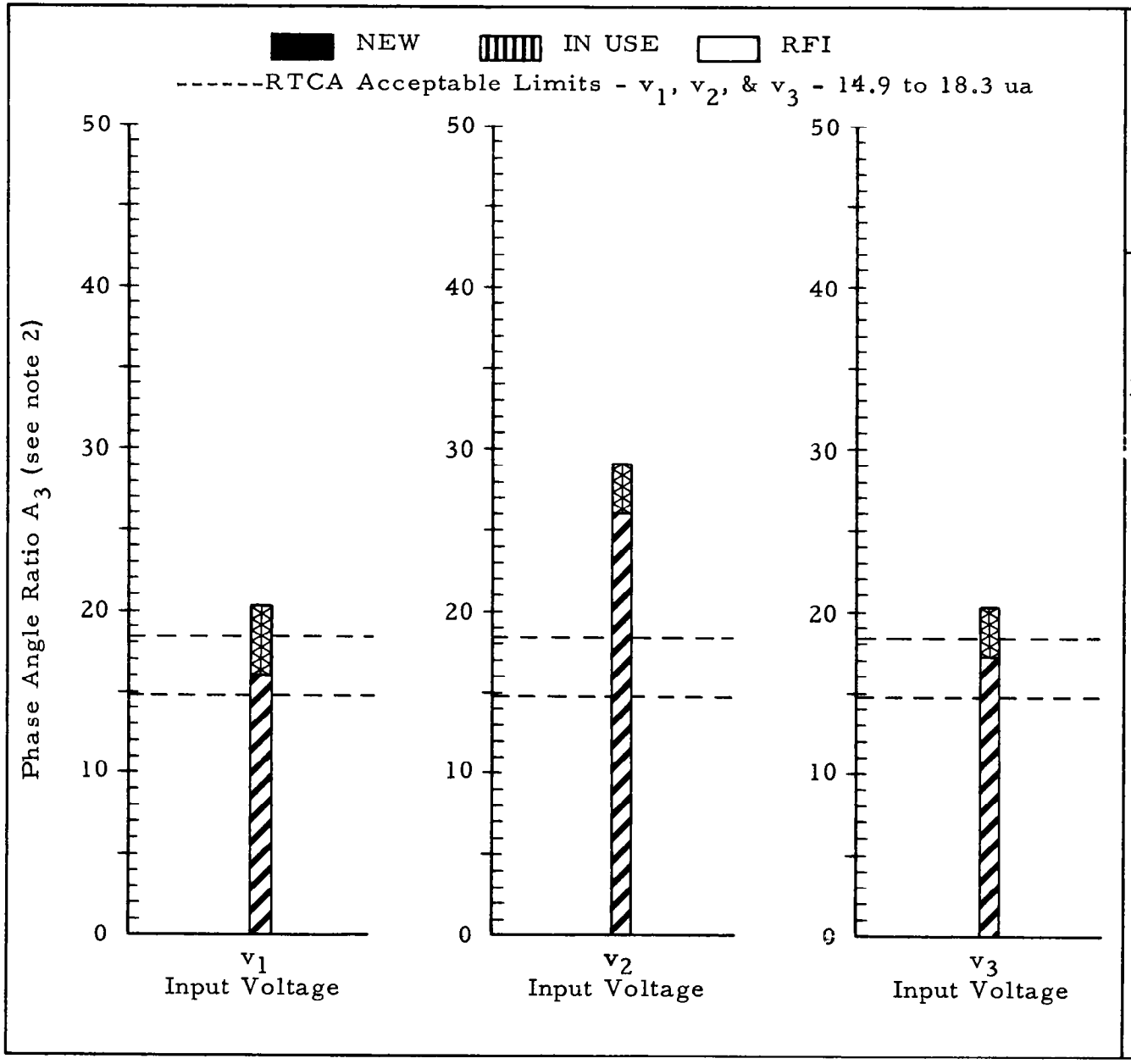
Test	New	In Use	RFI
v_1	7.60	6.47	1.40
v_2	1.55	12.40	2.60
v_3	0.14	0.92	2.12

Notes:

1. Each bar represents the arithmetic mean for 3 units except v_1 "New" and v_3 "RFI" which represents the arithmetic mean for 2 units.
2. A_3 is the ratio of the angle which gives full scale deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 14.9 to 18.3 ua.

Figure C-2(a)

(III) DEFLECTION LINEARITY - VOR RECEIVER - VO-1
(continued on Page C-104)



DEFLECTION LINEARITY

(III)
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND

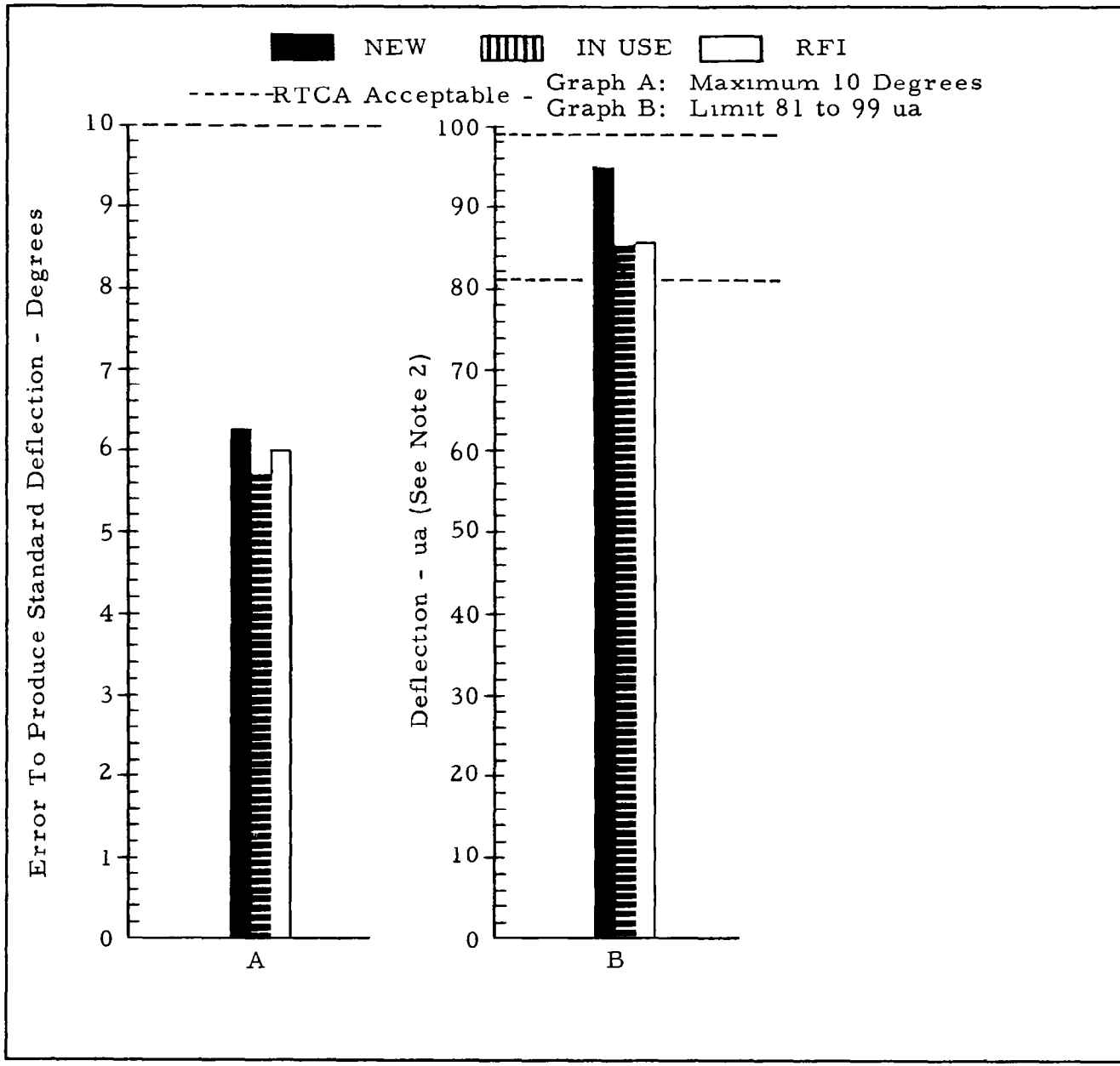
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Full Scale Deflection - 150 ua

Test	Standard Deviation In Use	
	Before	After
v_1	20.40	7.35
v_2	29.10	11.10
v_3	21.30	3.45

Notes:
1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. A_3 is the ratio of the angle which gives full scale deflection/to the angle which gives 0.1 standard deflection.
3. "In Use" units before adjustments.
"In Use" units after adjustments.
4. RTCA acceptable limits: v_1, v_2, & v_3 - 14.9 to 18.3 ua.
5. Adjustments were made in accordance with mfgr's recommended practices.

Figure C-2(a)

(III) DEFLECTION LINEARITY - VOR RECEIVER - VO-1



DEFLECTION SENSITIVITY

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.11

Standard Deviation

Test	New	In Use	RFI
A	.51	.48	.27
B	.71	3.00	1.73

Notes:

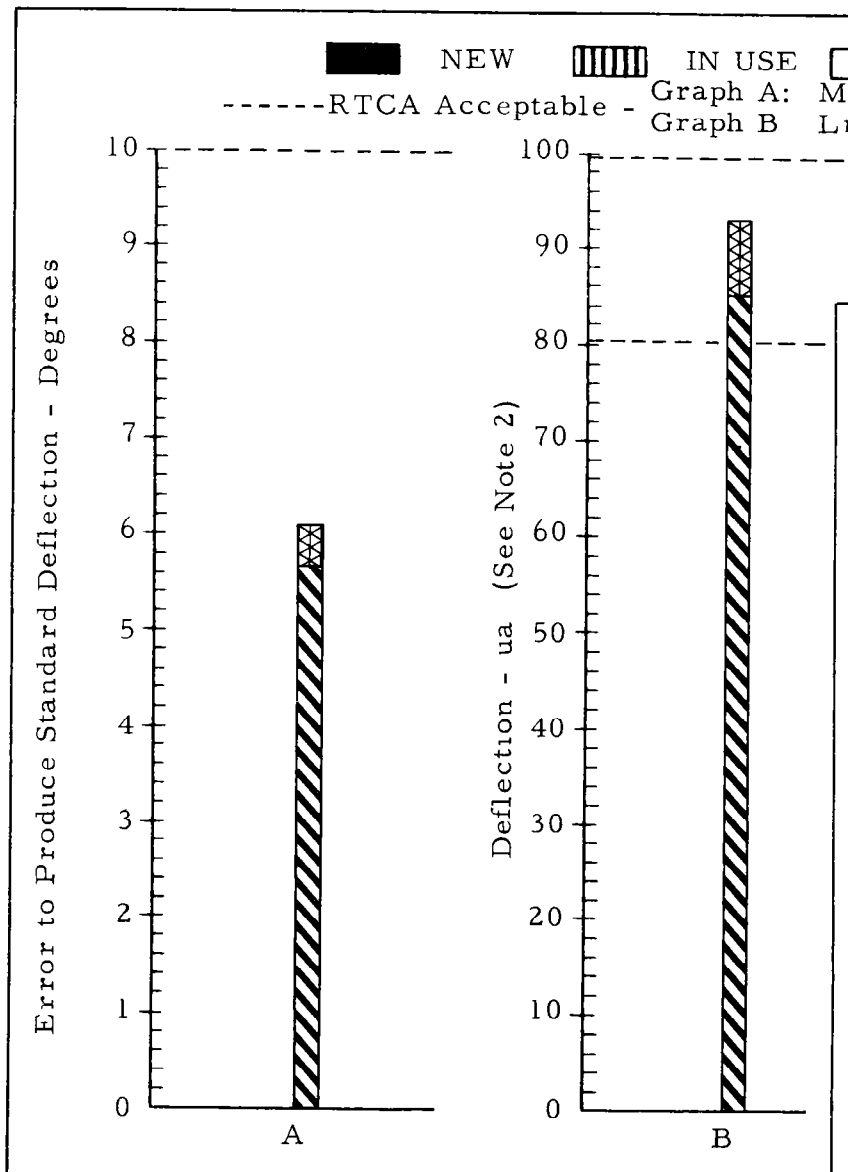
1. Each bar represents the arithmetic mean for 3 units.
2. Deflection on one side of center with input that produced standard deflection on the other side of center - ua.
3. Graph A: RTCA maximum acceptable level to produce standard deflection - 10 degrees.
4. Graph B: RTCA acceptable level for deflection on one side of center with input that produced standard deflection on the other side of center:

   Upper Level - 99 ua
   Lower Level - 81 ua

Figure C-2(a)

DEFLECTION SENSITIVITY - VOR RECEIVER - VO-1

(continued on Page C-106)



DEFLECTION SENSITIVITY
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 2.11

5. Graph B: RTCA acceptable level for deflection on one side of center with input that produced standard deflection on the other side of center:

Upper Level - 99 ua
Lower Level - 81 ua

6. Adjustments were made in accordance with manufacturer's recommended practices.

Standard Deviation

Test	In Use	
	Before	After
A	0.85	0
B	2.12	2.48

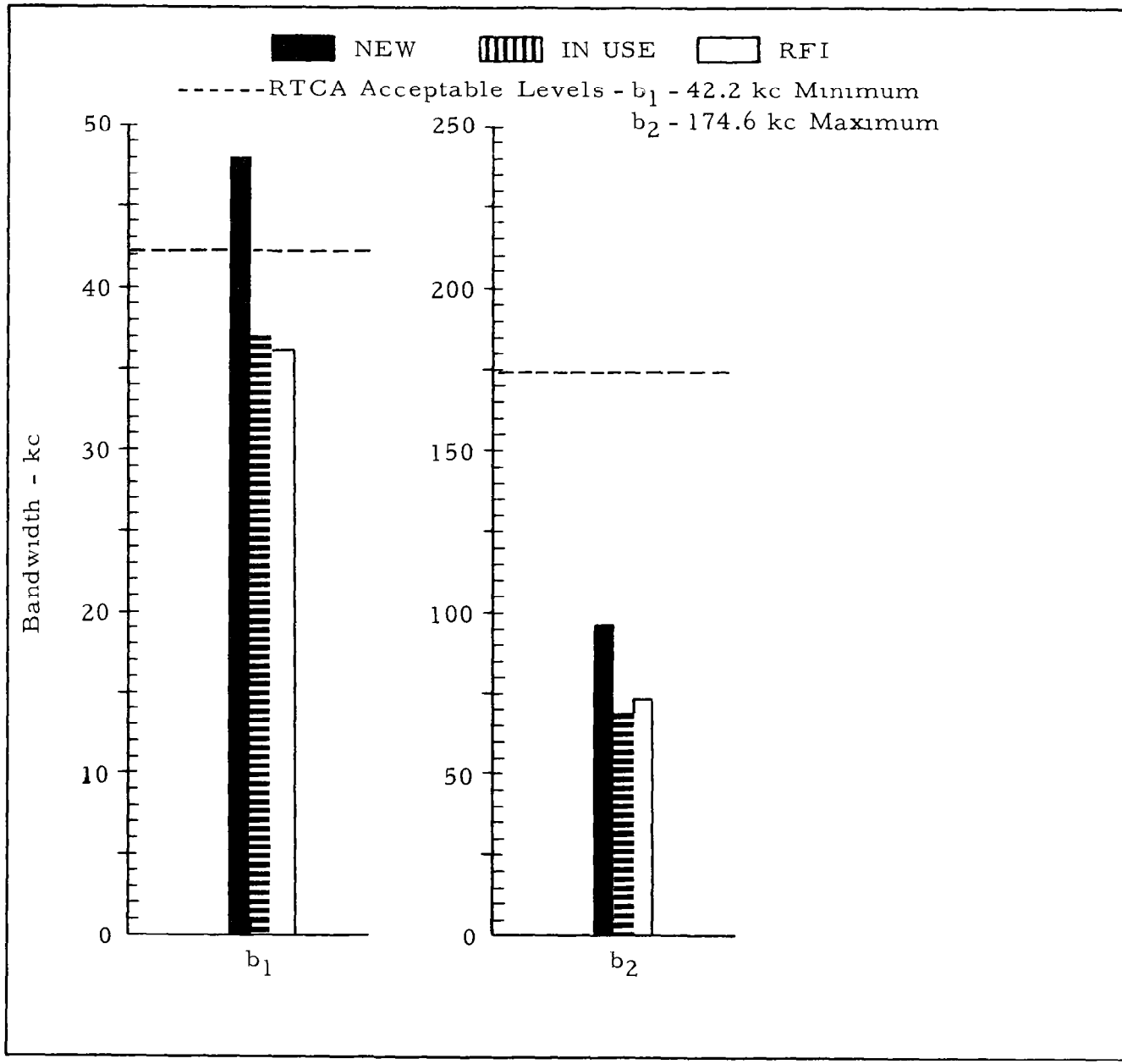
Notes:

1. Each bar represents the arithmetic mean for 2 units.
2. Deflection on one side of center with input that produced standard deflection on the other side of center - ua.
3. "In Use" units after adjustments.
   "In Use" units before adjustments.
4. Graph A: RTCA maximum acceptable level to produce standard deflection - 10 degrees.

←continued next column

DEFLECTION SENSITIVITY - VOR RECEIVER - VO-1

Figure C-2(a)



SELECTIVITY

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.5(a)

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @60 db down
f_c - 114.9 mc

Standard Deviation

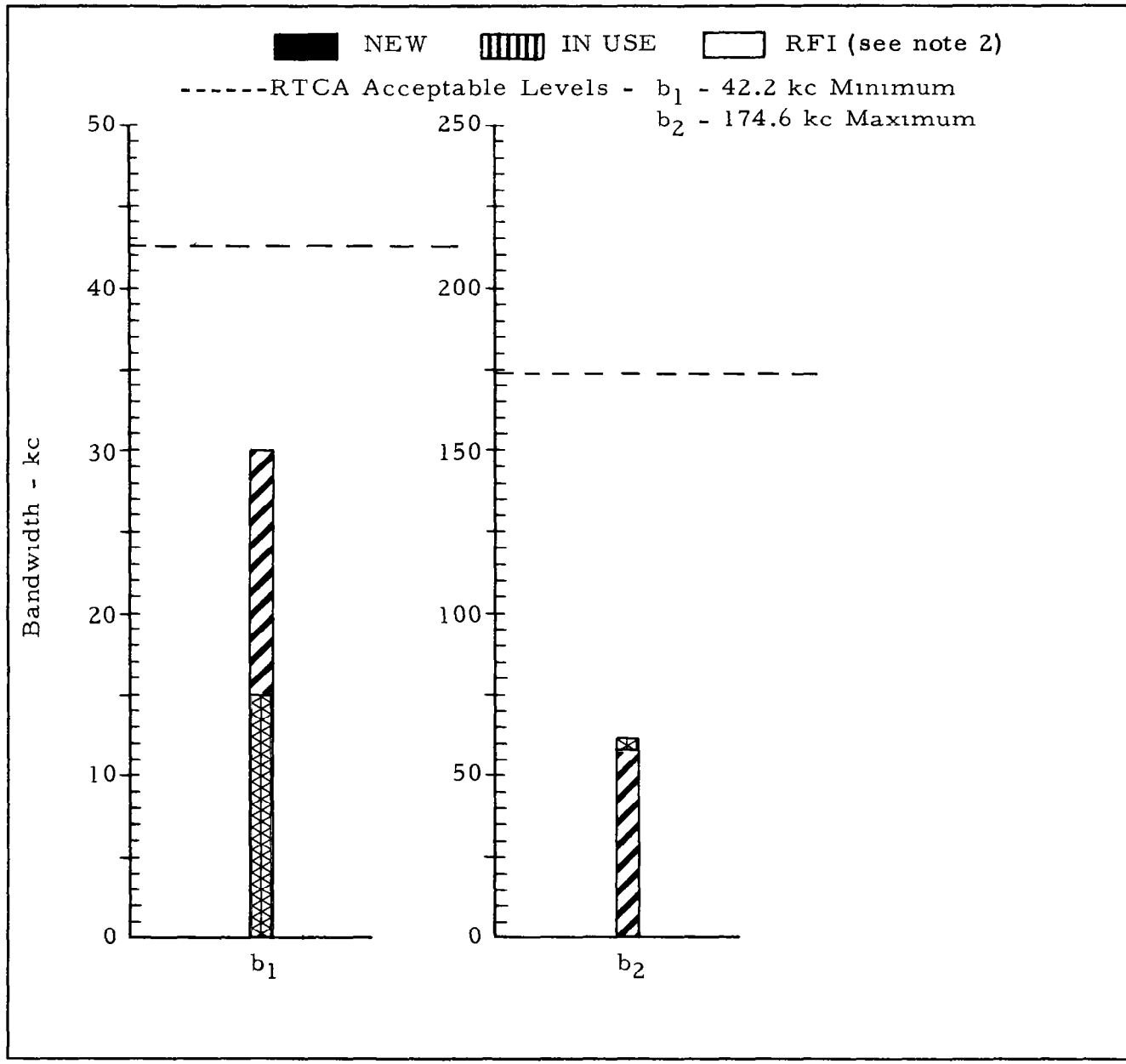
Test	New	In Use	RFI
b_1	12.8	11.3	12.3
b_2	22.4	15.1	14.4

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable levels:
b_1 - 42.2 kc minimum
b_2 - 174.6 kc maximum.
3. This receiver is tuned in discrete steps.

Figure C-2(a)

SELECTIVITY - VOR RECEIVER - VO-1

(continued on Page C-108)



SELECTIVITY

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.5(a)

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 114.9 kc

Standard Deviation

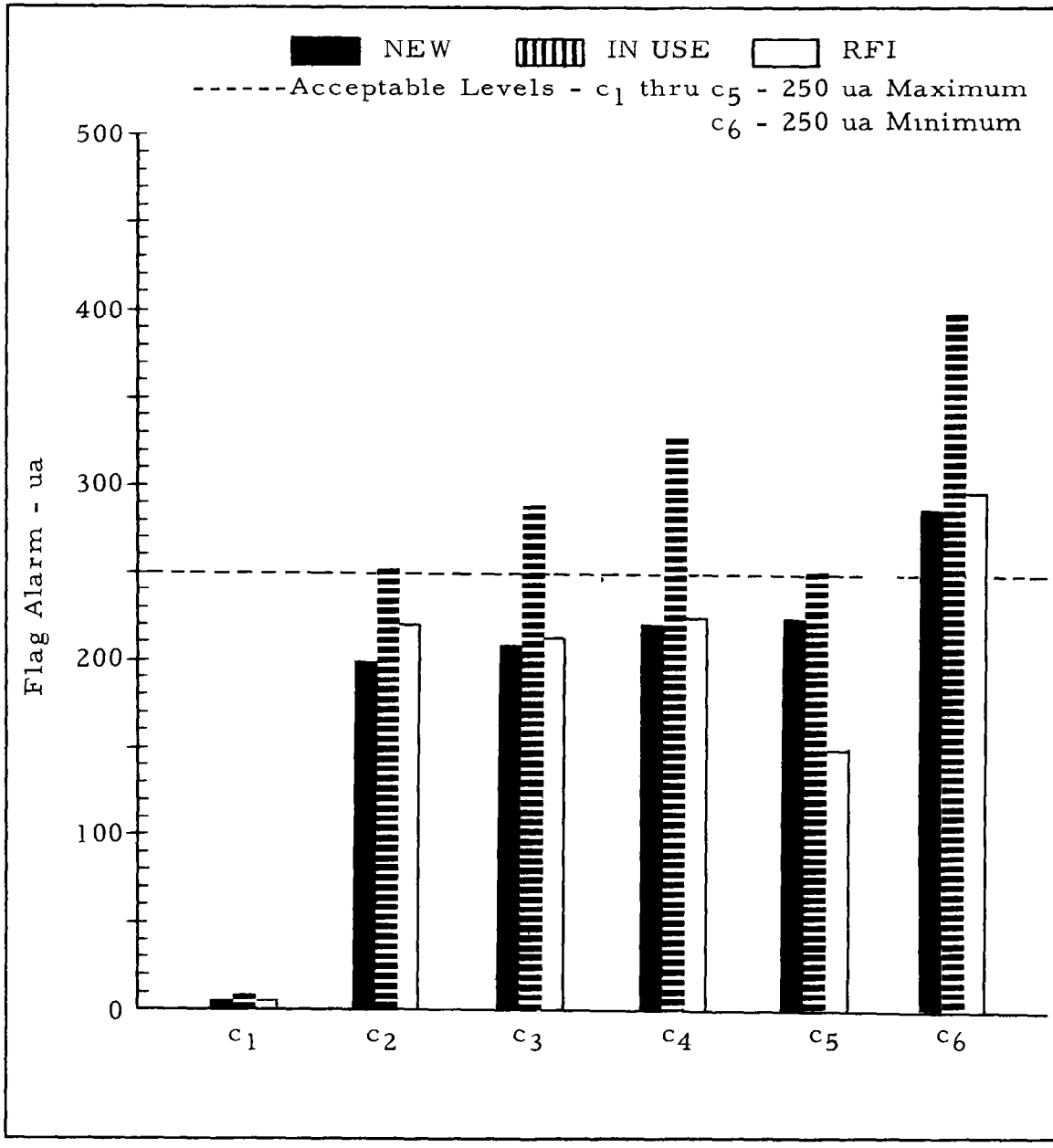
Test	In Use	
	Before	After
b_1	17.1	3.0
b_2	9.9	2.5

Notes:

1. Each bar represents the arithmetic mean for 2 units.
2. "In Use" units before adjustments.
   "In Use" units after adjustments.
3. RTCA acceptable levels:
   b_1 - 42.2 kc minimum
   b_2 - 174.6 kc maximum
4. This receiver is tuned in discrete steps.
5. Adjustments were made in accordance with manufacturer's recommended practice.

Figure C-2(a)

SELECTIVITY - VOR RECEIVER - VO-1



ALARM SIGNAL

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.8

LEGEND

c_1 - absence of R.F.
c_2 - absence of 9960 cps
c_3 - absence of 30 cps
c_4 - 15% mod. of 9960 & 30 cps
c_5 - VOR signal @50% deflection
c_6 - standard signal - 10 uv

Standard Deviation

Test	New	In Use	RFI
c_1	2.90	3.50	3.6
c_2	0	69.90	24.6
c_3	4.05	24.00	6.4
c_4	8.25	20.40	30.2
c_5	17.50	112.00	43.6
c_6	7.66	7.47	10.4

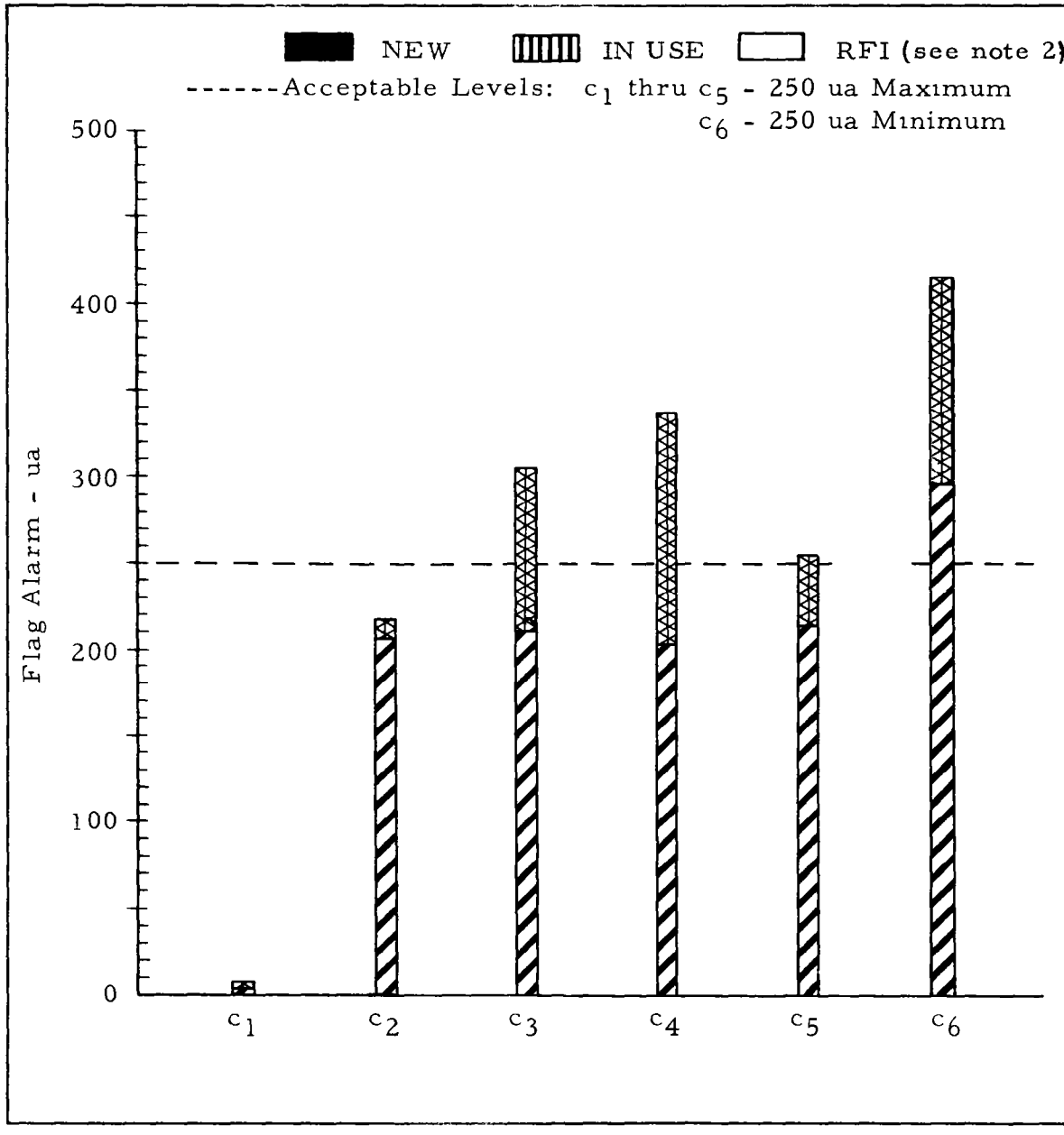
Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA paper as a guide.

Figure C-2(a)

ALARM SIGNAL - VOR RECEIVER - VO-1

(continued on Page C-110)



ALARM SIGNAL

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.8

LEGEND

c_1 - absence of R. F.
c_2 - absence of 9960 cps
c_3 - absence of 30 cps
c_4 - 15% mod. of 9960 & 30 cps
c_5 - VOR signal @ 50% deflection
c_6 - standard signal - 10 uv

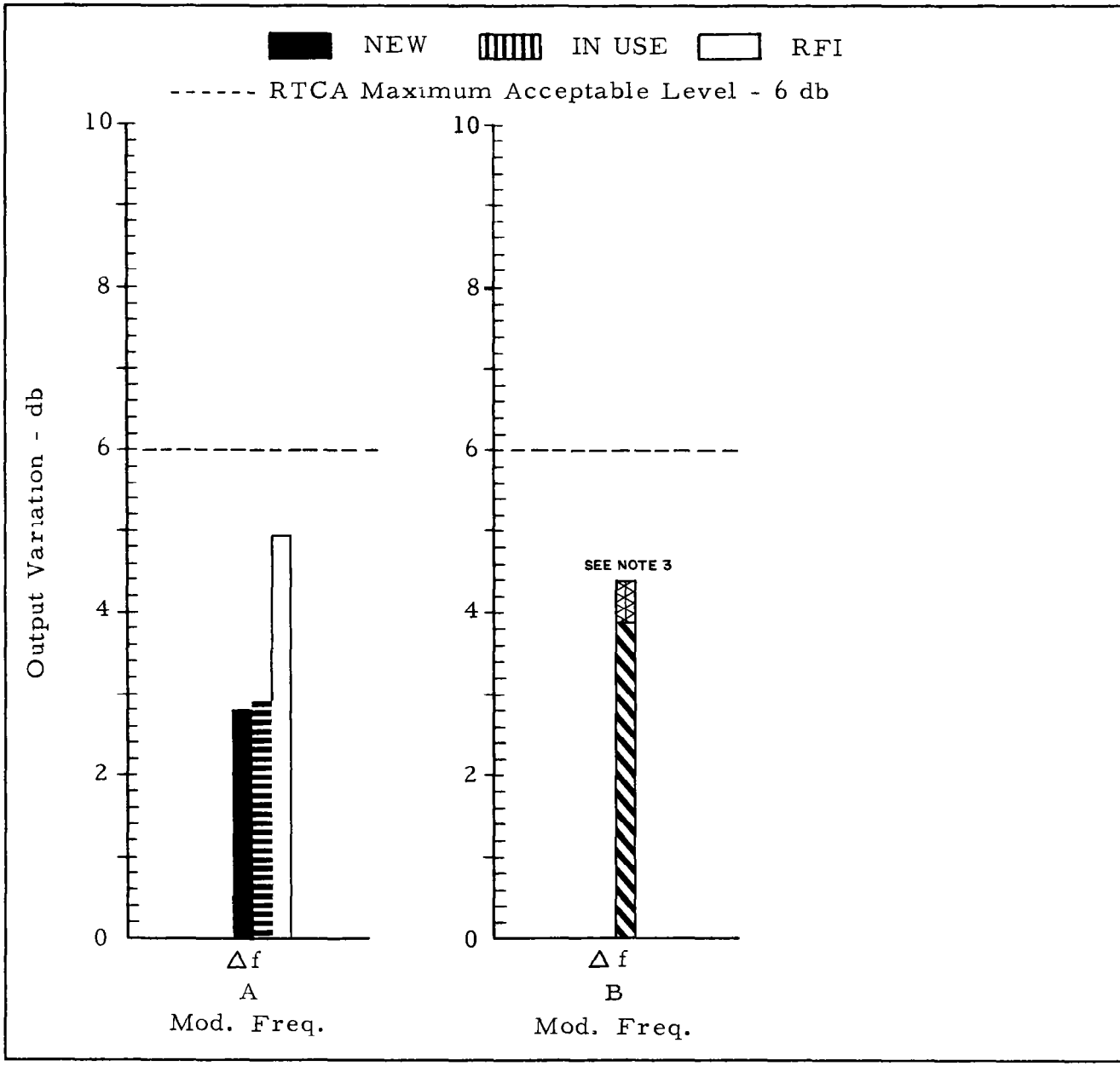
Standard Deviation

Test	In Use	
	Before	After
c_1	3.53	2.12
c_2	18.40	1.56
c_3	100.00	4.95
c_4	19.70	45.00
c_5	176.00	17.70
c_6	5.65	9.20

Notes:

1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. "In Use" units before adjust.
   "In Use" units after adjust.
3. Acceptable levels were determined by using RTCA paper as a guide.
4. Adjustments were made in accordance with manufacturer's recommended practices.

ALARM SIGNAL - VOR RECEIVER - VO-1



AUDIO FREQ. RESPONSE

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2,
RTCA Paper 225-55/DO-69,
Para 2.12

LEGEND

Δ f - 350 - 2500 cps

Standard Deviation

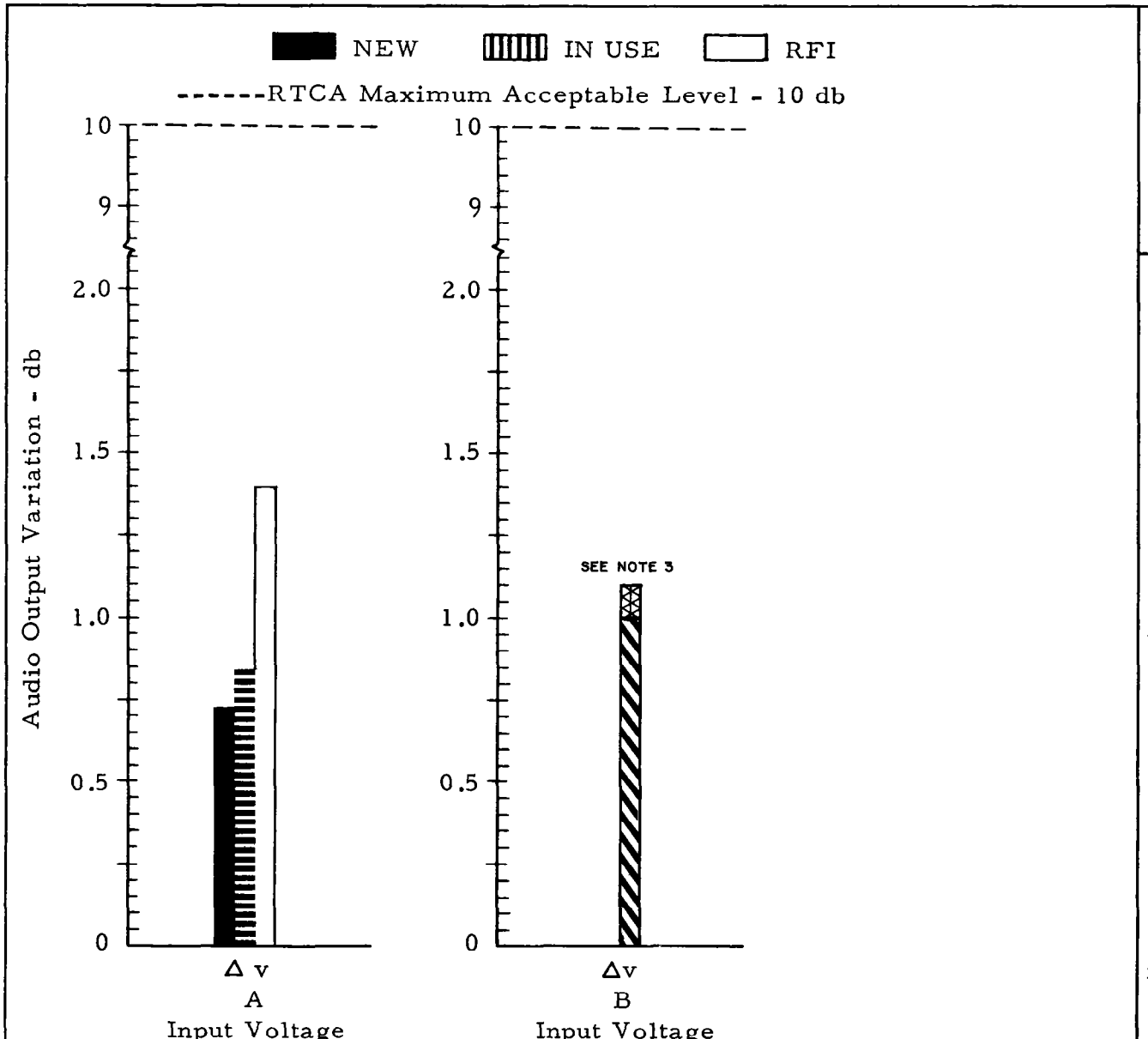
New	In Use	RFI
.77	.87	3.07

Notes:

1. Each bar in graph "A" represents the arithmetic mean for 3 units. Each bar in graph "B" represents 1 unit.
2. RTCA maximum acceptable level - 6 db.
3. For graph B:
   - "In Use" unit after adjustments.
   - "In Use" unit before adjustments.
4. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-2(a)

AUDIO FREQUENCY RESPONSE - VOR RECEIVER - VO-1



AVC CHARACTERISTIC

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69
Para 2.14

LEGEND

Δ v - 10 - 10,000 uv

Standard Deviation

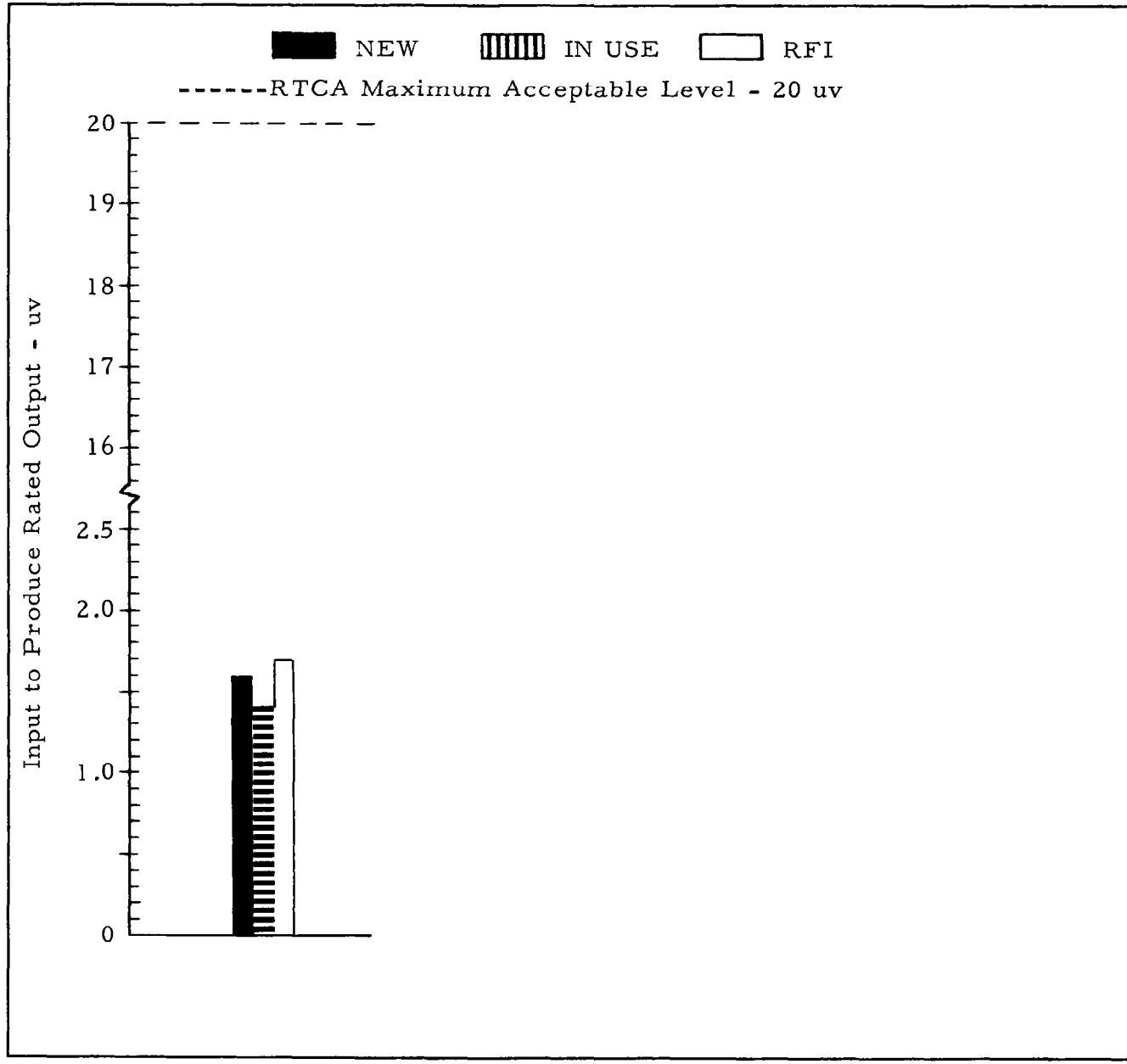
Test	New	In Use	RFI
A	.69	.60	.55

Notes:

1. Each bar in Graph A represents the arithmetic mean for 3 units. Each bar in Graph B represents one unit.
2. RTCA maximum acceptable level - 10 db.
3. Graph B:
   - "In Use" unit before adjustments.
   - "In Use" unit after adjustments.
4. Adjustments were made in accordance with manufacturer's recommended practices.

AVC CHARACTERISTIC - VOR RECEIVER - VO-1

Figure C-2(a)



GAIN

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.15

Standard Deviation

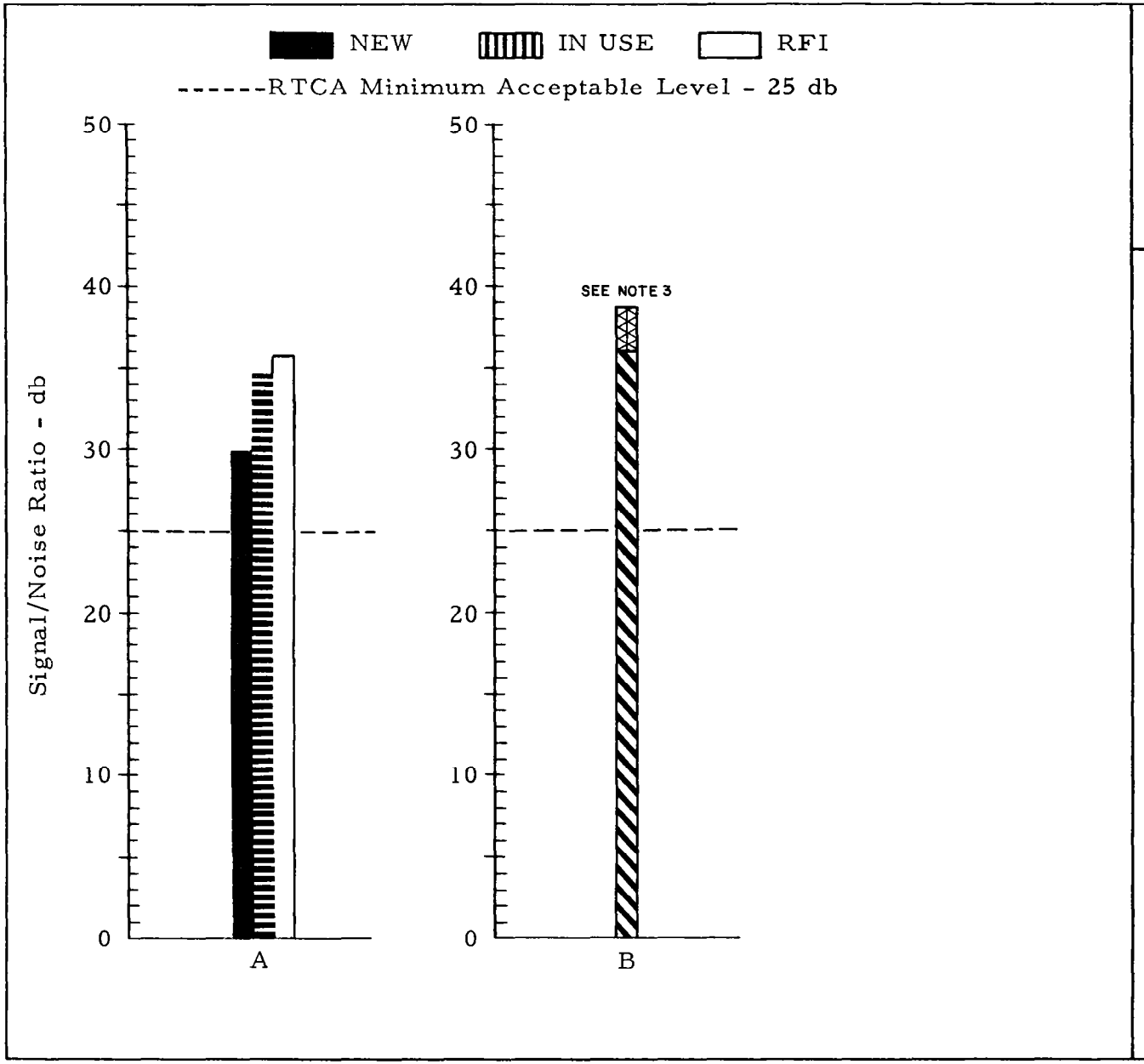
New	In Use	RFI
.52	.57	.22

Notes:

1. Each bar represents the arithmetic mean for 3 "New" and "In Use" units and 2 "RFI" units.
2. RTCA maximum acceptable level - 20 uv.
3. Rated output - 300 mw.

GAIN - VOR RECEIVER - VO-1

Figure C-2(a)



AUDIO OUTPUT
NOISE LEVEL
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.16

Standard Deviation

New	In Use	RFI
4.7	5.25	4.14

Notes:

1. Each bar in Graph A represents the arithmetic mean for 3 units. Each bar in Graph B represents 1 unit.
2. RTCA minimum acceptable level - 25 db.
3. Graph B:
   - "In Use" unit before adjustment.
   - "In Use" unit after adjustment.
4. Adjustments were made in accordance with manufacturer's recommended practices.

AUDIO OUTPUT NOISE LEVEL - VOR RECEIVER - VO-1

Figure C-2(a)

INTERFERENCE TESTS

VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.6	.19 to 1500	114.9	Acceptable level excluding the band of 107.8 to 118.2 mc: ≥60 db.	Actual Level: ≥60 db. All frequencies within performance standards.	Yes
Cross Modulation & Inter Modulation RTCA Para: 2.7	108 to 118	114.9	Acceptable level excluding the band within F_c ±200 kc: Bearing Error: ≤1 Deg. Alarm Meter: ≥250 microamps. *	Actual Level: 0 Degrees. >265 Microamps.	Yes
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25	118.0	Acceptable Emission: ≤200 microvolts.	Actual emission on +28 v. line ≤200 microvolts. All frequencies within performance standards.	Yes
Antenna Conducted Interference RTCA Para: 2.9(b)	.09 to 1500	118.0	Acceptable Emission: ≤400 micro-microwatts. * Acceptable level was determined using RTCA Paper as a guide.	Actual Emission: <400 micro-microwatts. All frequencies within performance standards	Yes

INTERFERENCE TESTS - VOR RECEIVER - VO-1

(continued on Page C-116)

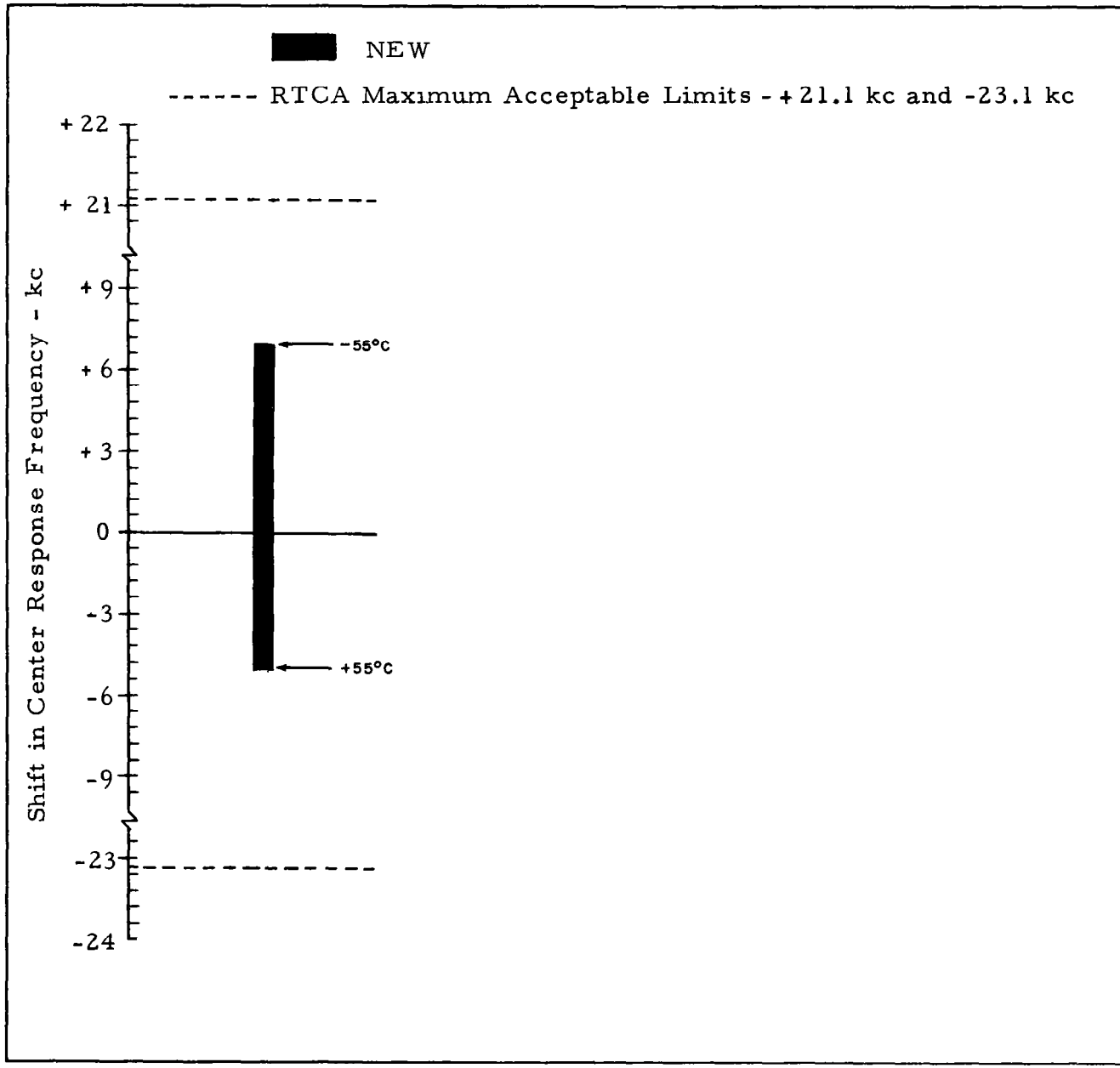
Figure C-2(a)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.17	112 to 118	Varied over VOR band	Acceptable Operation: Deviation indicator shall not depart from its centered position.	Actual Operation: No departure of deviation indicator from centered position.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	114.9	None over the range from 100 to 2000 mc.	(Not Applicable)

INTERFERENCE TESTS - VOR RECEIVER - VO-1

Figure C-2(a)



TEMPERATURE VARIATION TEST
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 3.1(a)

Notes:
1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits -+ 21.1 kc and -23.1 kc.
3. This unit was designed to operate above 15,000 feet.
4. This unit is tuned in discrete steps.

TEMPERATURE VARIATION TEST - VOR RECEIVER - VO-1

Figure C-2(a)

Notes: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.
2. Adjustments were made in accordance with manufacturer's recommended practices.
3. No change in this test "After Adjustments".

AUDIO OUTPUT
REGULATION & DISTORTION
VOR Receiver: VO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69
Para 2.13

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	388	400	405	379	390	400	288	295	300
	500	590	600	600	460	472	480	430	440	450
	1000	610	650	670	450	460	470	550	580	590
	1800	550	590	600	400	420	435	500	510	550
	2500	500	520	560	375	390	400	480	500	510
New Unit No. 2	350	222	232	240	240	250	258	168	170	175
	500	400	419	425	372	382	400	315	328	335
	1000	470	490	510	380	400	410	430	450	465
	1800	422	450	465	338	360	372	392	419	435
	2500	390	410	432	310	330	350	352	380	400
New Unit No. 3	350	320	350	370	300	310	318	238	250	252
	500	550	590	600	465	510	540	500	510	520
	1000	580	600	600	470	490	500	580	600	620
	1800	440	480	500	340	360	375	450	480	500
	2500	300	380	390	268	285	300	300	335	355
In Use Unit No. 1 Before Adjust.	350	105	115	120	100	107	110	110	118	121
	500	250	268	285	235	245	250	250	275	282
	1000	280	300	310	240	250	263	290	300	318
	1800	252	270	279	198	215	225	245	260	272
	2500	183	194	205	155	160	170	178	190	200

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-1

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 1 After Adjust.	350	100	110	120	90	95	100	82	90	95
	500	280	295	315	240	250	265	250	275	290
	1000	290	300	330	240	255	270	280	300	330
	1800	210	230	250	190	205	220	210	225	245
	2500	150	170	180	130	145	155	145	155	165
In Use Unit No. 2	350	180	188	192	160	168	170	153	158	165
	500	290	300	310	245	255	262	260	270	280
	1000	290	300	305	242	260	262	283	300	308
	1800	250	265	280	200	218	225	230	250	260
	2500	180	195	205	152	165	176	165	182	195
In Use Unit No. 3 Before Adjust. (See note 3)	350	160	165	170	160	162	170	150	153	168
	500	290	295	300	220	235	242	280	290	295
	1000	285	300	310	210	220	230	270	275	298
	1800	230	240	250	178	188	195	162	165	172
	2500	175	190	198	152	160	170	125	130	143
RFI Unit No. 1	350	135	150	153	138	143	150	132	140	145
	500	245	260	263	225	232	243	250	258	263
	1000	285	300	315	232	250	255	310	325	340
	1800	230	250	270	220	235	250	250	272	292
	2500	190	218	230	160	172	182	192	210	225
RFI Unit No. 2	350	250	270	275	220	245	260	180	195	208
	500	495	500	540	395	430	445	325	355	375
	1000	520	580	600	410	460	480	380	430	460
	1800	500	550	580	405	445	475	370	430	460
	2500	380	435	480	350	385	405	345	390	425

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-1

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
RFI Unit No. 3	350	44	47	50	47	52	57	35	37	42
	500	98	105	110	100	110	115	82	88	92
	1000	202	220	232	210	220	232	192	200	212
	1800	290	325	365	270	285	300	250	280	295
	2500	270	290	310	235	250	280	245	265	285
Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	15.0	15.0	15.0	13.0	13.5	13.5	16.5	17.0	17.0
	500	11.5	11.5	11.5	12.0	12.0	12.0	11.5	11.5	12.0
	1000	8.5	8.5	8.6	10.0	10.0	10.5	6.3	6.0	6.2
	1800	6.0	6.0	6.2	9.2	8.9	8.9	5.5	4.8	5.0
	2500	6.5	5.7	5.7	8.2	8.4	8.7	5.2	5.2	5.2
New Unit No. 2	350	15.0	15.0	15.5	13.5	13.5	13.5	18.8	19.0	19.0
	500	13.0	13.0	13.0	13.0	12.5	12.5	15.5	15.5	15.5
	1000	9.5	9.5	9.5	10.8	11.0	11.0	8.2	8.2	8.4
	1800	7.0	7.3	7.4	9.8	9.8	9.8	5.6	5.4	5.4
	2500	6.8	6.8	6.8	9.3	9.4	9.5	5.7	5.4	5.2
New Unit No. 3	350	12.0	11.5	12.0	11.0	11.0	11.0	13.0	12.5	12.8
	500	10.0	10.0	10.0	10.5	10.5	10.5	10.0	10.0	10.0
	1000	6.6	6.5	6.7	9.0	9.0	9.0	5.3	5.0	5.2
	1800	5.7	5.0	5.1	7.5	7.4	7.6	5.0	3.9	4.0
	2500	6.3	5.2	5.1	7.4	6.9	7.1	6.0	4.6	4.6

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-1

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 1 Before Adjust.	350	6.0	6.0	6.2	6.4	6.7	6.8	6.8	7.0	7.4
	500	7.8	8.2	8.4	8.4	8.8	9.0	7.6	7.7	8.1
	1000	5.5	5.8	6.0	6.3	6.8	6.9	4.2	4.7	5.1
	1800	3.9	4.2	4.4	5.0	5.3	5.6	3.0	3.1	3.2
	2500	3.4	3.4	3.7	4.2	4.3	4.5	3.0	3.1	3.0
In Use Unit No. 1 After Adjust	350	7.6	7.8	7.7	8.1	8.1	8.3	7.8	7.7	7.8
	500	6.1	6.3	6.8	7.2	7.4	7.8	6.0	6.2	6.4
	1000	4.9	5.0	5.2	6.0	6.2	6.5	4.4	4.4	4.5
	1800	4.5	4.5	4.6	5.2	5.3	5.5	4.3	4.2	4.2
	2500	5.8	5.6	5.5	6.0	5.9	5.8	5.5	5.3	5.3
In Use Unit No. 2	350	10.5	11.0	11.2	10.0	10.5	10.1	11.0	11.5	11.5
	500	8.4	9.5	9.9	10.0	10.0	10.1	9.3	10.0	10.1
	1000	5.4	5.8	5.7	7.2	7.3	7.6	4.8	5.0	5.0
	1800	4.7	4.8	4.9	5.8	5.9	6.2	4.1	4.2	4.3
	2500	5.4	5.3	5.2	5.8	5.8	5.8	5.2	5.2	5.1
In Use Unit No. 3 Before Adjust. (See note 3)	350	9.1	8.6	9.0	9.2	9.2	9.4	9.0	10.0	9.9
	500	8.8	8.8	10.0	8.6	8.5	8.6	9.2	8.8	8.9
	1000	6.8	6.7	6.7	7.4	7.4	7.6	6.0	5.8	5.6
	1800	6.0	5.7	5.8	6.6	6.7	6.6	6.6	6.7	6.6
	2500	6.9	6.4	6.3	7.3	6.9	6.9	8.2	7.6	7.6
RFI Unit No. 1	350	11.0	11.0	12.0	10.5	11.0	11.0	11.5	12.0	12.5
	500	10.0	10.3	11.0	10.0	11.0	10.5	10.5	11.0	11.0
	1000	5.2	5.4	5.6	6.2	6.5	6.7	4.0	4.4	4.6
	1800	3.1	3.3	3.6	5.0	5.5	5.8	2.4	2.1	2.2
	2500	3.0	2.8	3.0	3.6	3.7	3.9	2.3	1.8	1.8

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-1

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
RFI Unit No. 2	350	7.0	7.5	7.8	7.5	7.8	8.0	7.5	7.7	7.9
	500	7.0	7.3	7.6	7.8	8.0	8.6	6.0	6.3	6.5
	1000	5.5	5.8	6.0	7.3	7.8	8.0	5.0	5.2	5.3
	1800	5.0	5.0	5.0	6.8	7.3	7.6	5.0	5.1	5.2
	2500	5.2	5.3	5.4	6.0	6.5	7.8	5.0	5.0	5.0
RFI Unit No. 3	350	13.0	13.0	13.5	13.2	13.5	13.5	13.0	13.0	13.0
	500	9.0	9.0	9.2	9.0	9.0	9.1	8.6	8.4	8.6
	1000	6.2	6.2	6.4	6.4	6.4	6.5	5.8	5.7	5.8
	1800	5.2	5.1	5.2	5.6	5.7	5.9	4.5	4.5	4.4
	2500	4.7	4.7	4.6	5.2	5.2	5.4	4.5	4.4	4.4

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-1

Figure C-2(a)

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

3. Laboratory and Field Test Data

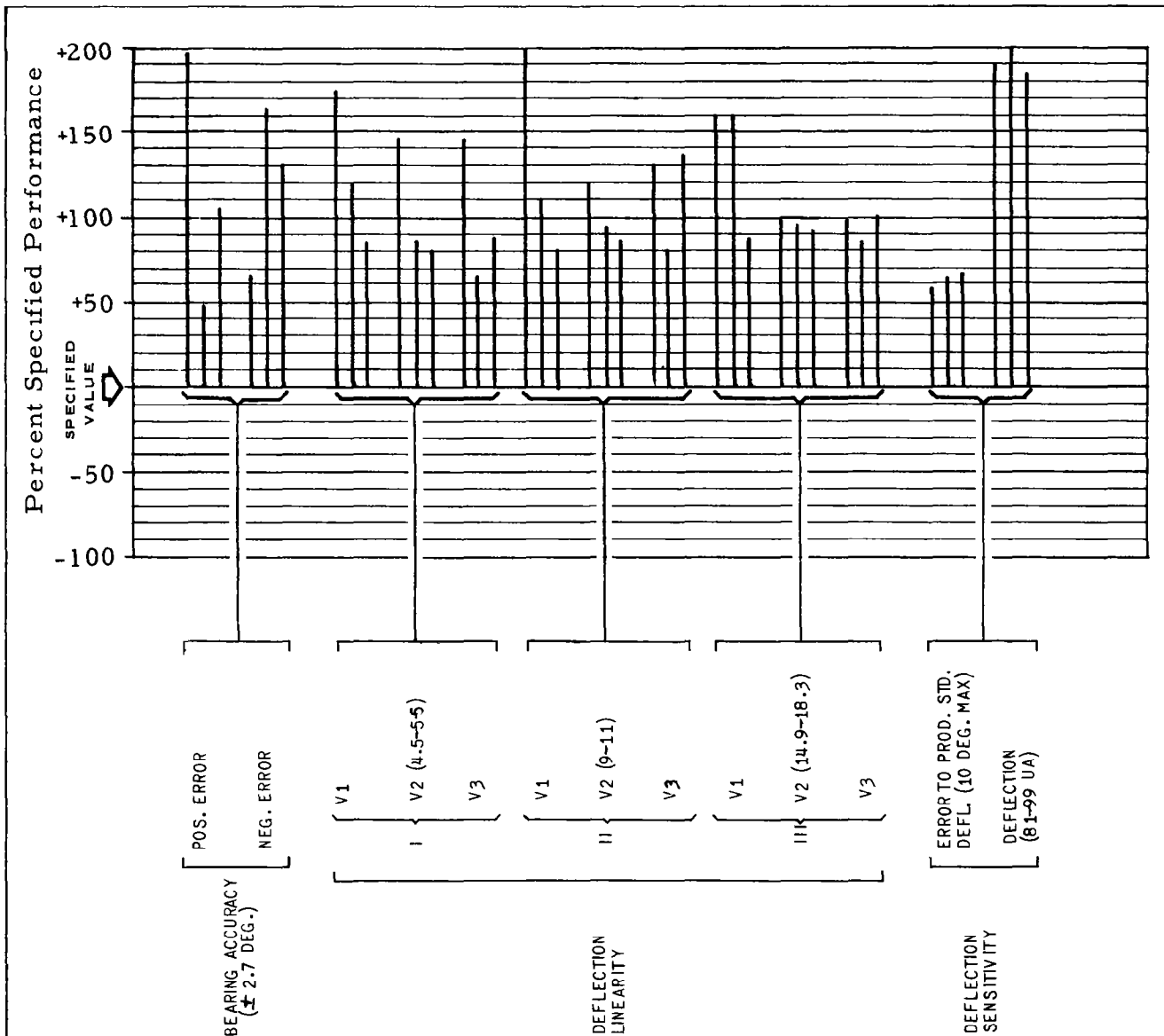
b. VO-2, VOR Receiver

General:

Frequency Range:	108.0 - 135.9 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	280
Number of Channels Available at Operator's Position:	280
Means of Frequency Selection:	Rotary Switch

Technical:

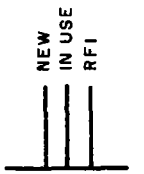
	Page(s)
Percent Specified Performance	C-120
Weighted Performance	C-121
Bearing Accuracy	C-122
Deflection Linearity	C-123-125
Deflection Sensitivity	C-126
Selectivity	C-127
Alarm Signal	C-128
Audio Frequency Response	C-129
AVC Characteristic	C-130
Gain	C-131
Noise Level	C-132
Interference Tests	C-133-134
Temperature Variation Test	C-135
Audio Output Regulation & Distortion	C-136



PERCENT
SPECIFIED PERFORMANCE
VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

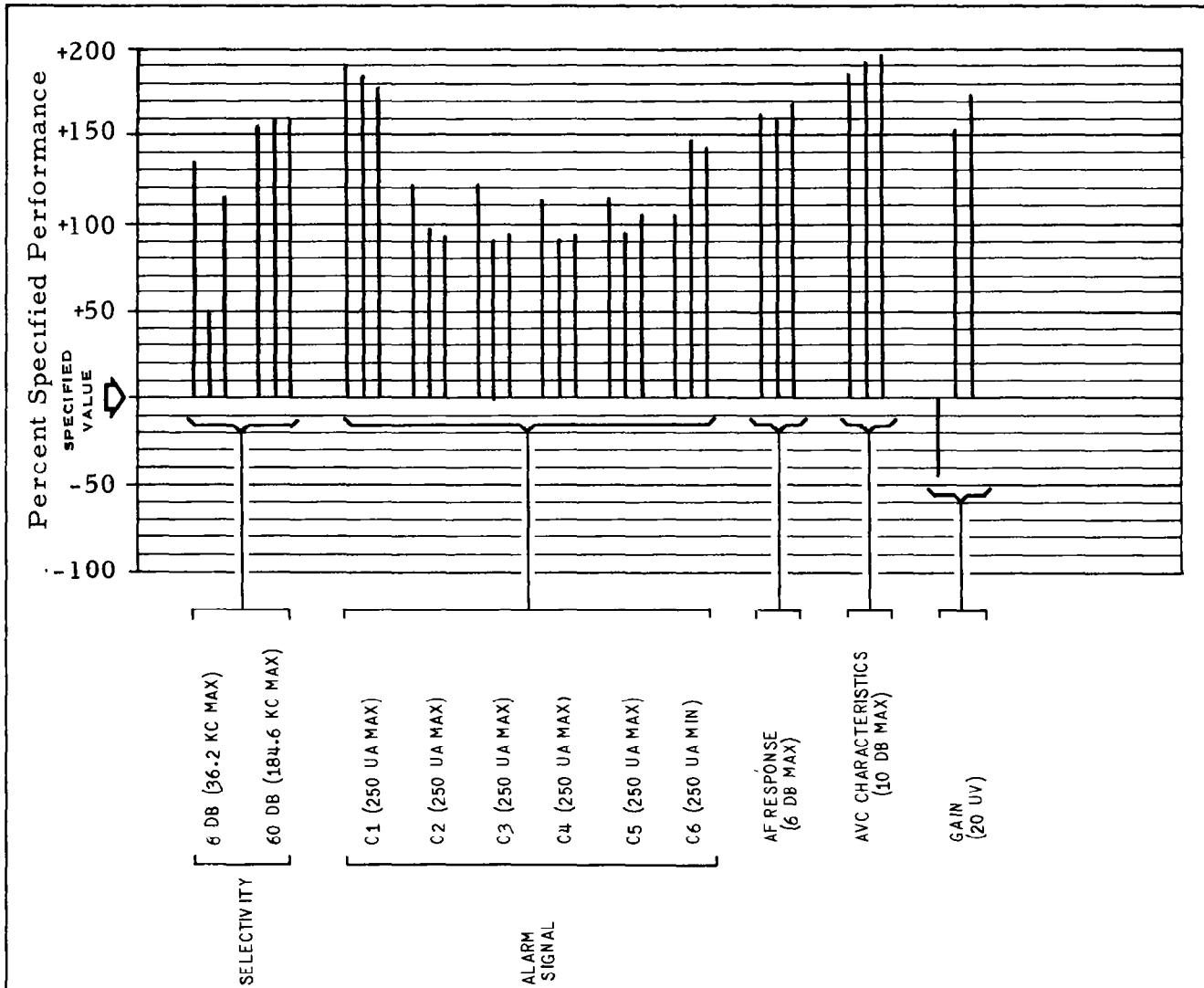


3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

Figure C-2(b)

PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-2

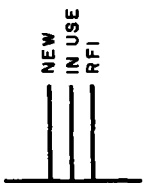
(continued on Page C-120a)



PERCENT
SPECIFIED PERFORMANCE
VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Notes:

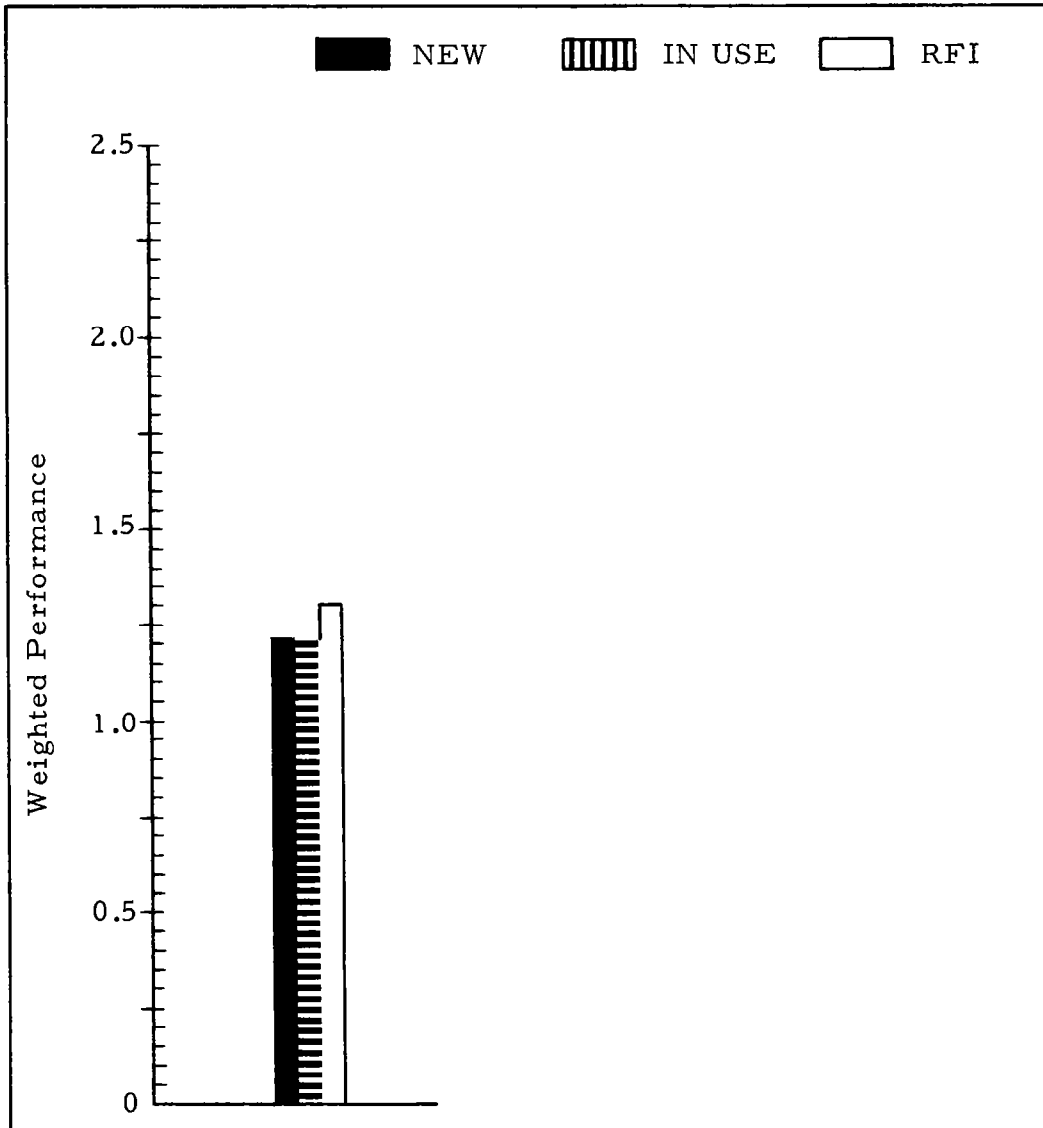
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-2

Figure C-2(b)



WEIGHTED PERFORMANCE

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2

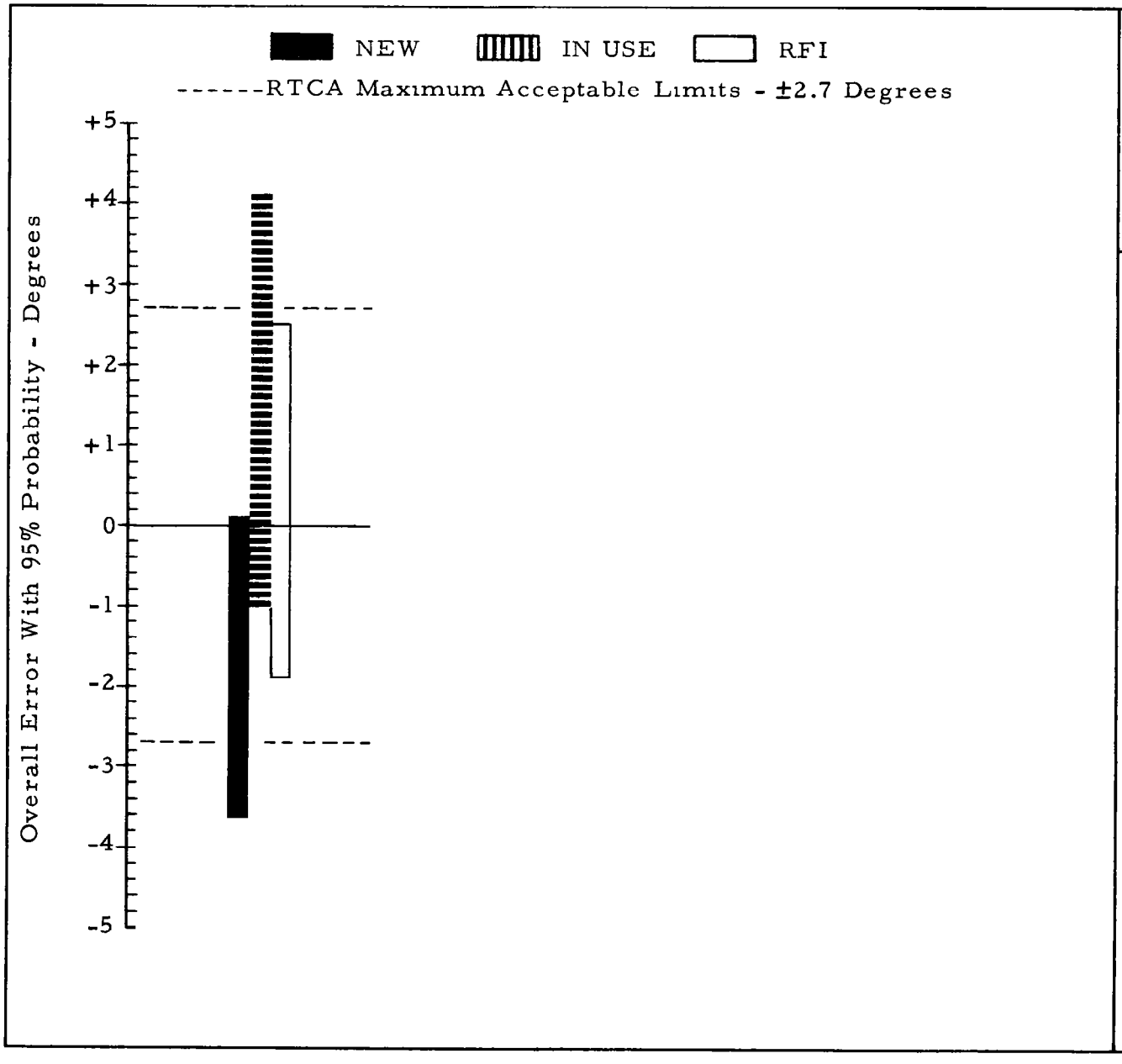
WEIGHTING FACTORS

Bearing Accuracy:	
± error	1/8 ea.
Deflection Linearity:	
(I) v_1, v_2, v_3	1/60 ea.
(II) v_1, v_2, v_3	1/60 ea.
(III) v_1, v_2, v_3	1/60 ea.
Deflection Sensitivity:	
(I), (II)	3/40 ea.
Selectivity:	
b_1, b_2	3/40 ea.
Alarm Signal:	
c_1, c_2, c_3, c_4, c_5, c_6	1/60 ea.
Audio Frequency Response:	1/20
AVC Characteristics:	1/20
Gain:	1/10

Note:
1. Graph based on arithmetic mean for above characteristics.

WEIGHTED PERFORMANCE - VOR RECEIVER - VO-2

Figure C-2(b)



BEARING ACCURACY

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.3

Standard Deviation

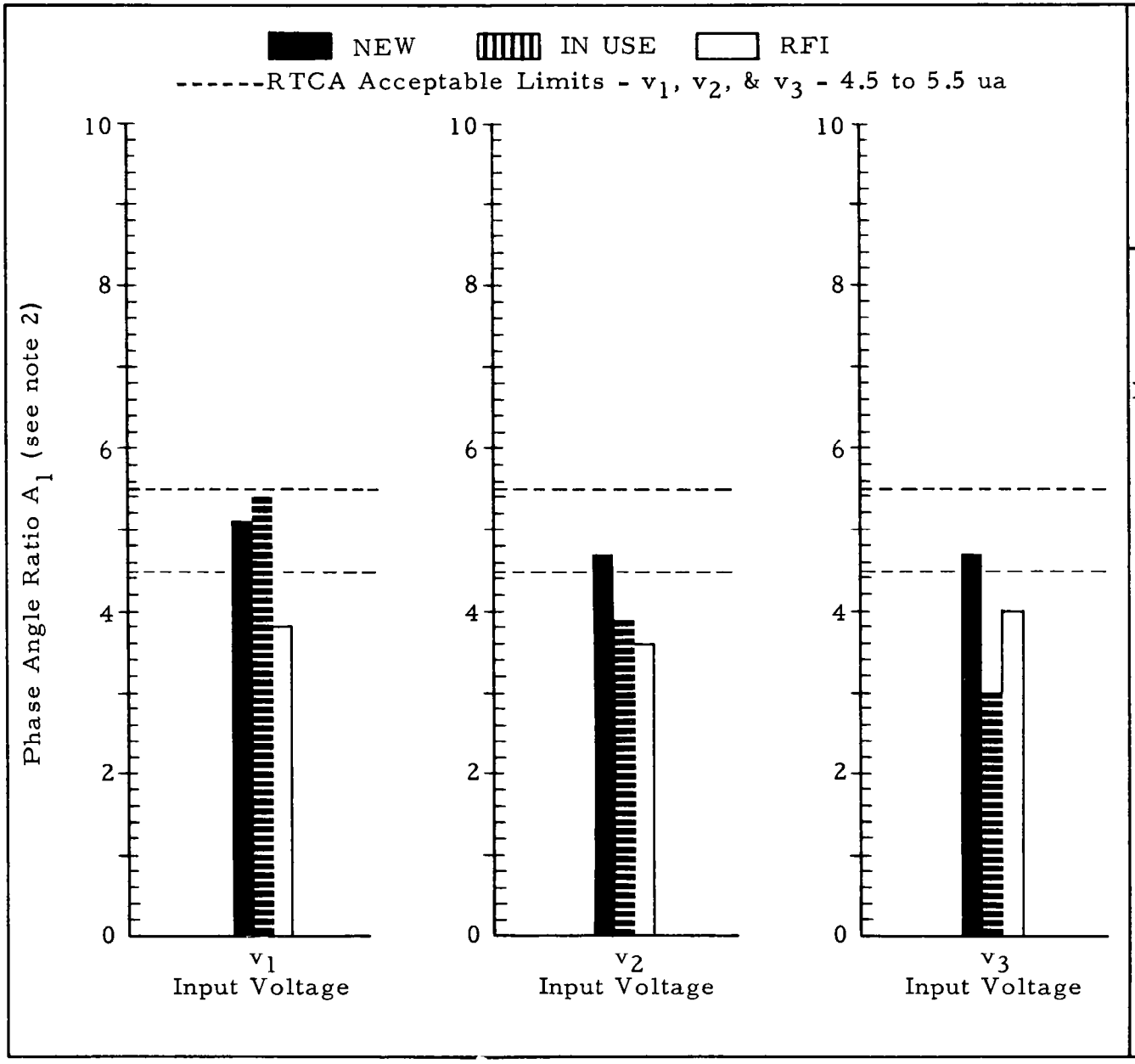
Test	New	In Use	RFI
+error	1.01	2.32	1.65
-error	0.25	1.94	1.68

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Each bar represents 95% statistical probability.
3. RTCA maximum acceptable limits -± 2.7 degrees.
4. This unit designed to operate above 15,000 feet.

BEARING ACCURACY - VOR RECEIVER - VO-2

Figure C-2(b)



DEFLECTION LINEARITY

(I)
VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND

v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Half-Standard Deflection-4.5ua
Standard Deviation

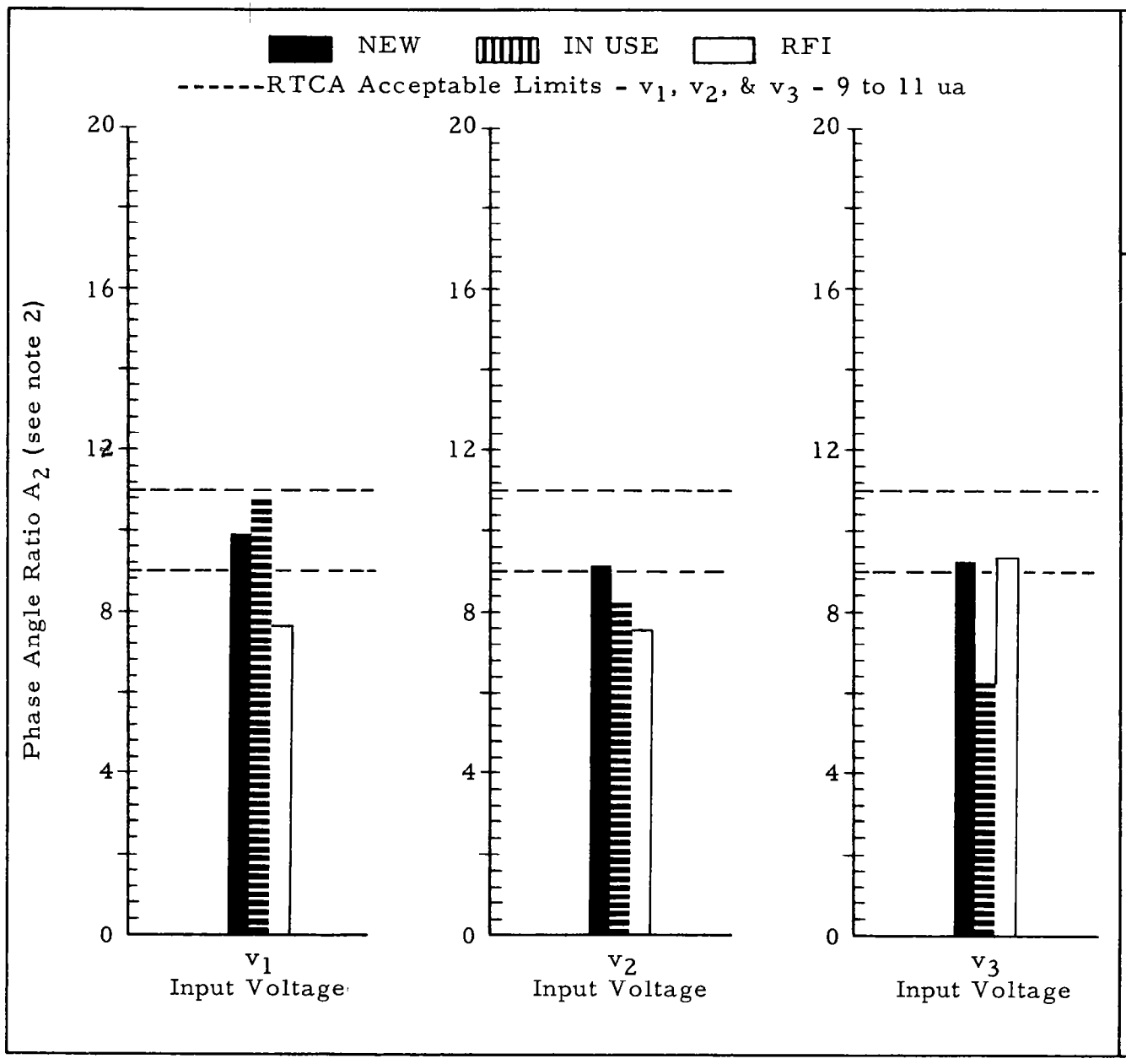
Test	New	In Use	RFI
v_1	1.48	4.14	0.20
v_2	3.14	1.69	0.38
v_3	0.16	0.39	0.91

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. A_1 is the ratio of the angle which gives .5 standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 4.5 to 5.5 ua.

Figure C-2(b)

(I) DEFLECTION LINEARITY - VOR RECEIVER - VO-2



DEFLECTION LINEARITY
(II)
VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

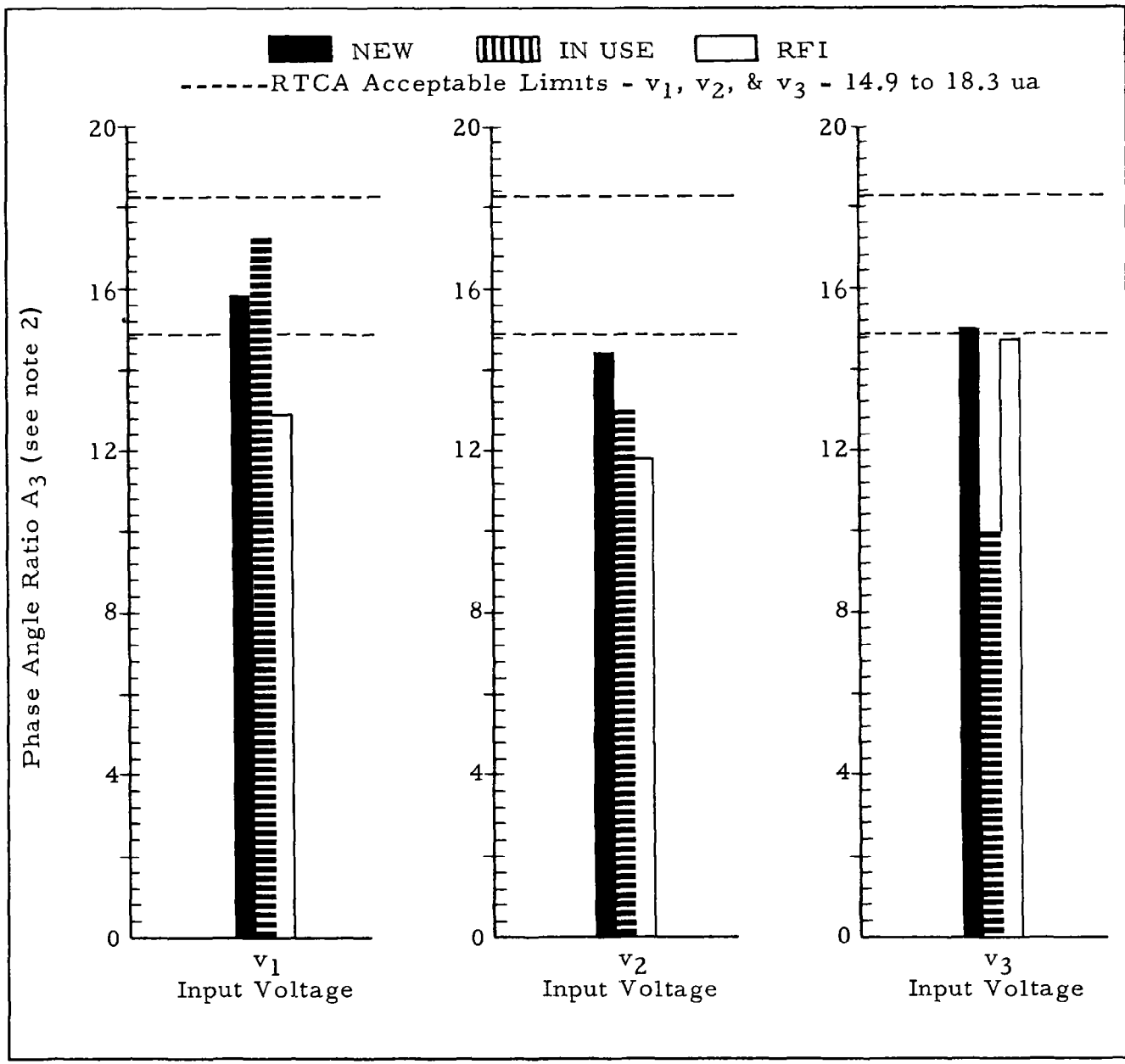
LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Standard Deflection - 90 ua
Standard Deviation

Test	New	In Use	RFI
v_1	1.860	10.30	0.33
v_2	1.450	3.79	0.74
v_3	0.284	0.78	3.20

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. A_2 is the ratio of the angle which gives standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 9 to 11 ua.

Figure C-2(b)

(II) DEFLECTION LINEARITY - VOR RECEIVER - VO-2



DEFLECTION LINEARITY
(III)
VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

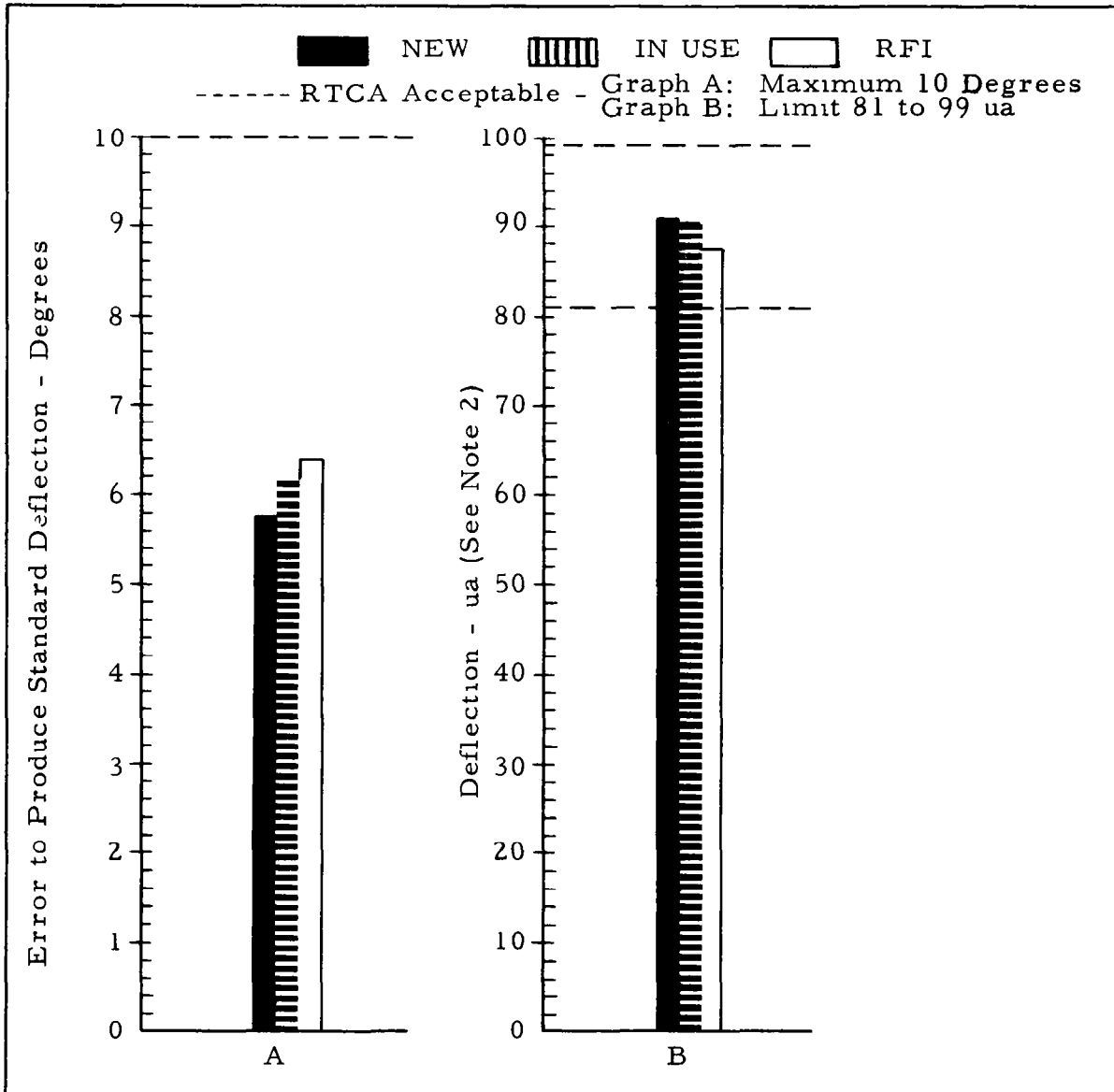
LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Full Scale Deflection - 150 ua
Standard Deviation

Test	New	In Use	RFI
v_1	3.47	11.10	0.50
v_2	1.59	6.14	0.74
v_3	0.16	1.27	5.24

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. A_3 is the ratio of the angle which gives full scale deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 14.9 to 18.3 ua.

Figure C-2(b)

(III) DEFLECTION LINEARITY - VOR RECEIVER - VO-2



DEFLECTION SENSITIVITY
VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 2.11

Standard Deviation

Test	New	In Use	RFI
A	0.69	0.79	0.23
B	1.78	0.57	1.00

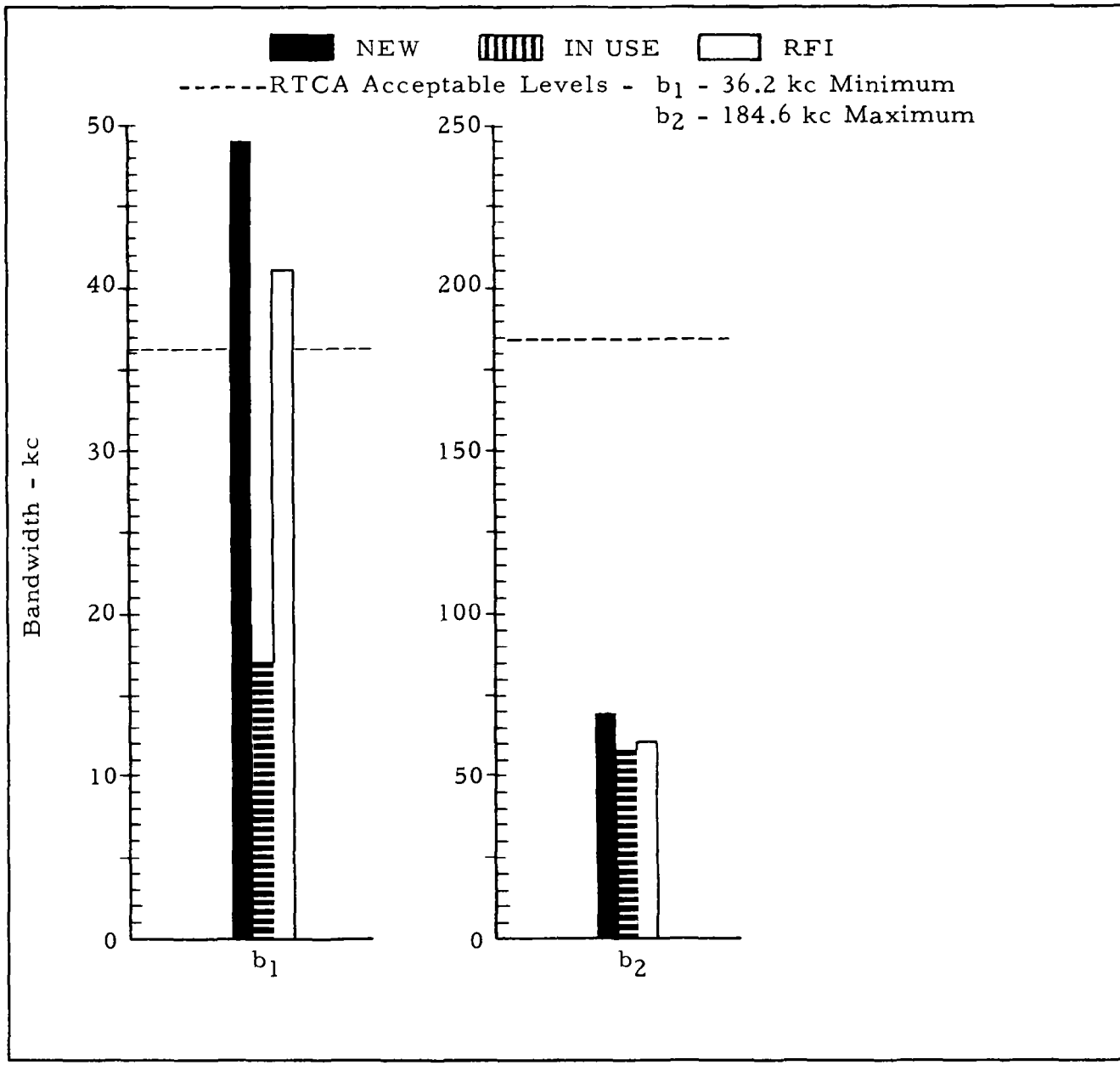
Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Deflection on one side of center with input that produced standard deflection on the other side of center - ua.
3. Graph A: RTCA maximum acceptable level to produce standard deflection - 10 degrees.
4. Graph B: RTCA acceptable level for deflection on one side of center with input that produced standard deflection on the other side of center:

   Upper Level - 99 ua
   Lower Level - 81 ua

DEFLECTION SENSITIVITY - VOR RECEIVER - VO-2

Figure C-2(b)



SELECTIVITY

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.5(a)

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 114.9 mc

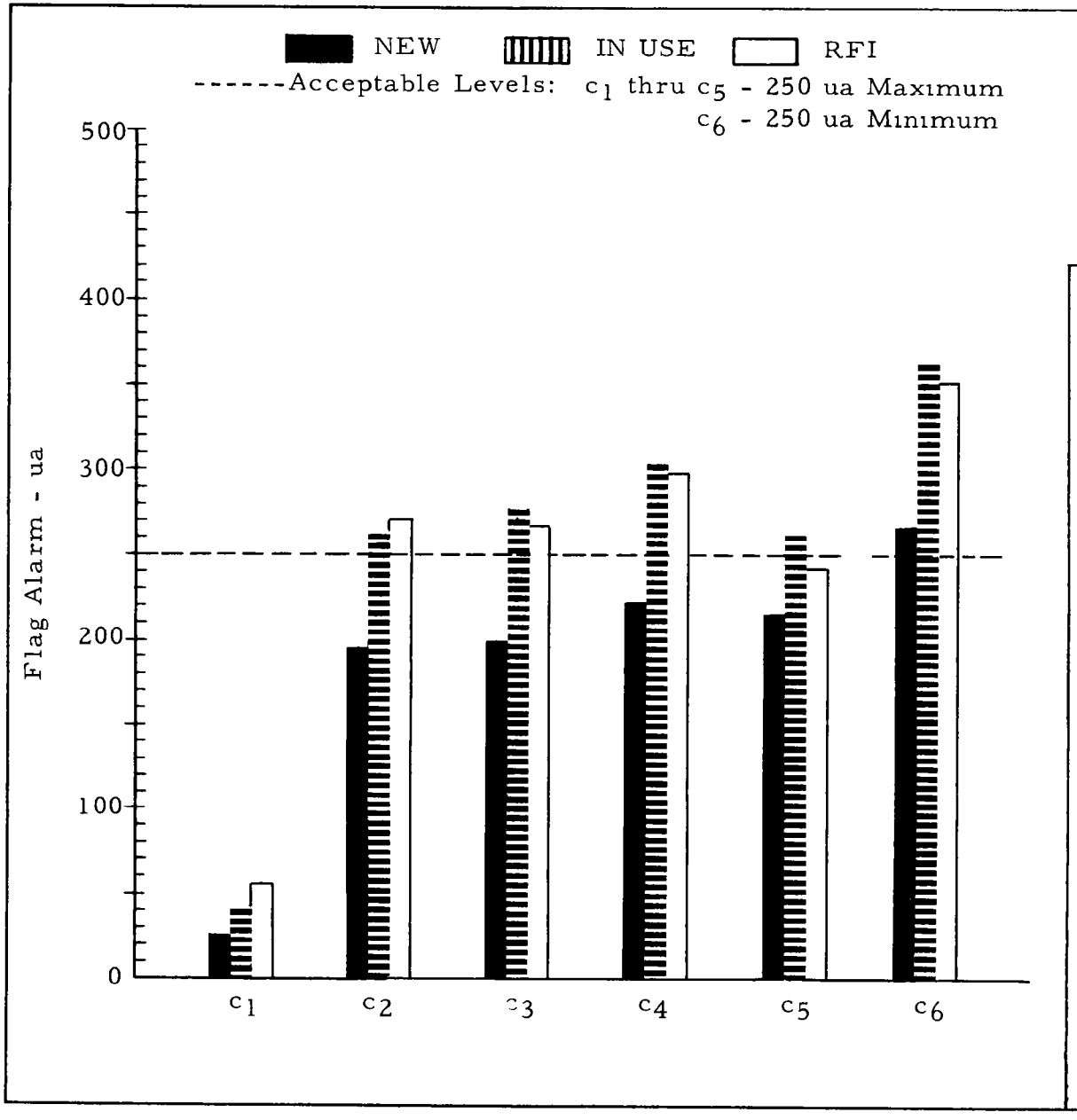
Standard Deviation

Test	New	In Use	RFI
b_1	5.89	10.0	13.00
b_2	4.61	14.2	2.14

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable levels:
b_1 - 36.2 kc minimum
b_2 - 184.6 kc maximum
3. This receiver is tuned in discrete steps.

SELECTIVITY - VOR RECEIVER - VO-2

Figure C-2(b)



ALARM SIGNAL

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.8

LEGEND

c_1 - absence of R.F.
c_2 - absence of 9960 cps
c_3 - absence of 30 cps
c_4 - 15% mod. of 9960 & 30 cps
c_5 - VOR signal @50% deflection
c_6 - standard signal - 10 uv

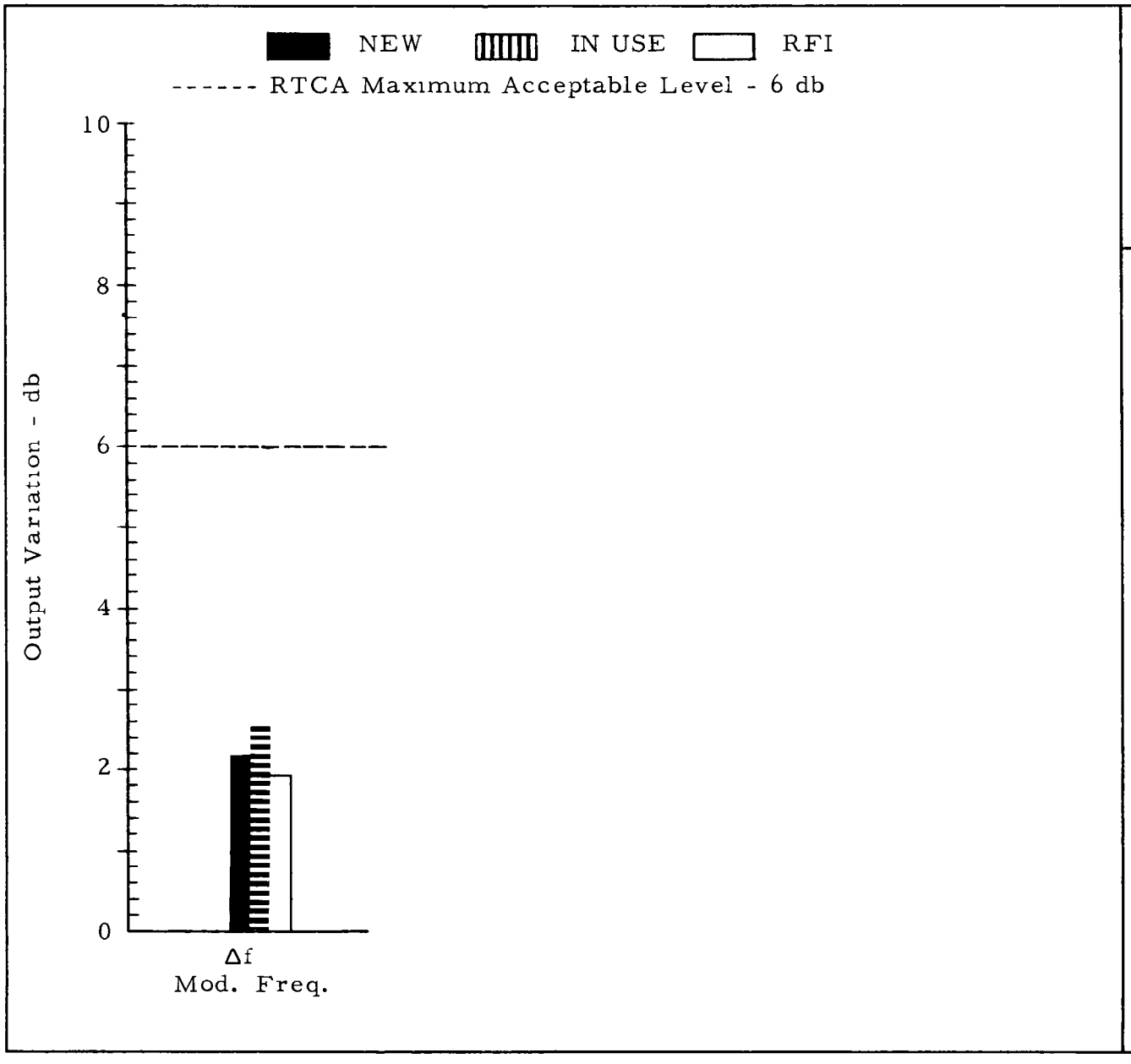
Standard Deviation

Test	New	In Use	RFI
c_1	0	42.50	5.77
c_2	8.41	17.40	10.00
c_3	8.70	20.60	5.78
c_4	7.26	15.20	5.78
c_5	77.50	11.30	5.78
c_6	10.60	4.35	5.78

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA paper as a guide.

ALARM SIGNAL - VOR RECEIVER - VO-2



AUDIO FREQ. RESPONSE

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.12

LEGEND

Δf - 350 - 2500 cps

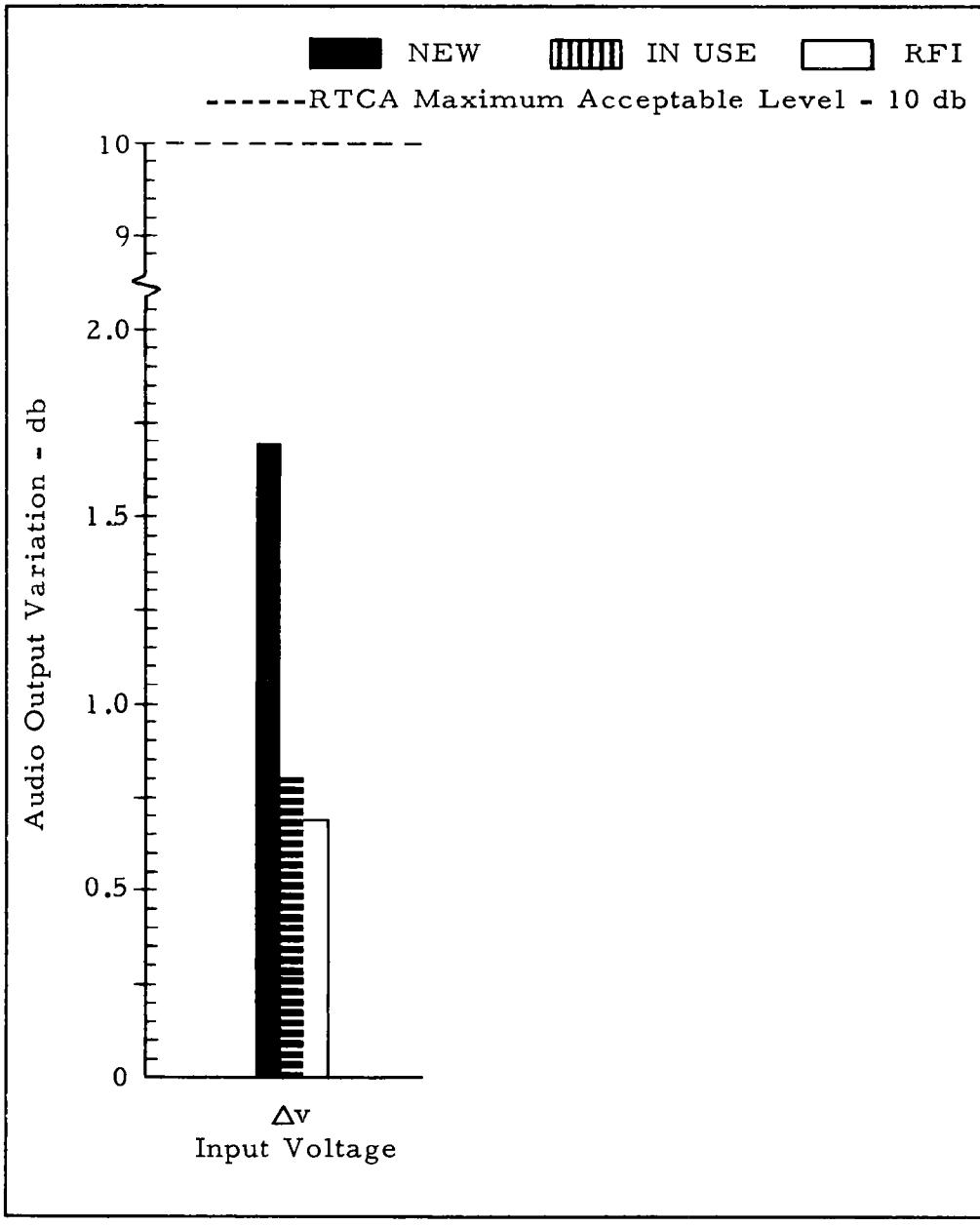
Standard Deviation

New	In Use	RFI
.143	.67	.50

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 6 db

Figure C-2(b)

AUDIO FREQUENCY RESPONSE - VOR RECEIVER - VO-2



AVC CHARACTERISTIC

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.14

LEGEND

Δv - 10 - 10,000 uv

Standard Deviation

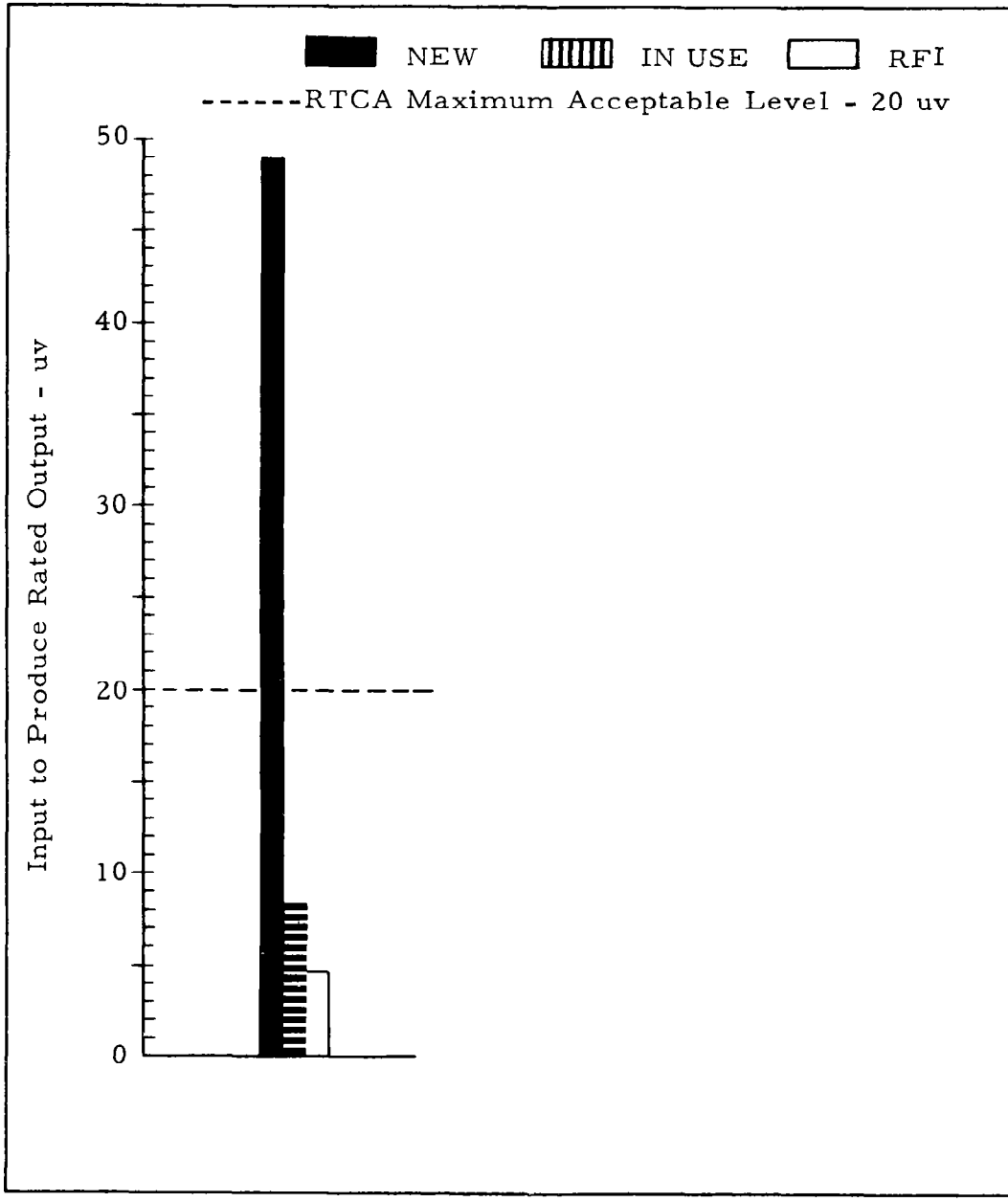
New	In Use	RFI
.12	.92	.15

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 10 db.

AVC CHARACTERISTIC - VOR RECEIVER - VO-2

Figure C-2(b)



GAIN

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.15

Standard Deviation

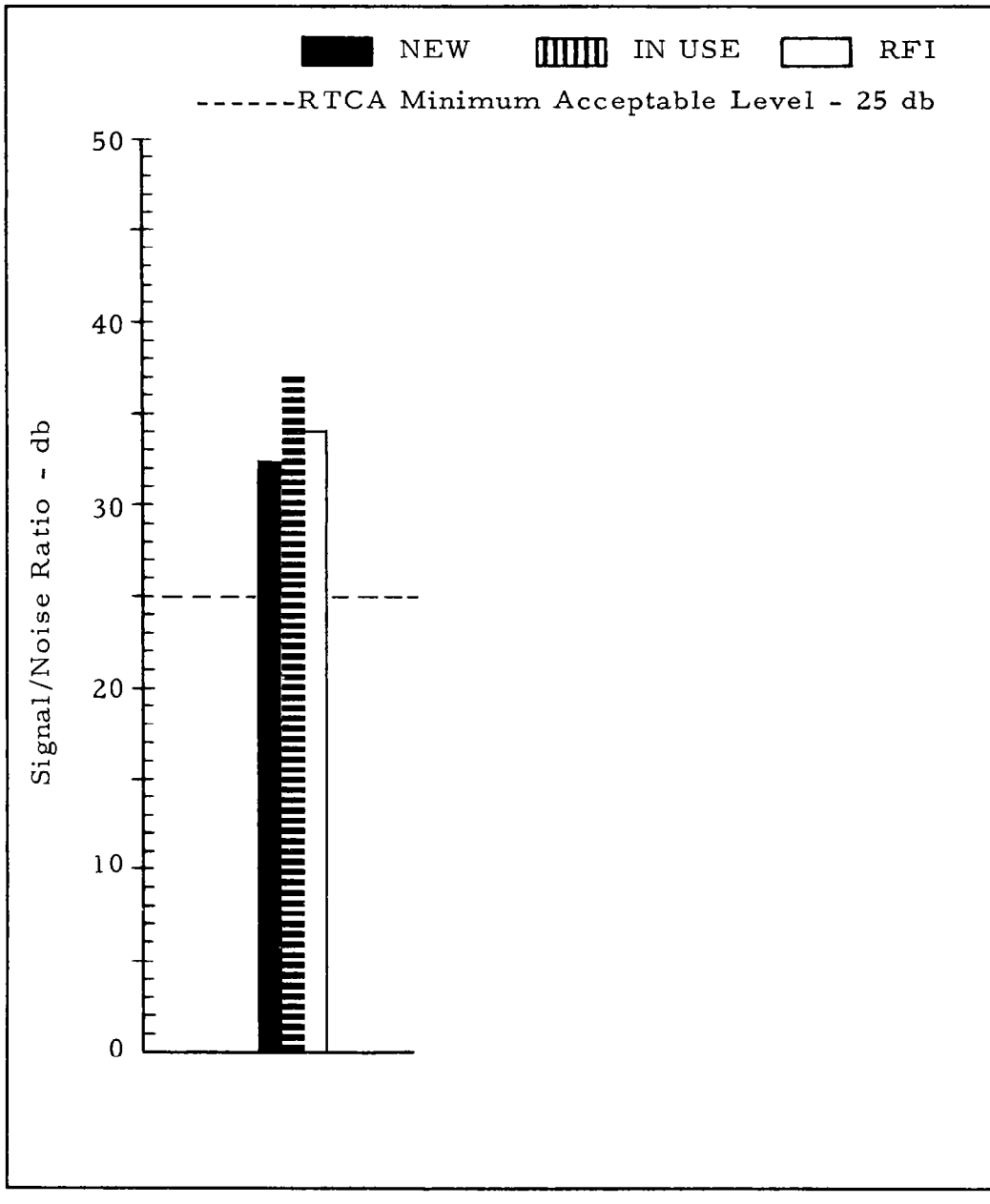
New	In Use	RFI
20.3	9.34	1.89

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 20 uv.
3. Rated output - 300 mw.

GAIN - VOR RECEIVER - VO-2

Figure C-2(b)



AUDIO OUTPUT
NOISE LEVEL

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.16

Standard Deviation

New	In Use	RFI
.66	1.85	1.82

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 25 db

AUDIO OUTPUT NOISE LEVEL - VOR RECEIVER - VO-2

Figure C-2(b)

INTERFERENCE TESTS

VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.6	.19 to 1500	114.9	Acceptable level excluding the band of 107.8 to 118.2 mc: ≥60 db.	Actual Level: >60 db. All frequencies within performance standards.	Yes
Cross Modulation & Inter Modulation RTCA Para: 2.7	108 to 118	114.9	Acceptable level excluding the band within F_c ±200 kc Bearing Error: ≤1 Deg. Alarm Meter: ≥250 microamps. *	Actual Level: 0 Degrees. ≥272 microamps. All frequencies within performance standards.	Yes
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25	118.0	Acceptable Emission: ≤200 microvolts.	Actual Emission on +28 v line: <200 microvolts. All frequencies within performance standards.	Yes
Antenna Conducted Interference RTCA Para: 2.9(b)	.09 to 1500	118.0	Acceptable Emission: ≤400 micro-microwatts * Acceptable level was determined using RTCA Paper as a guide.	Actual Emission: <400 micro-microwatts except at 102, 511, and 615 mc. All other frequencies within performance standards.	Partially

INTERFERENCE TESTS - VOR RECEIVER - VO-2

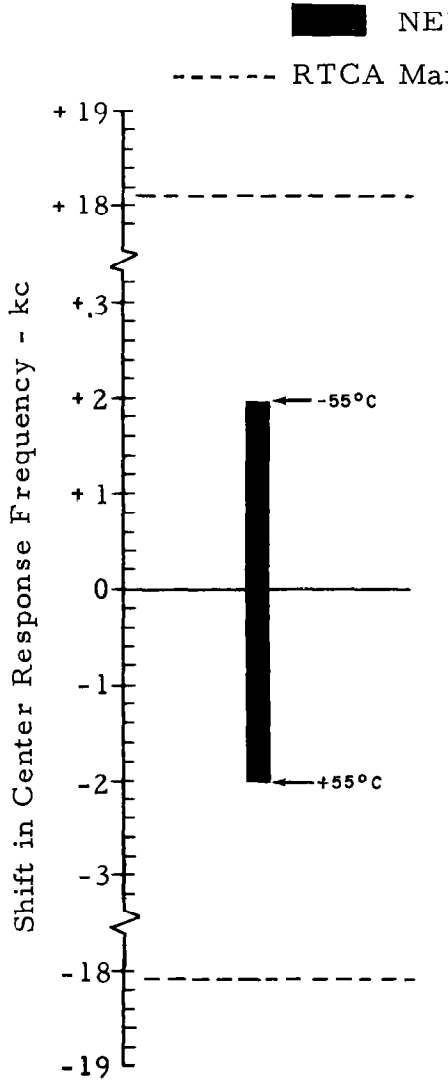
(continued on Page C-134)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna RTCA Para: 2.17	112 to 118	Varied over VOR band	Acceptable Operation: Deviation indicator shall not depart from its centered position.	Actual Operation: No departure of deviation indicator from centered position.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals	None	114.9	None over the range from 100 to 2000 mc.	(Not Applicable)

Figure C-2(b)

INTERFERENCE TESTS - VOR RECEIVER - VO-2



TEMPERATURE VARIATION TEST
VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 3.1(a)

Notes:
1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits - ± 18.1 kc.
3. This unit is designed to operate above 15,000 feet.
4. This unit is tuned in discrete steps.

TEMPERATURE VARIATION TEST - VOR RECEIVER - VO-2

Figure C-2(b)

Notes: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

AUDIO OUTPUT REGULATION & DISTORTION
VOR Receiver: VO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 2.13

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	187	205	220	174	192	200	170	185	195
	500	240	265	280	234	260	270	200	220	231
	1000	308	330	345	335	358	370	235	253	268
	1800	260	281	298	300	330	341	185	200	212
	2500	208	235	249	256	281	295	150	165	172
New Unit No. 2	350	230	260	280	220	251	270	194	220	236
	500	290	320	335	288	318	340	228	250	270
	1000	330	360	381	365	392	410	240	265	280
	1800	267	291	310	315	345	360	180	198	210
	2500	211	248	261	279	302	320	142	160	170
New Unit No. 3	350	200	226	245	191	218	237	180	200	215
	500	265	291	315	262	291	311	220	241	260
	1000	320	350	376	355	381	400	248	270	290
	1800	268	299	315	320	352	370	195	215	231
	2500	235	261	280	270	315	355	161	179	190
In Use Unit No. 1	350	222	238	247	200	210	220	200	211	220
	500	250	262	275	230	242	252	213	228	235
	1000	285	300	312	285	300	312	240	250	258
	1800	237	250	260	153	170	275	180	190	200
	2500	170	182	190	187	200	208	125	135	140

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-2

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 2	350	140	151	160	138	150	158	111	125	130
	500	215	230	248	205	240	230	178	190	195
	1000	282	300	318	288	305	320	207	223	232
	1800	222	250	260	252	272	287	165	180	187
	2500	168	180	191	194	210	225	110	120	130
In Use Unit No. 3	350	180	185	190	168	181	187	160	167	170
	500	240	245	255	230	240	250	200	205	210
	1000	295	300	320	310	320	330	232	240	250
	1800	260	268	272	282	295	310	190	195	200
	2500	198	210	215	230	245	250	148	152	158
RFI Unit No. 1	350	210	222	231	198	209	213	180	190	197
	500	260	272	282	250	261	268	215	225	231
	1000	290	300	312	302	320	328	220	231	240
	1800	230	240	245	252	268	272	168	172	180
	2500	161	170	178	186	196	202	110	118	122

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-2

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	15.8	15.0	15.0	18.5	18.0	18.2	13.5	13.0	13.0
	500	12.0	11.5	11.5	14.0	13.8	13.5	11.0	11.0	11.0
	1000	10.5	10.5	10.8	11.2	11.0	11.2	10.5	10.6	11.0
	1800	11.3	11.5	11.8	12.5	12.5	12.5	11.0	11.0	11.5
	2500	13.2	13.0	13.0	14.5	14.0	14.0	12.8	12.5	12.8
New Unit No. 2	350	12.0	11.8	12.0	14.0	13.5	13.5	11.0	11.5	12.0
	500	9.0	9.3	9.7	10.0	9.2	9.2	9.6	10.3	11.0
	1000	8.9	9.4	9.7	8.8	9.1	9.3	9.5	10.0	10.8
	1800	9.4	9.6	10.0	9.8	9.9	10.0	9.2	10.0	10.2
	2500	11.0	11.0	11.4	11.4	11.4	11.6	11.0	11.3	11.8
New Unit No. 3	350	14.8	14.5	14.5	17.8	17.5	17.5	12.5	12.8	12.8
	500	11.0	10.6	10.8	13.0	12.5	12.2	10.0	10.5	10.8
	1000	9.9	10.1	10.5	10.5	10.5	10.8	10.0	10.5	11.0
	1800	10.5	11.0	11.2	11.6	11.8	12.0	10.0	10.8	11.0
	2500	12.0	12.2	12.5	13.5	13.1	13.1	12.0	12.0	12.2
In Use Unit No. 1	350	12.5	12.5	12.5	15.0	15.0	15.0	11.0	11.1	11.3
	500	9.7	9.5	9.4	11.8	11.5	11.5	9.2	9.2	9.3
	1000	9.5	10.0	10.0	10.0	10.0	10.5	9.5	9.8	10.1
	1800	9.5	10.0	10.0	10.5	11.0	11.0	9.3	9.6	9.8
	2500	12.5	12.5	12.5	13.5	13.5	13.5	11.8	11.5	11.6
In Use Unit No. 2	350	20.0	19.7	19.5	22.4	21.8	22.0	18.5	18.0	18.0
	500	13.3	13.0	13.0	16.0	16.0	16.0	11.4	11.0	11.0
	1000	9.2	9.0	9.4	10.8	10.6	11.0	8.5	8.8	9.0
	1800	9.8	11.0	10.0	11.5	11.7	11.8	8.8	9.0	9.5
	2500	12.2	12.4	12.0	14.0	14.3	14.0	11.5	11.0	11.6

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-2

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 3	350	17.5	17.5	17.8	22.0	22.2	22.4	15.5	15.6	15.7
	500	13.0	13.0	13.0	16.5	16.7	16.9	13.0	13.3	13.4
	1000	11.5	12.0	12.0	13.0	13.2	13.4	11.8	12.0	12.2
	1800	12.5	12.8	13.0	13.8	14.0	14.3	12.0	12.3	12.7
	2500	14.0	14.5	14.8	16.8	16.5	17.0	13.9	14.2	14.5
RFI Unit No. 1	350	13.3	13.0	13.0	16.0	16.2	16.0	11.0	11.3	11.0
	500	11.0	10.8	10.8	12.7	12.9	12.5	9.5	10.0	10.0
	1000	10.0	10.5	10.0	11.3	11.4	11.6	9.5	9.7	10.0
	1800	11.6	11.8	12.0	13.0	13.0	13.0	10.5	10.8	11.0
	2500	14.0	14.0	14.4	16.0	16.0	16.0	13.0	13.0	13.2

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

3. Laboratory and Field Test Data

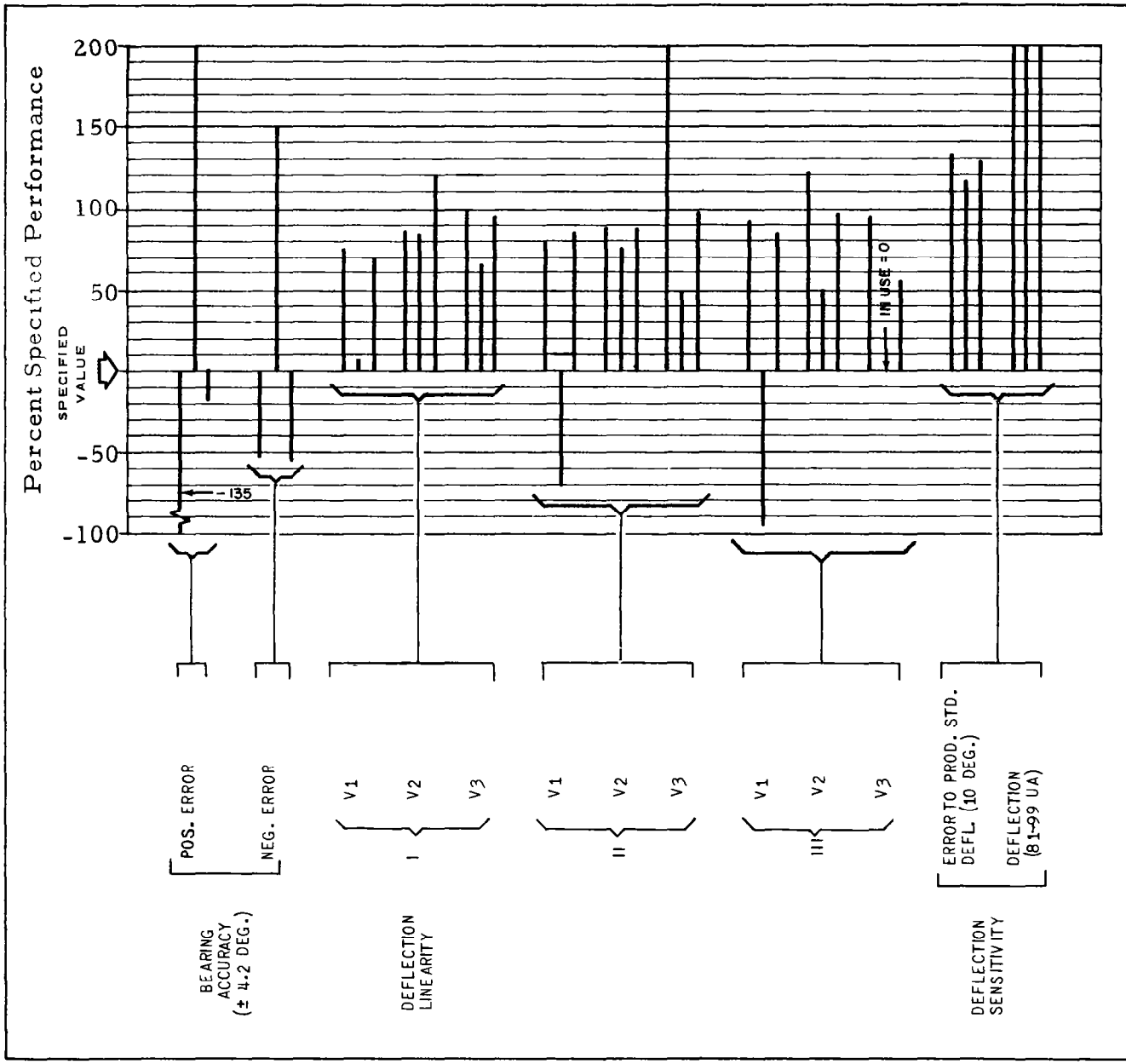
c. VO-3, VOR Receiver

General:

Frequency Range:	108.0 - 126.5 mc
Means of Frequency Control:	Master Oscillator
Total Number of Channels:	Continuously Tunable
Number of Channels Available at Operator's Position:	Continuously Tunable
Means of Frequency Selection:	Continuously Tunable

Technical:

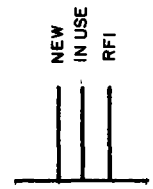
	Page(s)
Percent Specified Performance	C-138
Weighted Performance	C-139
Bearing Accuracy	C-140
Deflection Linearity	C-141-143
Deflection Sensitivity	C-144
Selectivity	C-145
Audio Frequency Response	C-146
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Gain	C-148
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PERCENT
SPECIFIED PERFORMANCE
VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

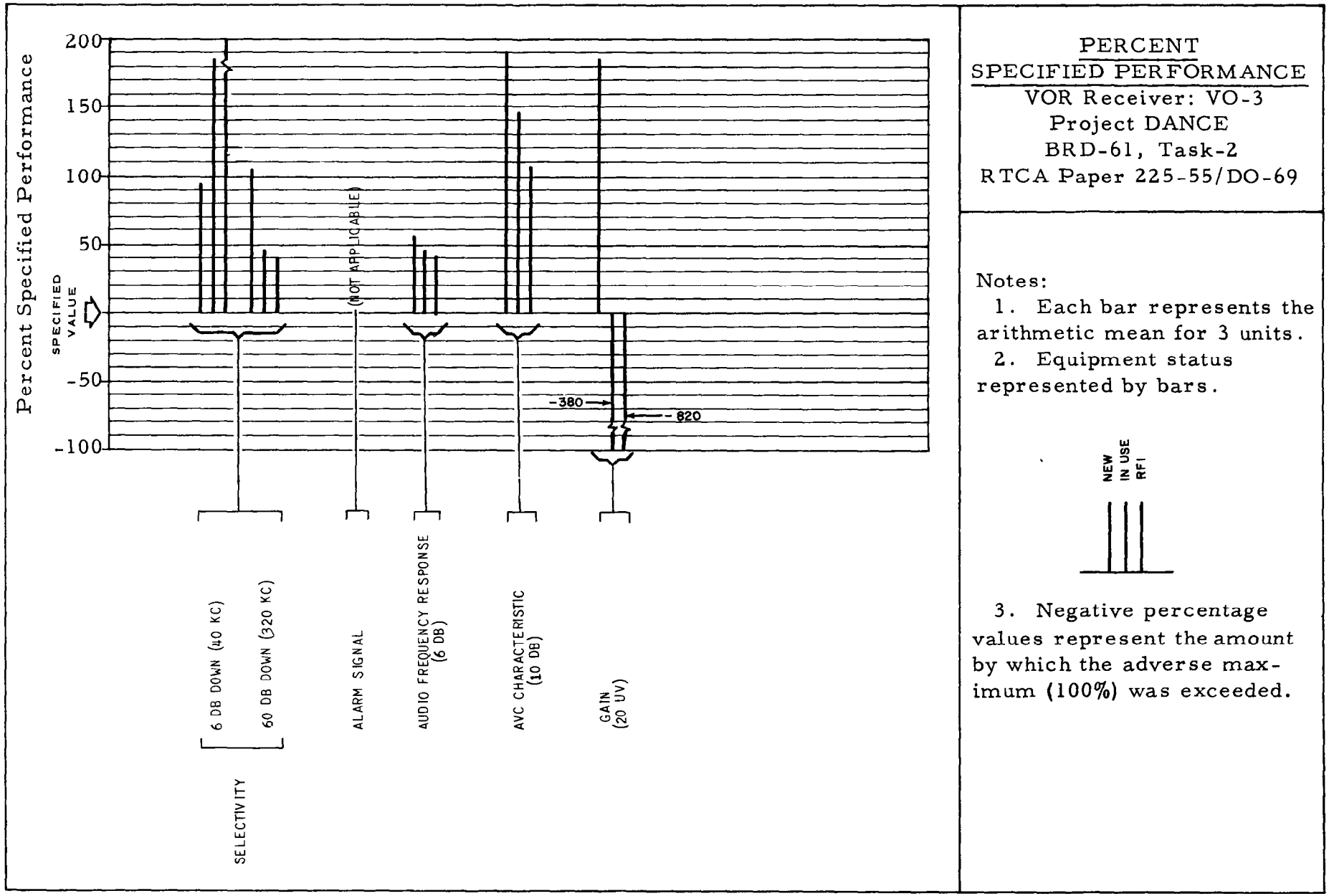


3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

Figure C-2(c)

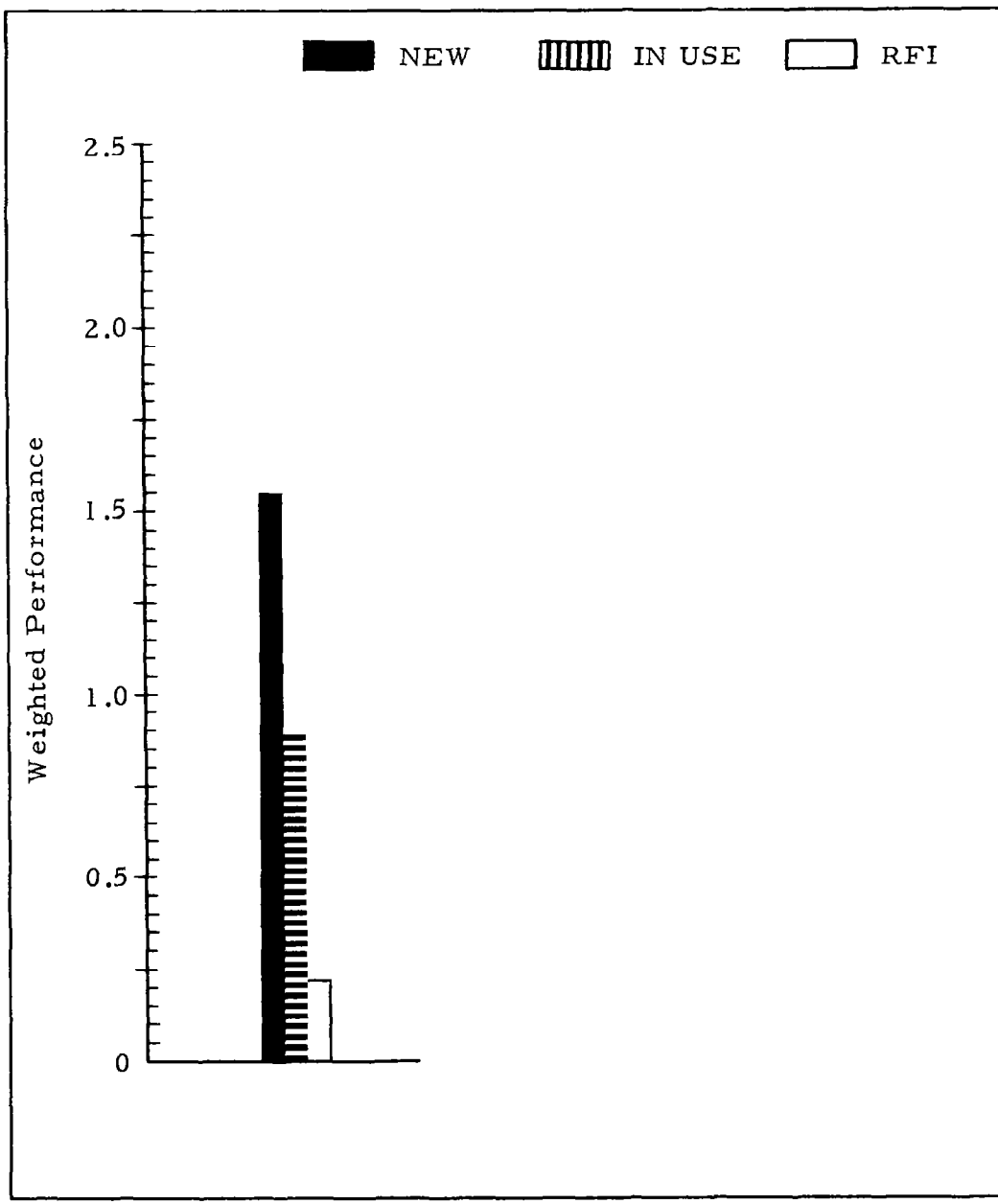
PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-3

(continued on Page C-138a)



PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-3

Figure C-2(c)



WEIGHTED PERFORMANCE

VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2

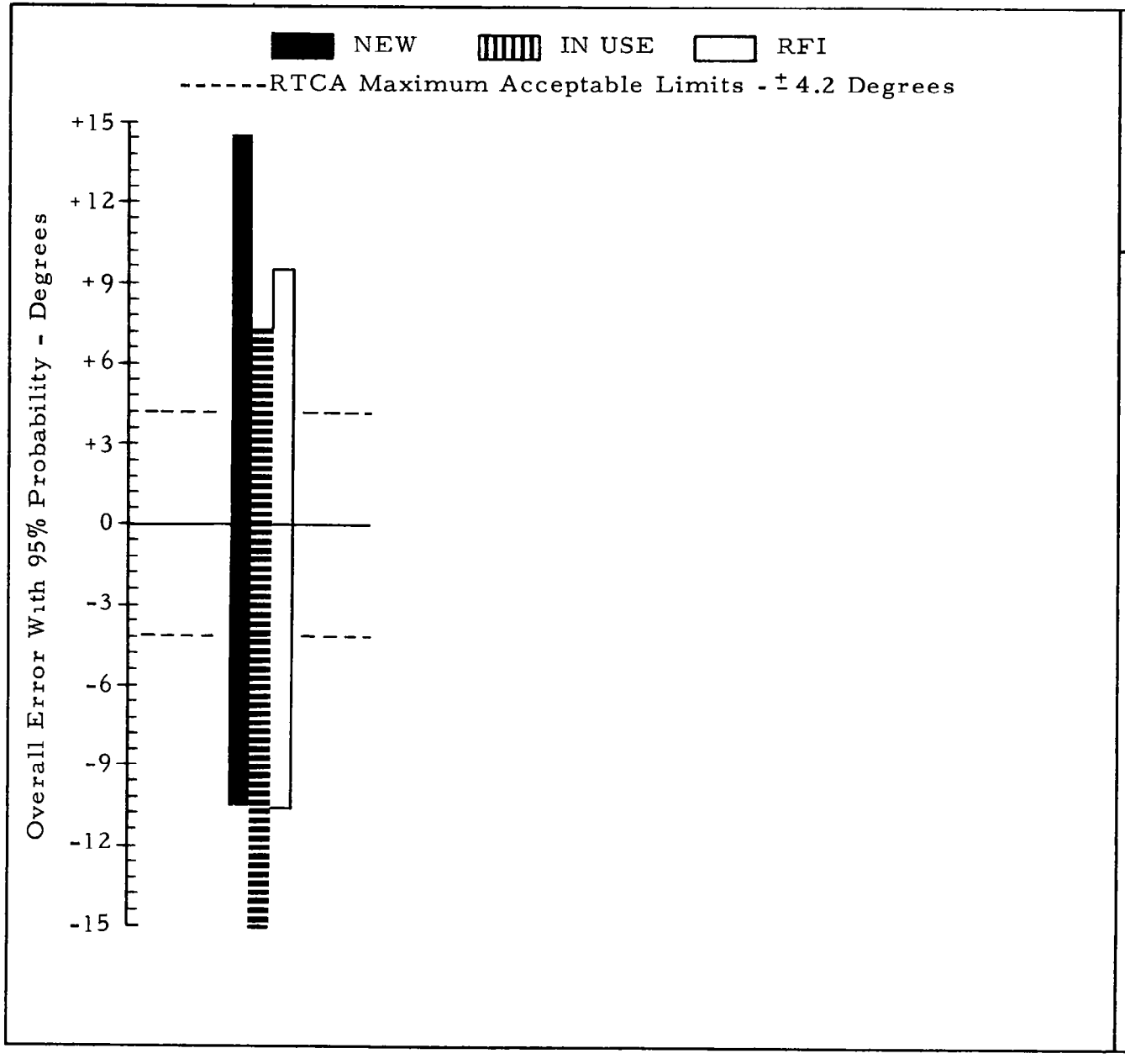
WEIGHTING FACTORS

Bearing Accuracy:	
± error	1/8 ea.
Deflection Linearity:	
(I) v_1, v_2, v_3	1/60 ea.
(II) v_1, v_2, v_3	1/60 ea.
(III) v_1, v_2, v_3	1/60 ea.
Deflection Sensitivity:	
(I), (II)	3/40 ea.
Selectivity:	
b_1, b_2	3/40 ea.
Audio Frequency Response:	1/10
AVC Characteristics:	1/10
Gain:	1/10

Note:
1. Graph based on arithmetic mean for above characteristics.

Figure C-2(c)

WEIGHTED PERFORMANCE - VOR RECEIVER - VO-3



BEARING ACCURACY

VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.3

Standard Deviation

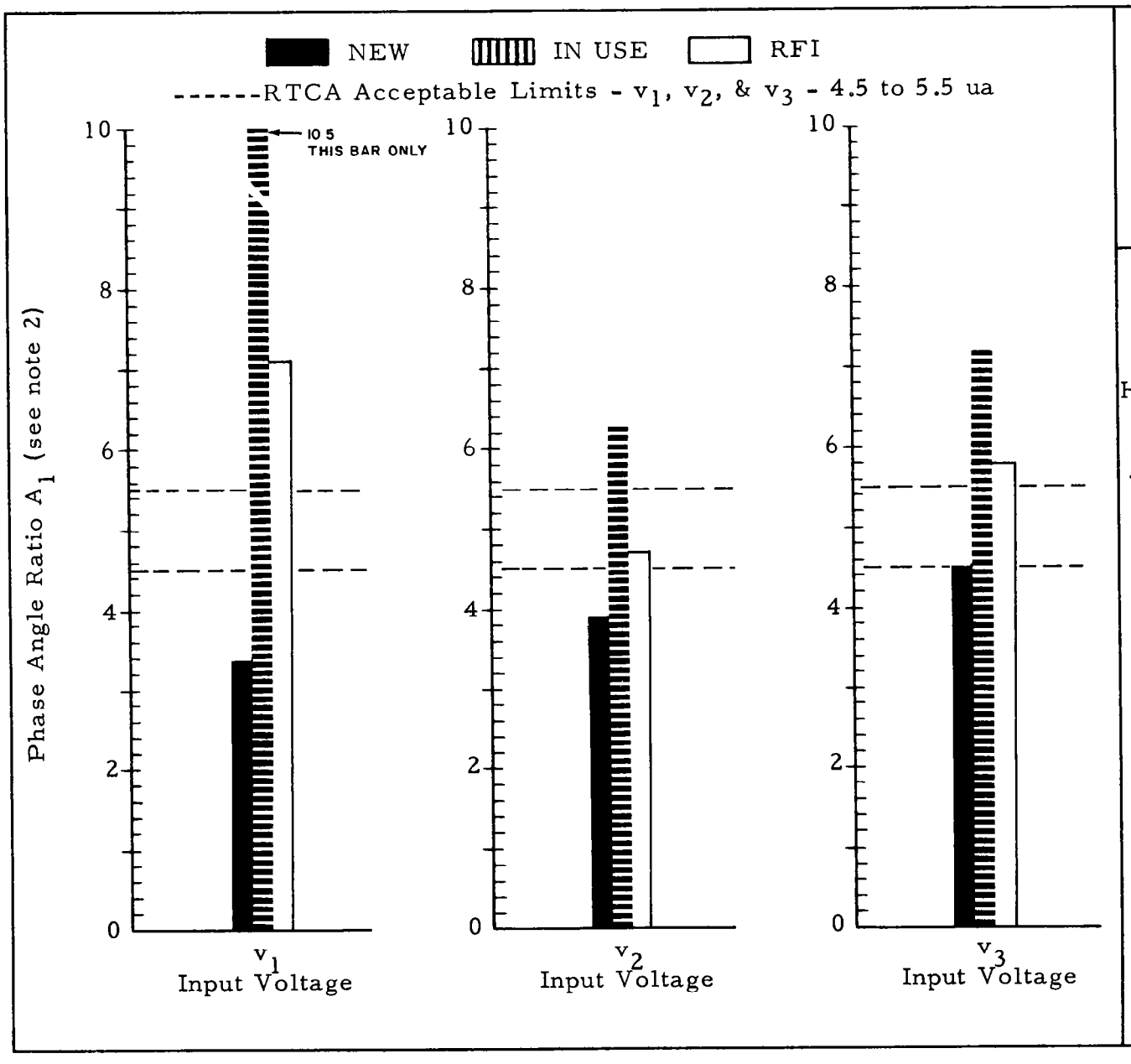
Test	New	In Use	RFI
+error	0.62	3.4	4.28
-error	3.92	8.8	4.96

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Each bar represents 95% statistical probability.
3. RTCA maximum acceptable limits - ± 4.2 degrees.
4. This unit is designed to operate below 15,000 feet.

BEARING ACCURACY - VOR RECEIVER - VO-3

Figure C-2(c)



DEFLECTION LINEARITY
(I)
VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Half-Standard Deflection-45ua

Standard Deviation

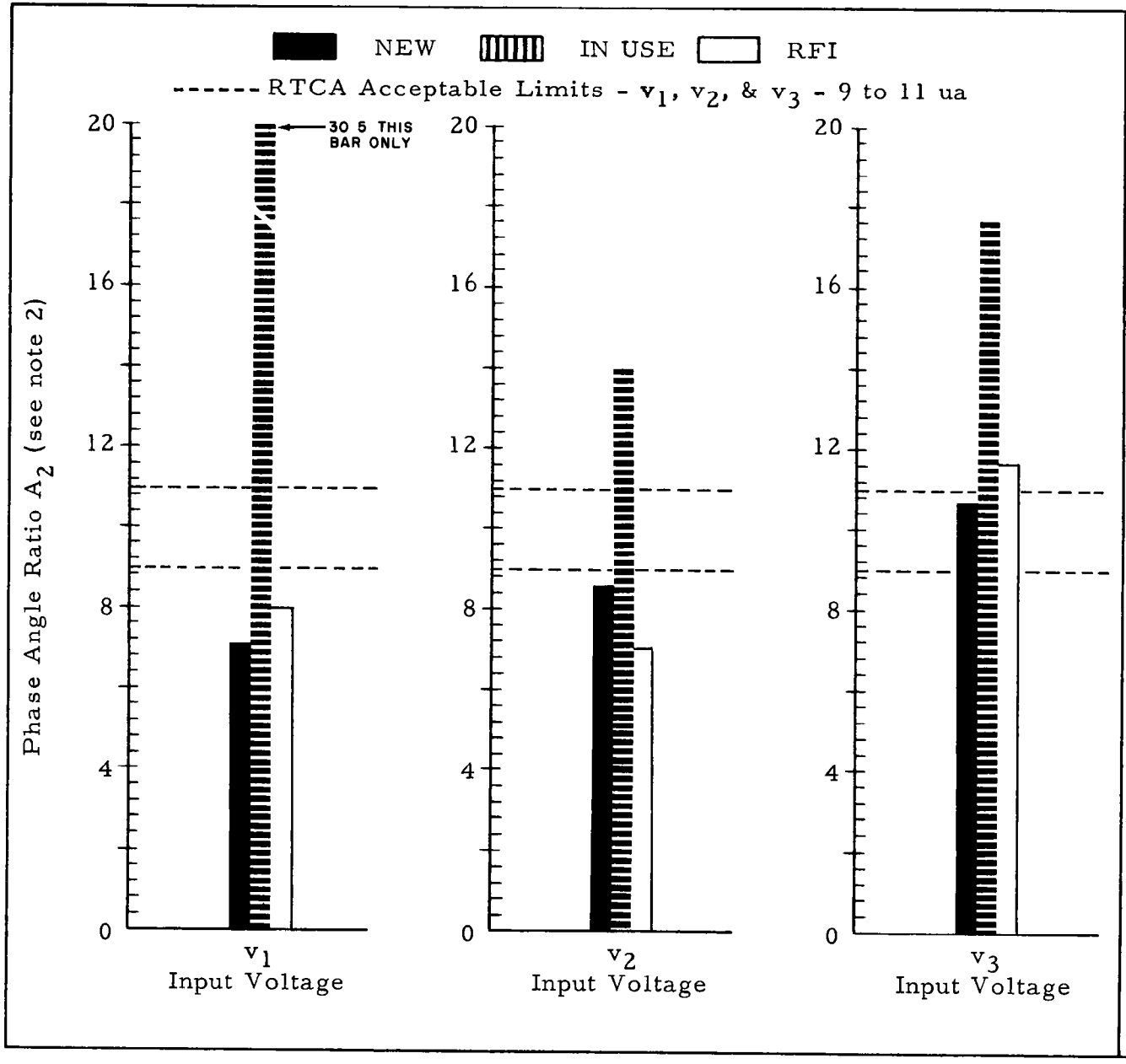
Test	New	In Use	RFI
v_1	0.20	11.40	1.7
v_2	0.41	0.95	5.7
v_3	2.75	5.90	3.0

Notes:

1. Each bar represents the arithmetic mean for 3 units except v_2 "RFI." This bar represents the arithmetic mean for 2 units because one "RFI" unit performed erratically at this input.
2. A_1 is the ratio of the angle which gives .5 standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 4.5 to 5.5 ua.

(I) DEFLECTION LINEARITY - VOR RECEIVER - VO-3

Figure C-2(c)



DEFLECTION LINEARITY
(II)

VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND

v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Standard Deflection - 90 ua
Standard Deviation

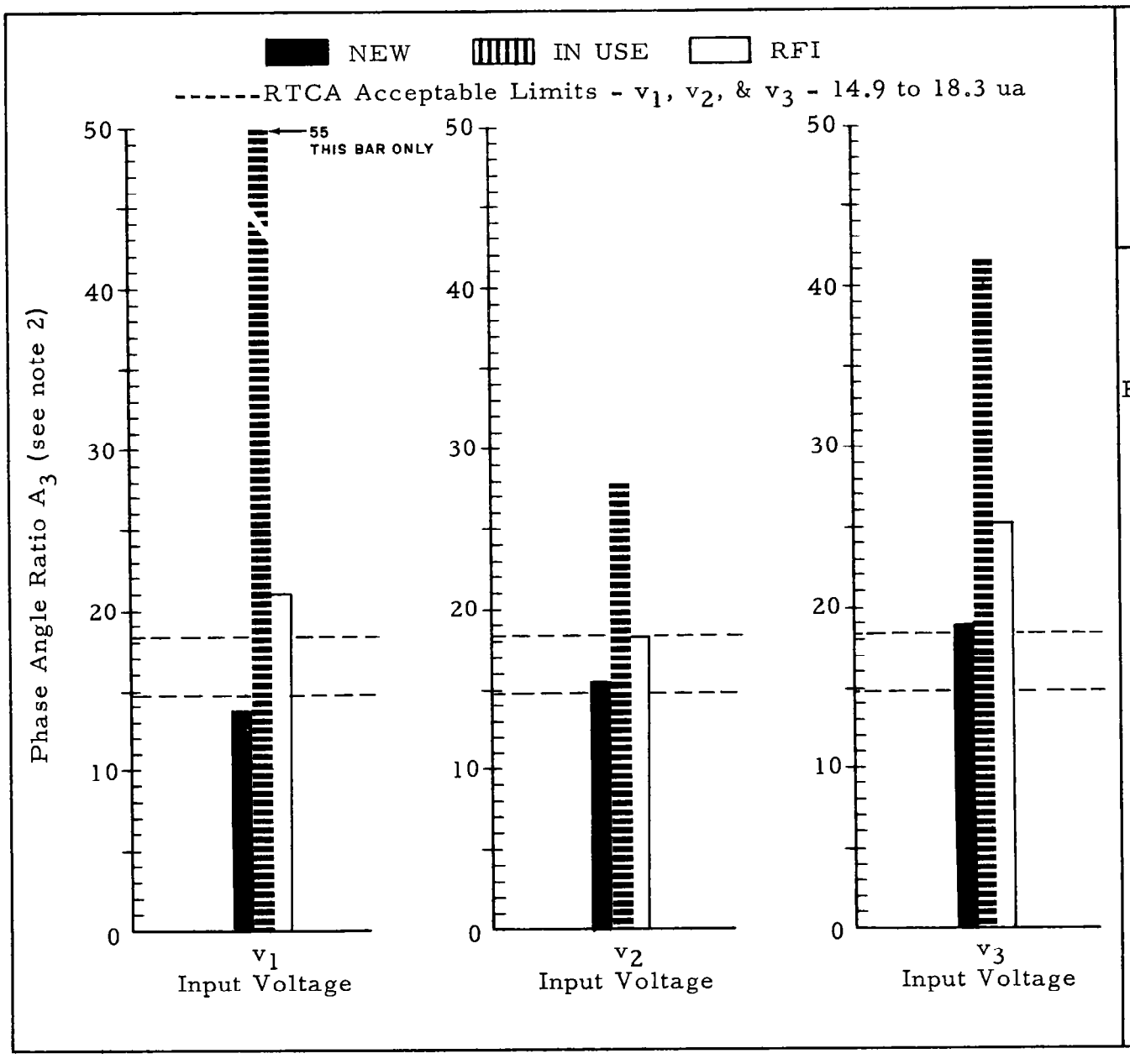
Test	New	In Use	RFI
v_1	0.49	39.6	4.38
v_2	0.99	6.3	0.36
v_3	6.90	16.7	5.90

Notes:

1. Each bar represents the arithmetic mean for 3 units except v_2 "RFI". This bar represents the arithmetic mean for 2 units because one "RFI" unit performed erratically at this input.
2. A_2 is the ratio of the angle which gives standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA accpetable limits: v_1, v_2, & v_3 - 9 to 11 ua.

(II) DEFLECTION LINEARITY - VOR RECEIVER - VO-3

Figure C-2(c)



DEFLECTION LINEARITY
(III)
VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Full Scale Deflection - 150 ua

Standard Deviation

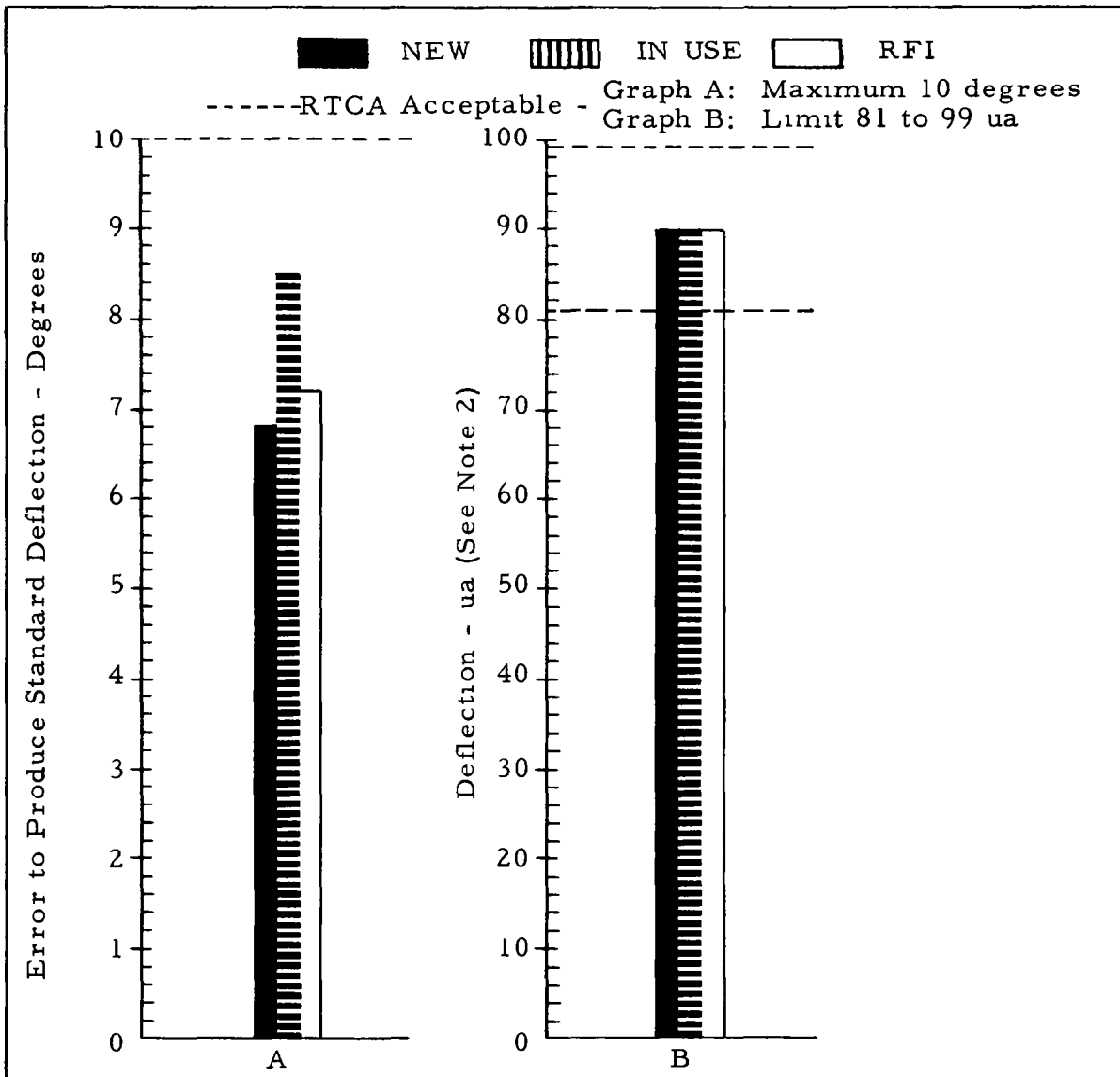
Test	New	In Use	RFI
v_1	0.411	75.1	10.90
v_2	1.800	12.9	2.26
v_3	12.600	25.0	14.10

Notes:

1. Each bar represents the arithmetic mean for 3 units except v_2 "RFI." This bar represents the arithmetic mean for 2 units because one "RFI" unit performed erratically at this input.
2. A_3 is the ratio of the angle which gives full scale deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 14.9 to 18.3 ua.

(III) DEFLECTION LINEARITY - VOR RECEIVER - VO-3

Figure C-2(c)



DEFLECTION SENSITIVITY
VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.11

Standard Deviation

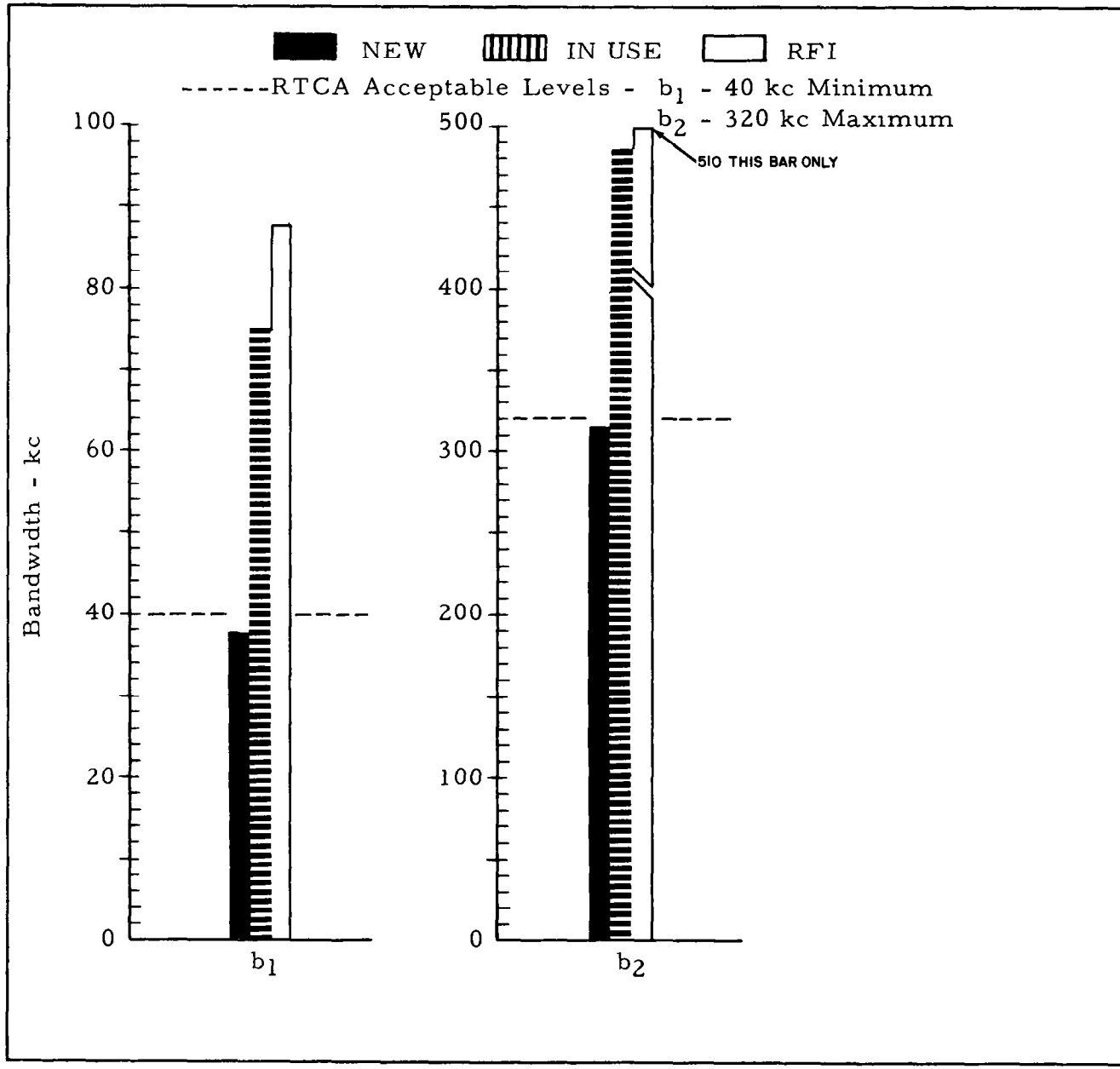
Test	New	In Use	RFI
A	0.48	1.46	2.53
B	10.60	1.73	5.67

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Deflection on one side of center with input that produced standard deflection on the other side of center - ua.
3. Graph A: RTCA maximum acceptable level to produce standard deflection - 10 degrees.
4. Graph B: RTCA acceptable level for deflection on one side of center with input that produced standard deflection on the other side of center:

   Upper Level - 99 ua
   Lower Level - 81 ua

DEFLECTION SENSITIVITY - VOR RECEIVER - VO-3



SELECTIVITY

VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.5(b)

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 114.9 mc

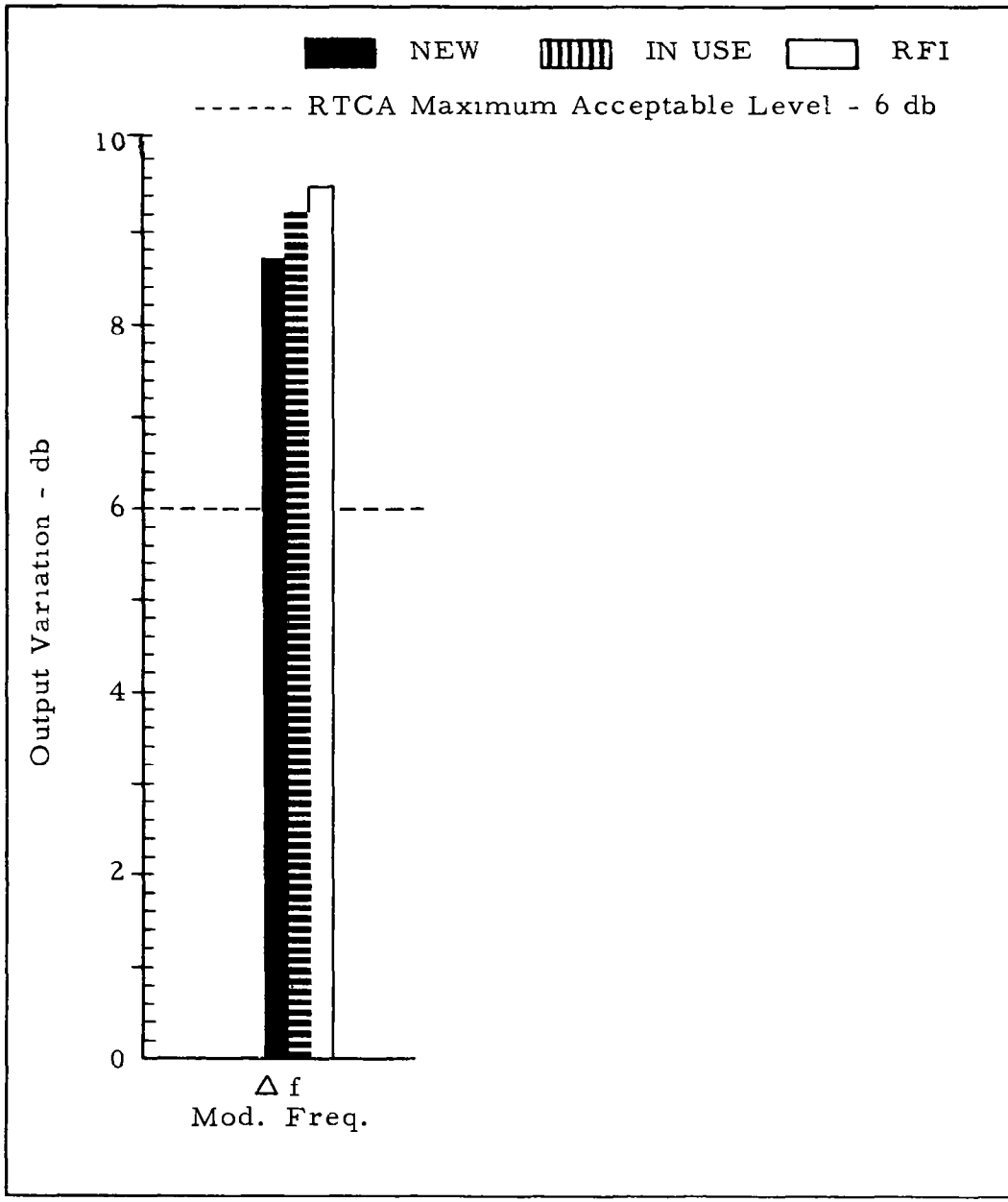
Standard Deviation

Test	New	In Use	RFI
b_1	7.03	30.2	14.6
b_2	136.00	57.4	22.6

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable levels:
b_1 - 40 kc minimum
b_2 - 320 kc maximum
3. This receiver is continuously tunable.

SELECTIVITY - VOR RECEIVER - VO-3

Figure C-2(c)



AUDIO FREQ. RESPONSE

VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.12

LEGEND

Δf - 350 - 2500 cps

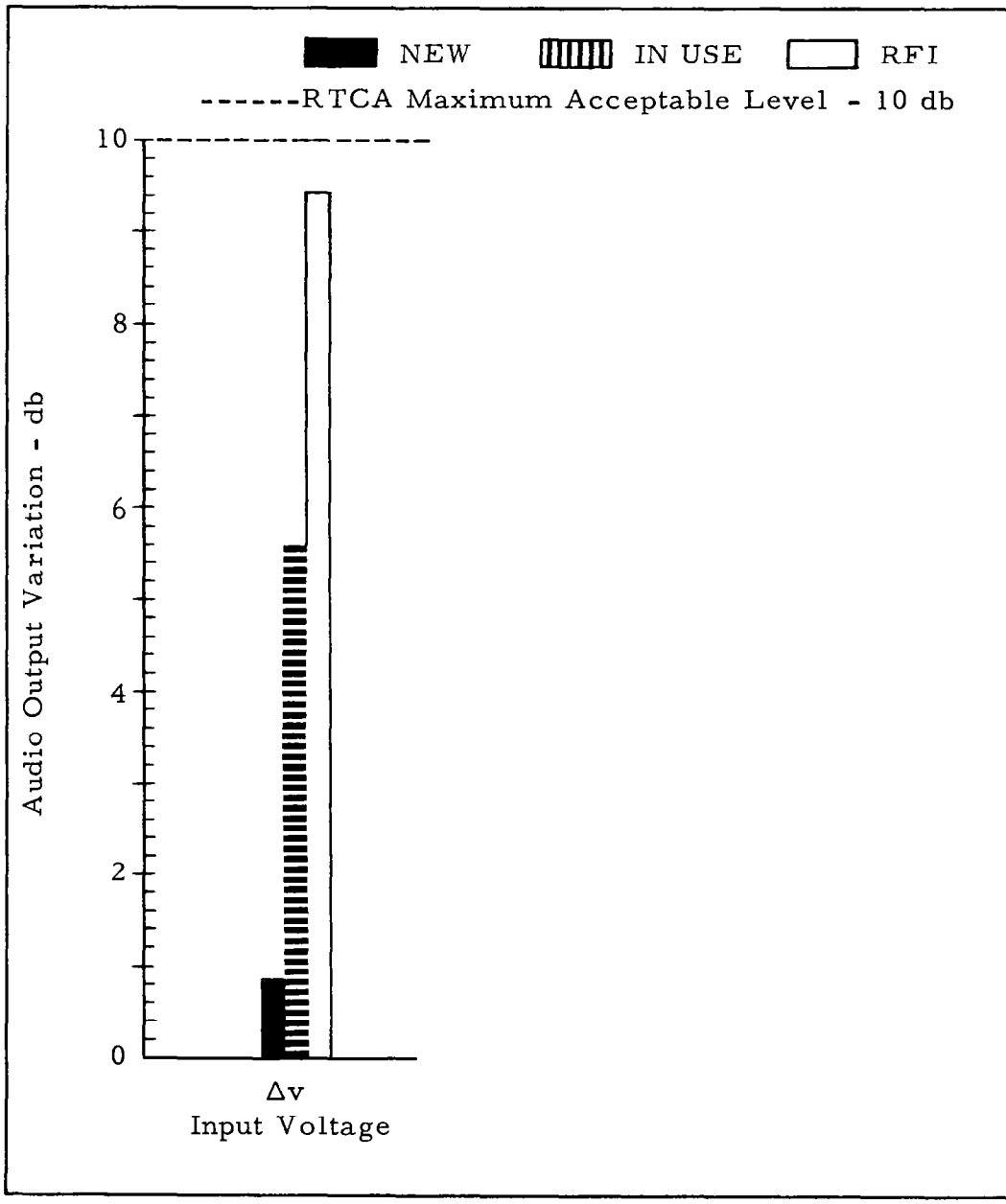
Standard Deviation

New	In Use	RFI
3.35	2.61	4.26

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA Maximum acceptable level - 6 db

Figure C-2(c)

AUDIO FREQUENCY RESPONSE - VOR RECEIVER - VO-3



AVC CHARACTERISTIC

VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.14

LEGEND

Δv - 10 - 10,000 uv

Standard Deviation

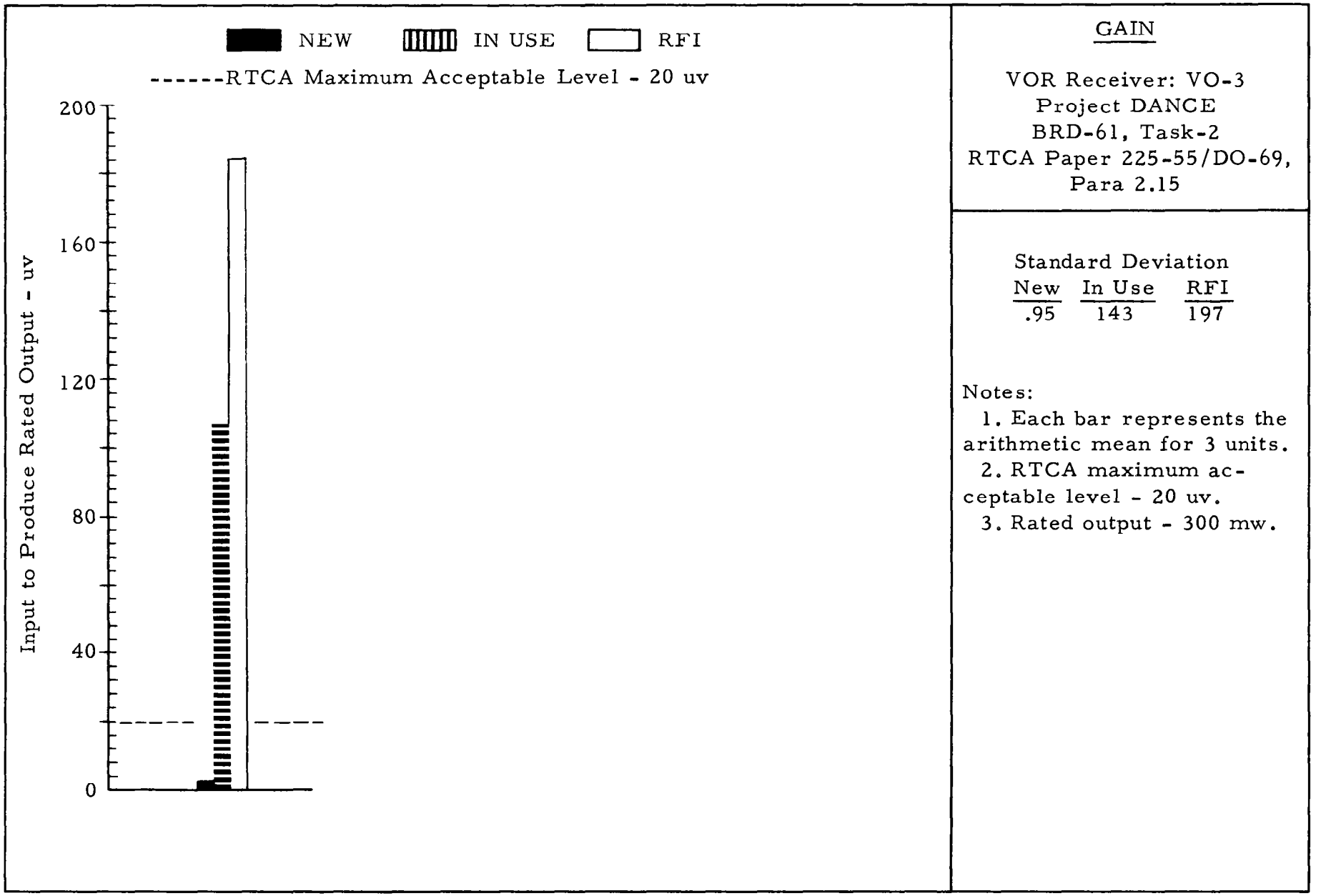
New	In Use	RFI
.19	5.56	1.27

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 10 db.

Figure C-2(c)

AVC CHARACTERISTIC - VOR RECEIVER - VO-3



GAIN

VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.15

Standard Deviation

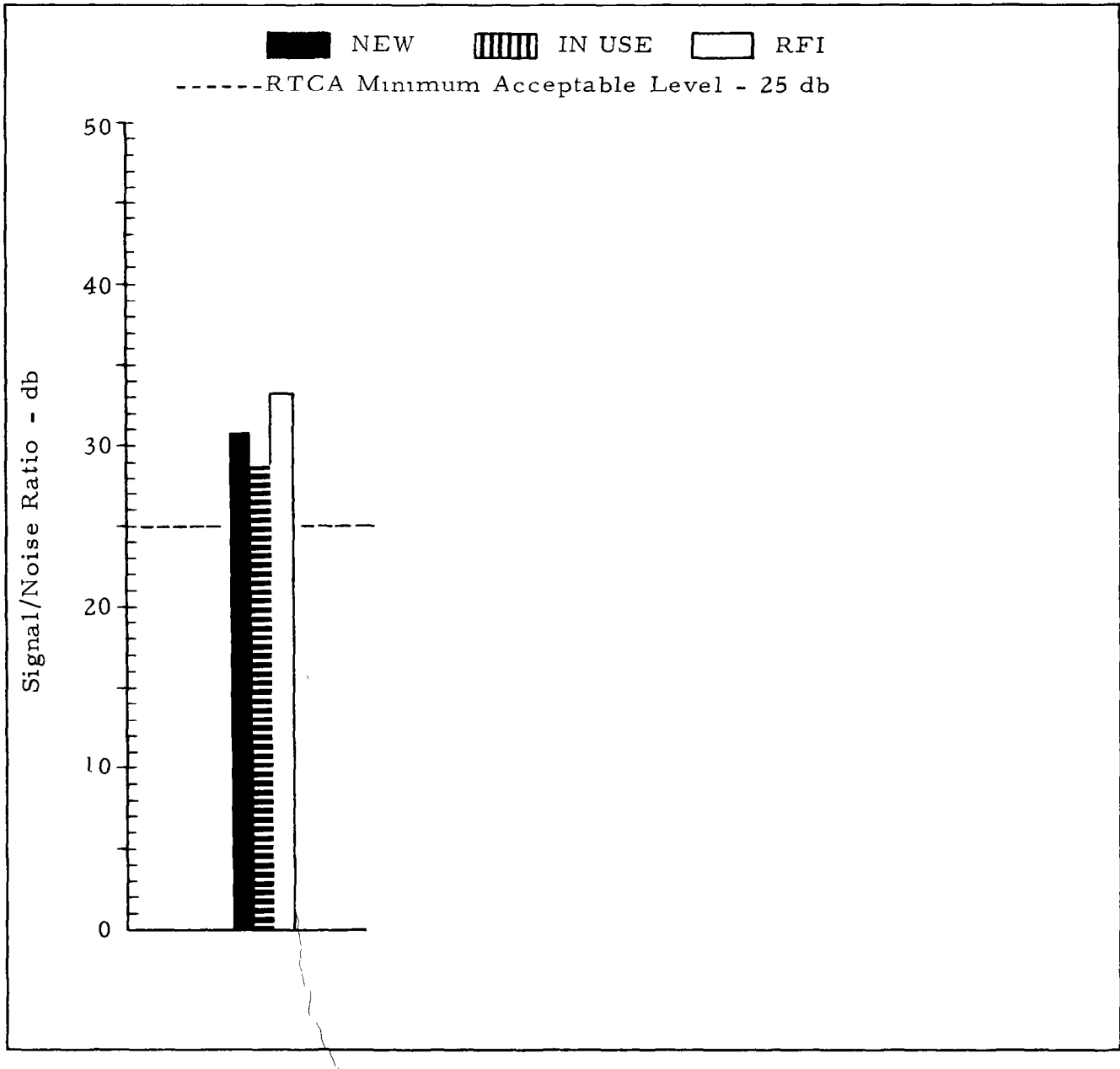
New	In Use	RFI
.95	143	197

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 20 uv.
3. Rated output - 300 mw.

Figure C-2(c)

GAIN - VOR RECEIVER - VO-3



AUDIO OUTPUT
NOISE LEVEL
VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.16

Standard Deviation

New	In Use	RFI
4.68	3.32	2.82

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 25 db.

AUDIO OUTPUT NOISE LEVEL - VOR RECEIVER - VO-3

Figure C-2(c)

INTERFERENCE TESTS

VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.6	.19 to 1500	108.0	Acceptable level excluding the band 107.8 to 118.2 mc: ≥60 db.	Actual Level: >60 db except at 124.6 mc. All other frequencies within performance standards.	Partially
Cross Modulation & Inter Modulation RTCA Para: 2.7	108 to 118	114.9	Acceptable level excluding the band within F_c±200 kc: Bearing Error: ≤1 Deg.	Actual Level: 5.5 degrees at slightly under 114.7 mc. All other frequencies within performance standards.	Partially
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25	108.0	Acceptable Emission: ≤200 microvolts.	Actual Emission on +13 v line: ≤200 microvolts.	Yes
Antenna Conducted Interference RTCA Para: 2.9(b)	.09 to 1500	108.0	Acceptable Emission: ≤400 micro-microwatts.	Actual Emission: <400 micro-microwatts except at 116.5, 349, 469, and 585 mc.	Partially

INTERFERENCE TESTS - VOR RECEIVER - VO-3

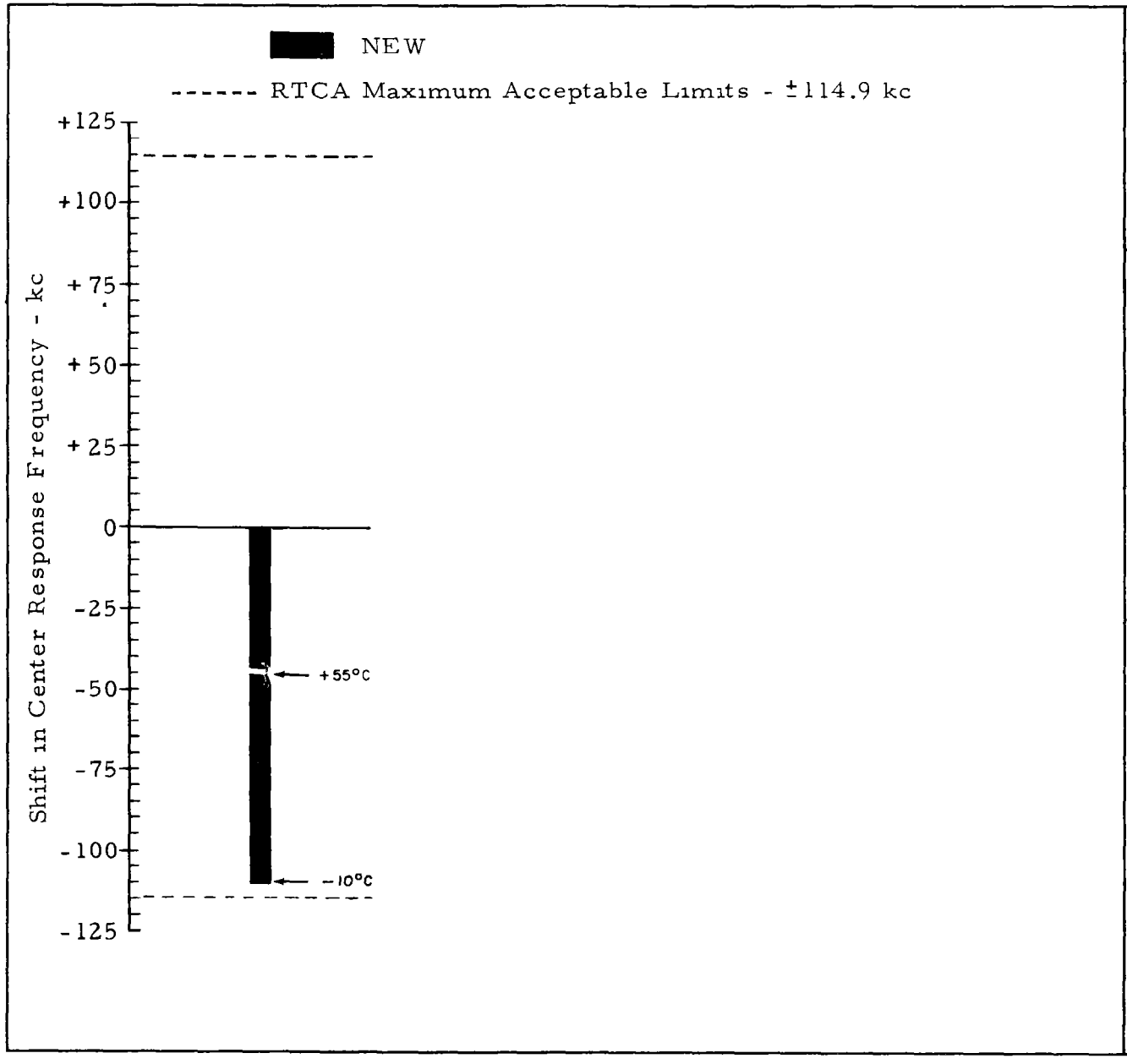
(continued on Page C-151)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.17	112 to 118	Varied over VOR band	Acceptable Operation: Deviation indicator shall not depart from its center position.	Actual Operation: No departure of deviation indicator from centered position except at 112.0 mc for receiver under test. Error was 0.7 degrees.	Partially

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relationship to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	114.9	When the receiver is tuned anywhere within the band from 108, to 126 mc, the receiver will probable be susceptible to the following range of frequencies:	The following lists the relationship between a radar type signal and the receiver oscillator frequency which will produce a spurious output which will be near the intermediate frequency or the image frequency of the receiver. (Indicated by (x) in table below). For the given radar type signal, the receiver can be tuned throughout the tuning range of 108 to 126 mc and still produce a spurious output near the intermediate frequency or the image frequency of the rcvr.

Radar Type Signal (mc)	Radar Type Signal (Harmonic)	Receiver Oscillator (Harmonic)	Intermediate Freq.	Image Freq.
124.6 to 143.0	1 st	1 st		X
170.0 to 197.5	3 rd	2 nd	X	
178.0 to 206.0	2 nd	2 nd		X
223.0 to 261.5	1 st	2 nd	X	
228.0 to 260.5	1 st	3 rd		X
241.0 to 277.5	1 st	2 nd	X	
340.0 to 395.0	1 st	3 rd	X	
690.0 to 798.5	1 st	6 th	X	

INTERFERENCE TESTS - VOR RECEIVER - VO-3



TEMPERATURE VARIATION TEST
VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 3.1(b)

Notes:
1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits - ±114.9 kc.
3. This unit was designed to operate below 15,000 feet.
4. This unit is continuously tunable.

TEMPERATURE VARIATION TEST - VOR RECEIVER - VO-3

Figure C-2(c)

Note: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

AUDIO OUTPUT
REGULATION & DISTORTION
VOR Receiver: VO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.13

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	215	240	250	115	145	150	220	255	270
	500	380	405	425	250	275	285	520	590	610
	1000	600	670	680	380	400	420	720	790	800
	1800	410	420	495	240	265	280	490	540	580
	2500	150	200	230	110	148	168	250	300	320
New Unit No. 2	350	230	300	310	200	220	220	300	350	380
	500	405	500	500	300	330	340	550	600	630
	1000	610	640	650	410	420	460	700	720	770
	1800	400	440	480	280	290	300	410	490	500
	2500	210	280	300	170	200	210	220	300	330
New Unit No. 3	350	270	290	300	190	200	210	325	360	375
	500	600	690	700	340	360	370	700	750	800
	1000	730	750	780	490	500	520	880	920	960
	1800	430	490	500	275	310	330	500	560	590
	2500	200	260	288	148	185	200	230	300	330
In Use Unit No. 1	350	45	83	122	29	68	83	47	92	140
	500	100	193	270	63	130	170	125	240	330
	1000	170	300	375	106	195	255	200	360	450
	1800	47	86	120	29	58	80	50	91	130
	2500	10	20	30	6	15	19	14	26	37

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-3

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 2	350	900	950	970	795	830	850	895	935	960
	500	1010	1030	1050	860	890	900	995	1020	1020
	1000	1000	1000	1000	860	880	905	910	950	970
	1800	720	800	800	640	700	700	660	720	730
	2500	500	620	640	450	520	600	460	560	590
In Use Unit No. 3	350	610	795	980	270	680	800	375	870	1005
	500	850	1010	1180	430	845	935	670	1120	1220
	1000	900	1000	1150	450	850	940	650	1010	1130
	1800	242	700	850	240	620	760	280	680	820
	2500	120	348	600	130	380	540	135	360	560
RFI Unit No. 1	350	45	90	123	26	62	85	44	108	153
	500	11	257	335	90	170	222	158	320	425
	1000	180	300	380	103	200	260	172	325	425
	1800	37	70	88	23	50	64	35	70	95
	2500	8	16	20	5	10	15	8	15	21
RFI Unit No. 2	350	100	150	165	68	102	112	102	170	180
	500	170	205	225	116	150	162	190	250	255
	1000	215	270	279	168	190	191	270	300	305
	1800	140	195	208	100	143	154	170	220	232
	2500	50	92	135	40	70	91	60	116	150
RFI Unit No. 3	350	105	168	185	70	115	135	127	188	208
	500	208	275	295	150	190	208	245	335	355
	1000	165	300	385	110	210	270	185	350	465
	1800	30	58	83	21	39	59	34	65	95
	2500	8	15	22	6	10	16	9	12	25

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-3

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	48.0	54.0	57.0	31.0	39.0	42.0	37.0	43.0	43.0
	500	33.0	38.0	39.0	33.0	37.0	39.5	36.0	40.0	42.0
	1000	15.0	16.5	17.0	15.5	16.5	17.0	17.5	18.0	18.0
	1800	9.0	11.0	12.0	9.5	11.0	11.5	10.5	12.5	13.5
	2500	11.0	10.5	12.0	11.0	10.5	12.0	16.5	15.5	16.0
New Unit No. 2	350	38.0	45.0	47.0	36.0	43.0	45.0	40.0	46.0	50.0
	500	34.0	38.0	39.0	32.0	35.0	39.0	37.0	40.0	42.0
	1000	17.5	19.9	20.5	18.0	20.0	20.0	19.5	20.0	21.0
	1800	9.5	12.0	13.0	8.8	11.5	12.8	9.8	12.0	13.5
	2500	13.8	13.8	14.0	13.0	13.0	14.0	13.0	13.5	15.0
New Unit No. 3	350	27.0	40.0	42.0	34.0	41.0	42.0	40.0	43.0	44.5
	500	34.0	38.5	39.0	34.0	38.0	38.0	38.5	40.0	41.0
	1000	18.0	19.0	18.8	17.0	18.4	18.8	19.0	19.2	19.0
	1800	9.5	11.0	12.5	8.3	11.0	12.0	10.0	11.8	12.9
	2500	18.0	18.0	18.0	18.0	17.0	18.0	19.0	18.0	18.5
In Use Unit No. 1	350	12.0	15.0	19.0	12.0	14.0	18.0	13.0	16.0	19.5
	500	11.0	15.0	18.0	10.0	13.2	16.6	12.0	16.2	19.8
	1000	5.8	6.0	6.8	5.0	5.6	6.0	5.5	6.0	8.0
	1800	7.0	4.8	5.0	7.0	5.0	6.2	6.0	5.0	5.0
	2500	13.0	11.0	11.8	13.0	9.8	10.0	13.0	11.0	12.0
In Use Unit No. 2	350	26.5	32.0	35.0	23.0	29.0	31.0	32.0	38.0	40.0
	500	23.5	26.0	27.5	21.5	25.2	26.5	24.5	27.0	27.5
	1000	16.0	18.0	18.5	15.0	18.0	19.0	17.0	18.0	18.8
	1800	10.5	13.0	14.5	9.0	12.0	13.8	12.2	14.5	16.0
	2500	15.5	15.5	17.0	15.5	15.0	16.0	17.5	16.0	17.8

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-3

Figure C-2(c)

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 3	350	9.0	13.0	21.0	6.5	13.0	21.0	8.5	20.0	27.0
	500	10.8	12.8	18.0	4.6	13.0	18.0	8.2	19.0	22.5
	1000	8.4	10.5	13.5	4.7	10.0	13.2	7.9	13.0	15.0
	1800	5.2	8.2	11.2	5.0	8.2	11.0	5.7	9.7	13.2
	2500	6.4	8.4	11.5	6.6	8.4	11.0	6.5	9.0	12.5
RFI Unit No. 1	350	10.0	13.0	17.0	10.0	12.5	16.0	11.0	14.0	18.0
	500	11.0	15.0	18.0	10.0	14.5	17.0	11.0	17.0	19.5
	1000	8.0	9.0	9.0	7.5	8.5	8.0	14.0	15.0	14.5
	1800	3.4	3.6	4.2	3.2	3.4	3.8	3.6	3.8	4.4
	2500	10.0	9.0	9.5	9.0	8.5	9.5	10.0	9.0	10.0
RFI Unit No. 2	350	27.0	30.8	34.2	38.0	43.0	49.0	42.0	54.0	61.0
	500	19.5	22.6	26.0	26.0	32.0	39.0	33.0	42.0	47.0
	1000	10.0	15.0	16.5	11.0	15.0	17.0	13.2	16.8	17.0
	1800	6.0	9.0	11.0	6.5	9.0	11.0	6.0	9.2	11.3
	2500	8.0	10.5	11.6	8.5	11.0	12.0	8.5	10.5	11.0
RFI Unit No. 3	350	19.0	27.0	9.5	17.0	21.0	22.0	20.0	25.0	28.0
	500	18.0	22.0	26.0	16.0	22.0	24.0	18.0	24.0	27.0
	1000	7.0	9.0	11.5	8.0	9.0	11.0	8.0	9.0	12.0
	1800	9.5	9.0	8.0	5.0	4.0	4.5	5.5	4.8	5.0
	2500	12.0	11.0	13.0	12.0	11.5	13.0	13.0	12.0	13.0

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-3

SECTION C

AIRBORNE NAVIGATION EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

3. Laboratory and Field Test Data

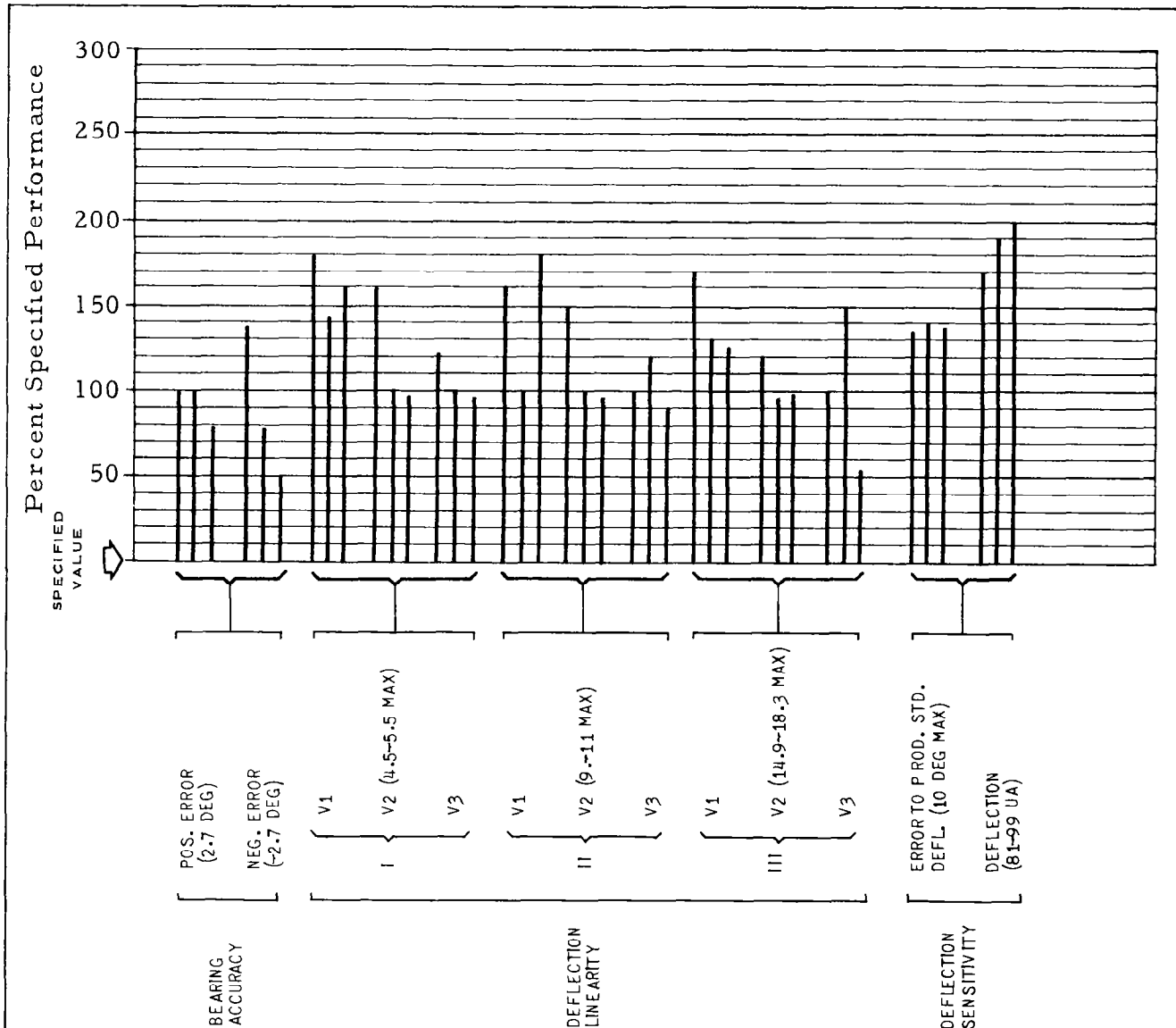
d. VO-4, VOR Receiver

General:

Frequency Range:	108.0 - 135.0 mc
Means of Frequency Control:	Master Oscillator
Total Number of Channels:	Continuously Tunable
Number of Channels Available at Operator's Position:	Continuously Tunable
Means of Frequency Selection:	Continuously Tunable

Technical:

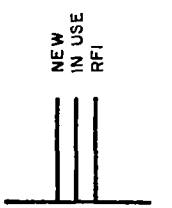
	Page(s)
Percent Specified Performance	C-156
Weighted Performance	C-157
Bearing Accuracy	C-158
Deflection Linearity	C-159-161
Deflection Sensitivity	C-162
Selectivity	C-163
Alarm Signal	C-164-165
Audio Frequency Response	C-166
AVC Characteristic	C-167
Gain	C-168
Noise Level	C-169
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Audio Output Regulation & Distortion	C-173



PERCENT
SPECIFIED PERFORMANCE
VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

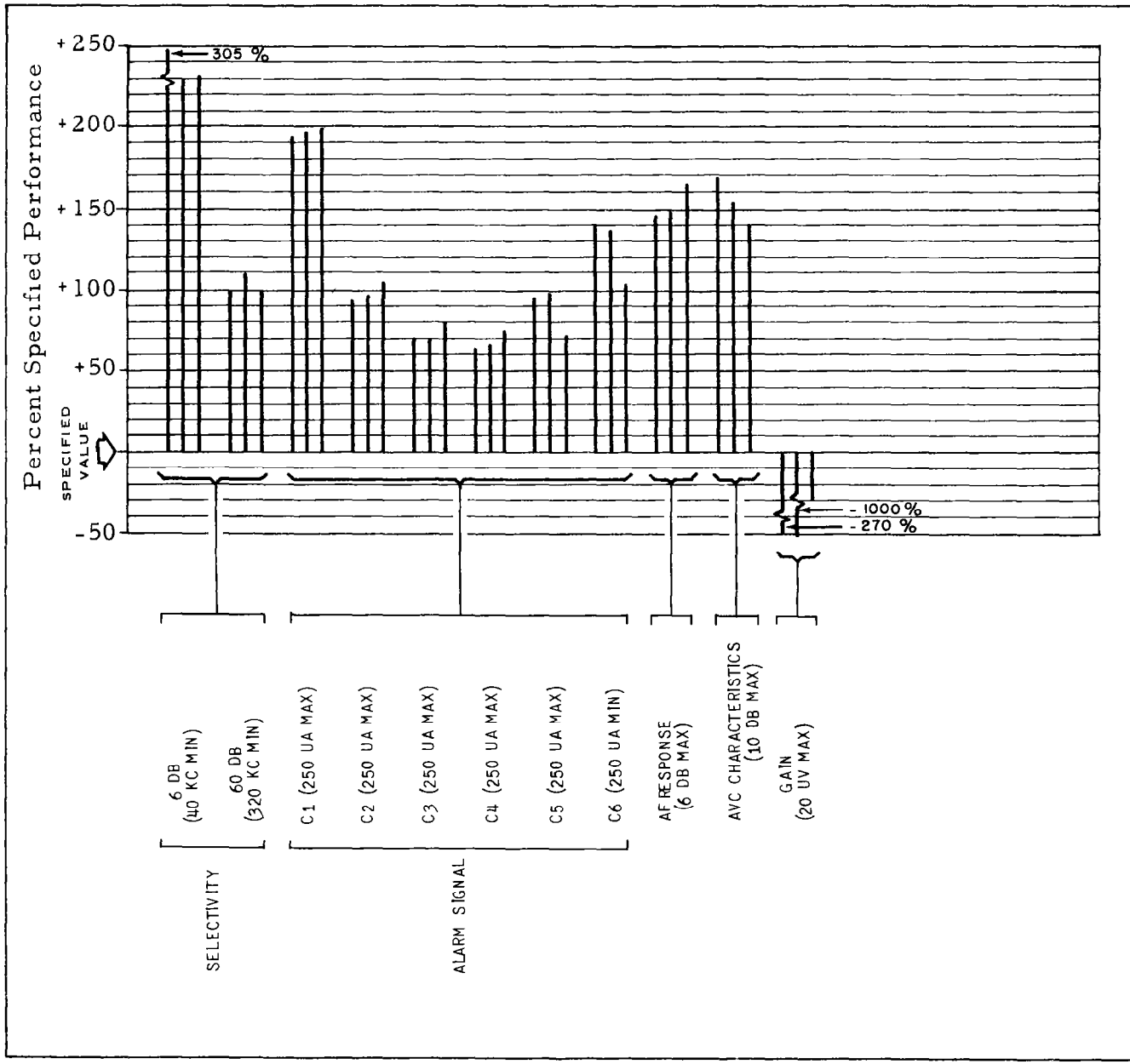


3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-4

(continued on Page C-156a)

Figure C-2(b)



PERCENT
SPECIFIED PERFORMANCE

VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Notes:

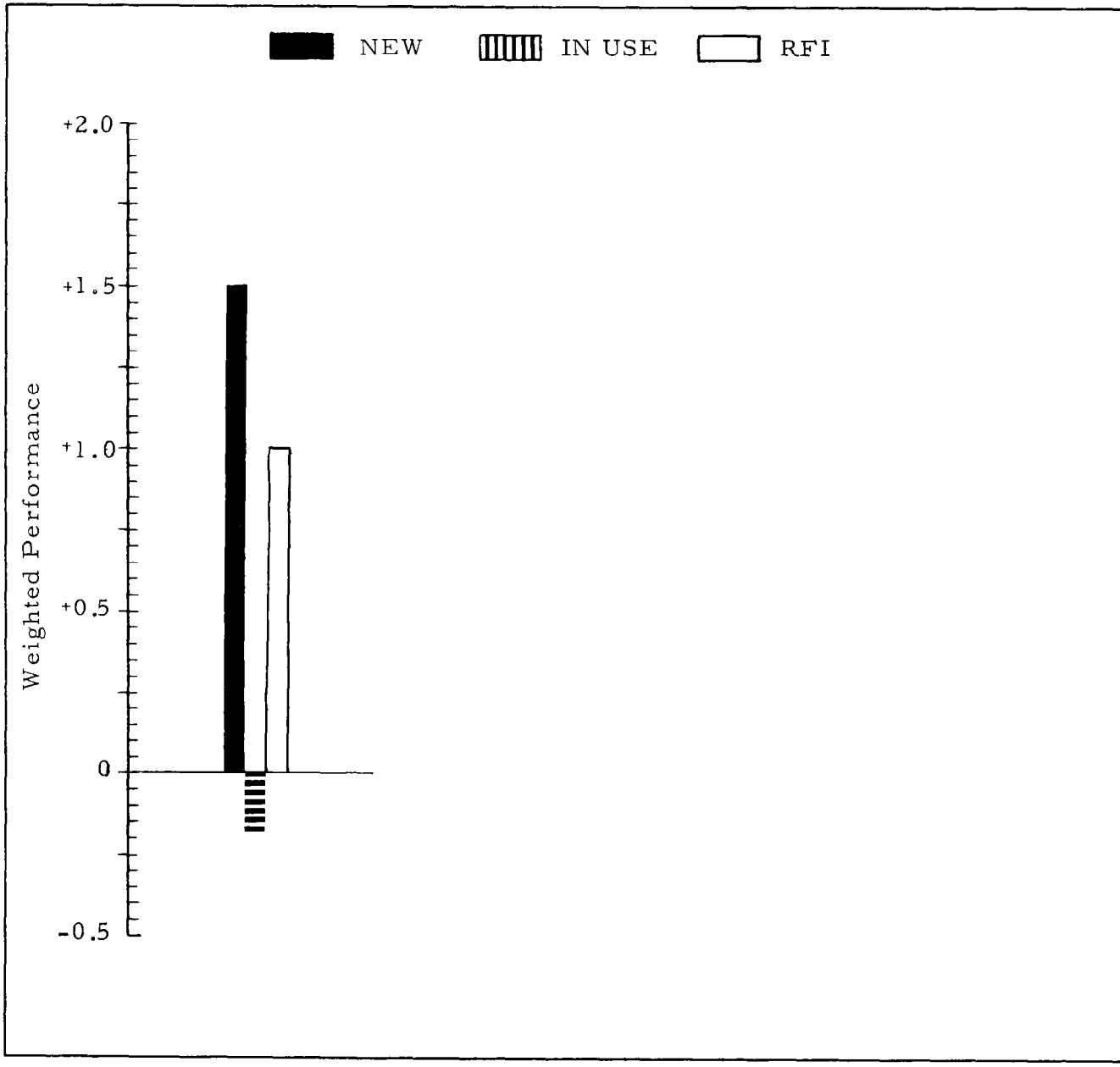
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

Figure C-2(b)

PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-4



WEIGHTED PERFORMANCE

VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2

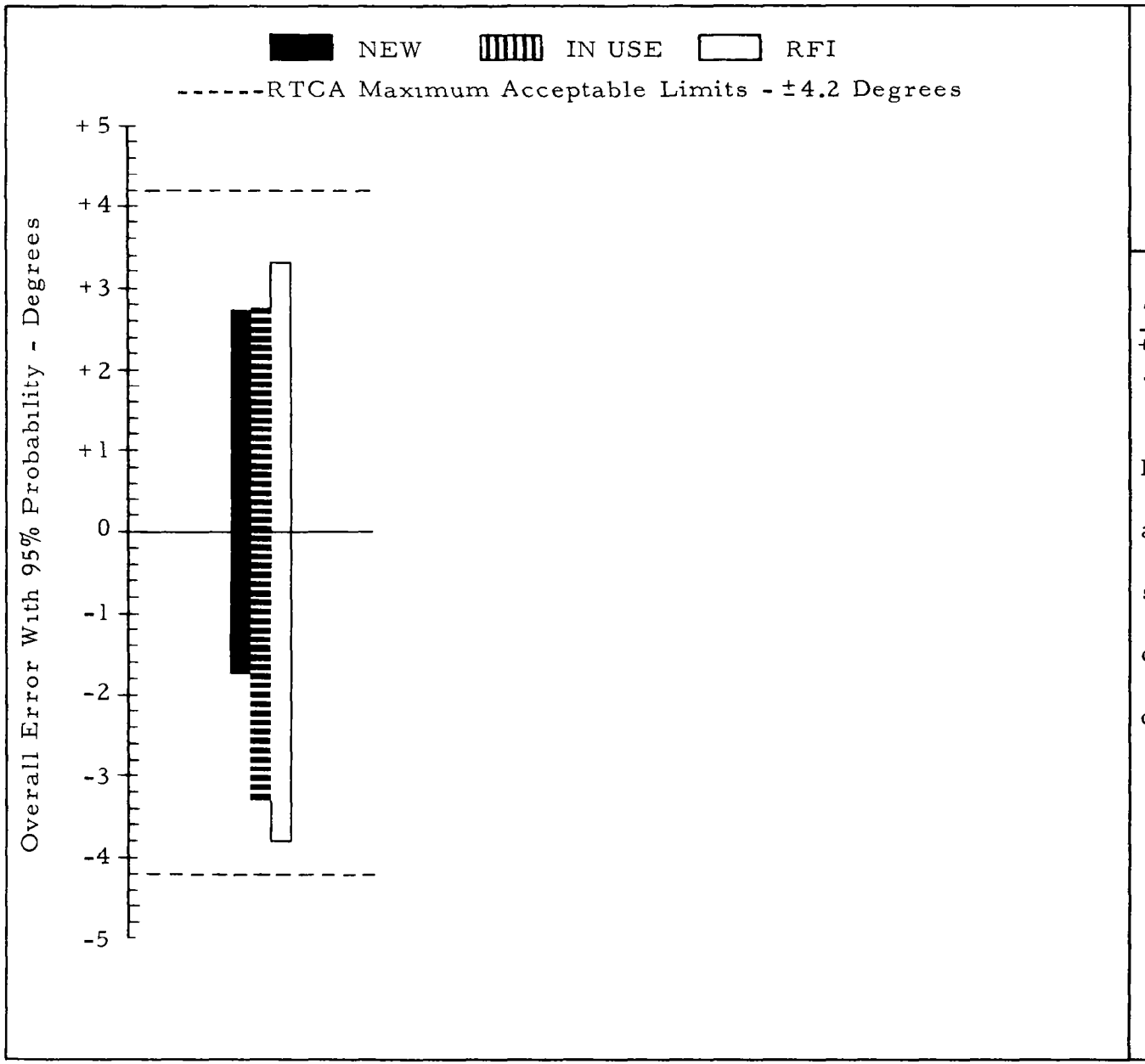
WEIGHTING FACTORS

Bearing Accuracy:	
± error	1/8 ea.
Deflection Linearity:	
(I) v_1, v_2, v_3	1/60 ea
(II) v_1, v_2, v_3	1/60 ea.
(III) v_1, v_2, v_3	1/60 ea.
Deflection Sensitivity:	
(I), (II)	3/40 ea.
Selectivity:	
b_1, b_2	3/40 ea.
Alarm Signal:	
c_1, c_2, c_3, c_4, c_5, c_6	1/60 ea.
Audio Frequency Response:	1/20
AVC Characteristics:	1/20
Gain:	1/10

Note:
1. Graph based on arithmetic mean for above characteristics.

Figure C-2(d)

WEIGHTED PERFORMANCE - VOR RECEIVER - VO-4



BEARING ACCURACY

VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.3

Standard Deviation

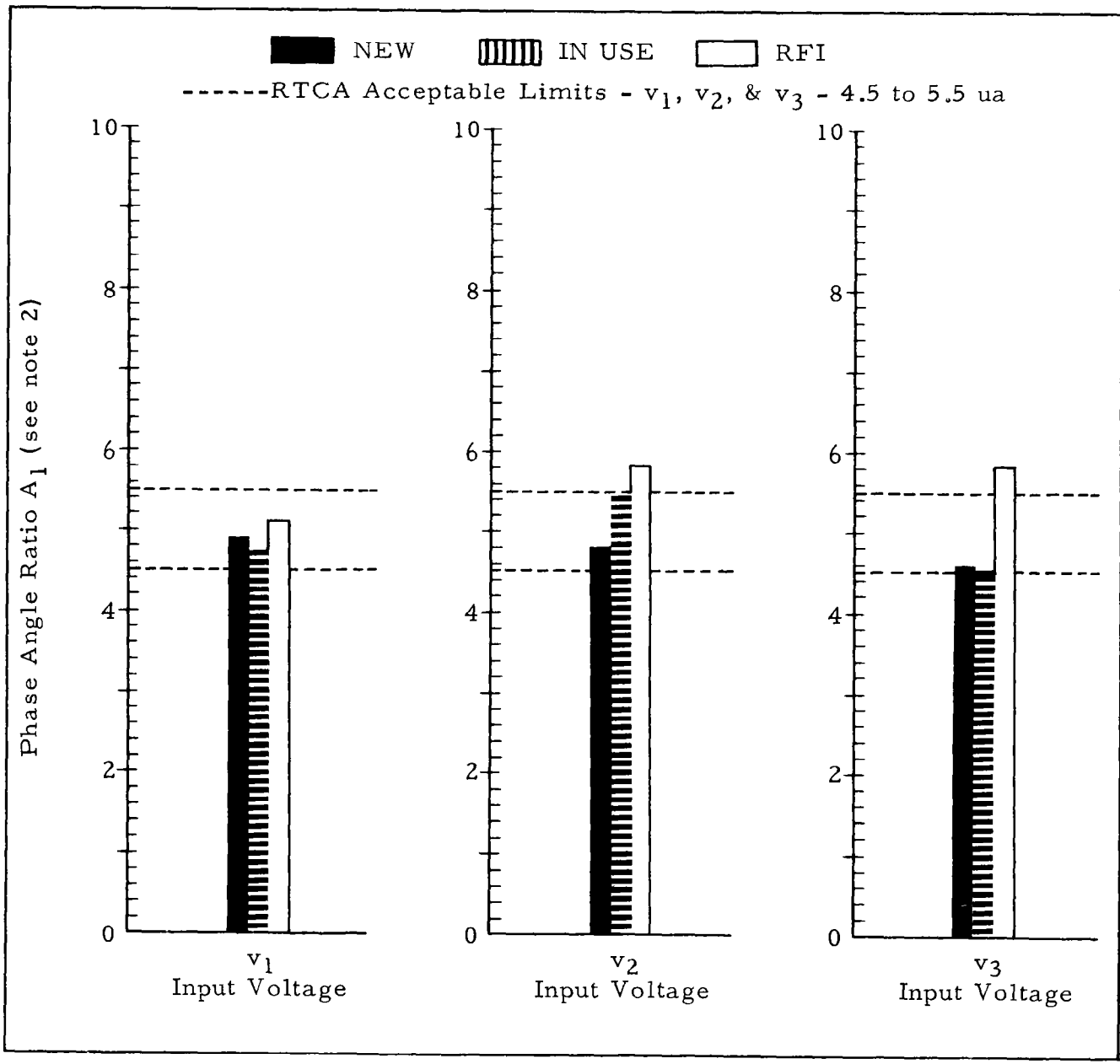
Test	New	In Use	RFI
+error	0.42	.85	.64
-error	2.20	.99	.48

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Each bar represents 95% statistical probability.
3. RTCA maximum acceptable limits - ±4.2 degrees.
4. This unit is designed to operate above 15,000 feet.

BEARING ACCURACY - VOR RECEIVER - VO-4

Figure C-2(d)



DEFLECTION LINEARITY
(I)
VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Half-Standard Deflection-45 ua
Standard Deviation

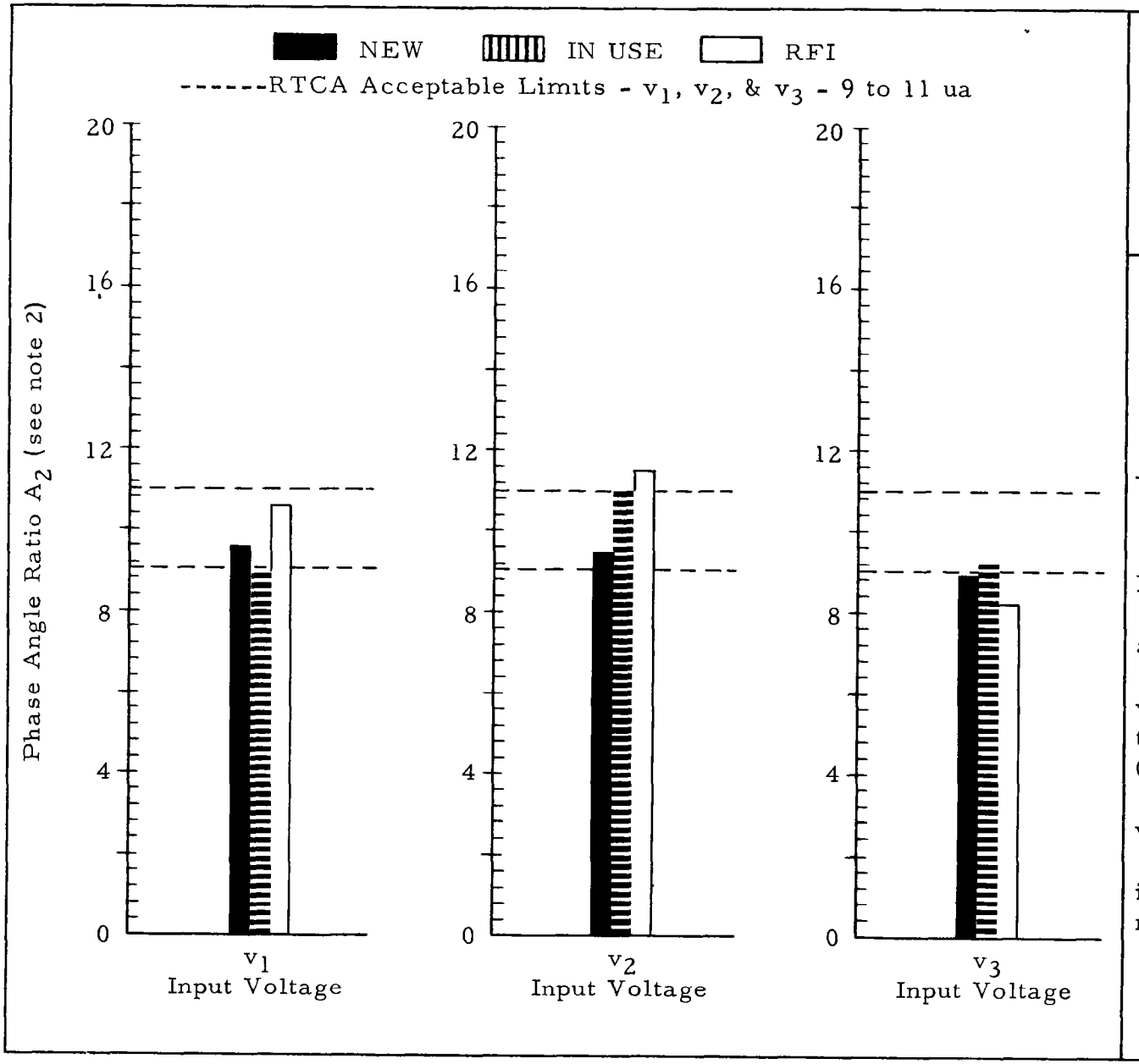
Test	New	In Use	RFI
v_1	0.28	0.60	0.3
v_2	0.17	0.40	1.7
v_3	0.10	0.28	0.8

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. A_1 is the ratio of the angle which gives .5 standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 4.5 to 5.5 ua.
4. No change in characteristic before and after adjustments of the "In Use" units.

Figure C-2(d)

(I) DEFLECTION LINEARITY - VOR RECEIVER - VO-4



DEFLECTION LINEARITY
(II)
VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Standard Deflection - 90 ua
Standard Deviation

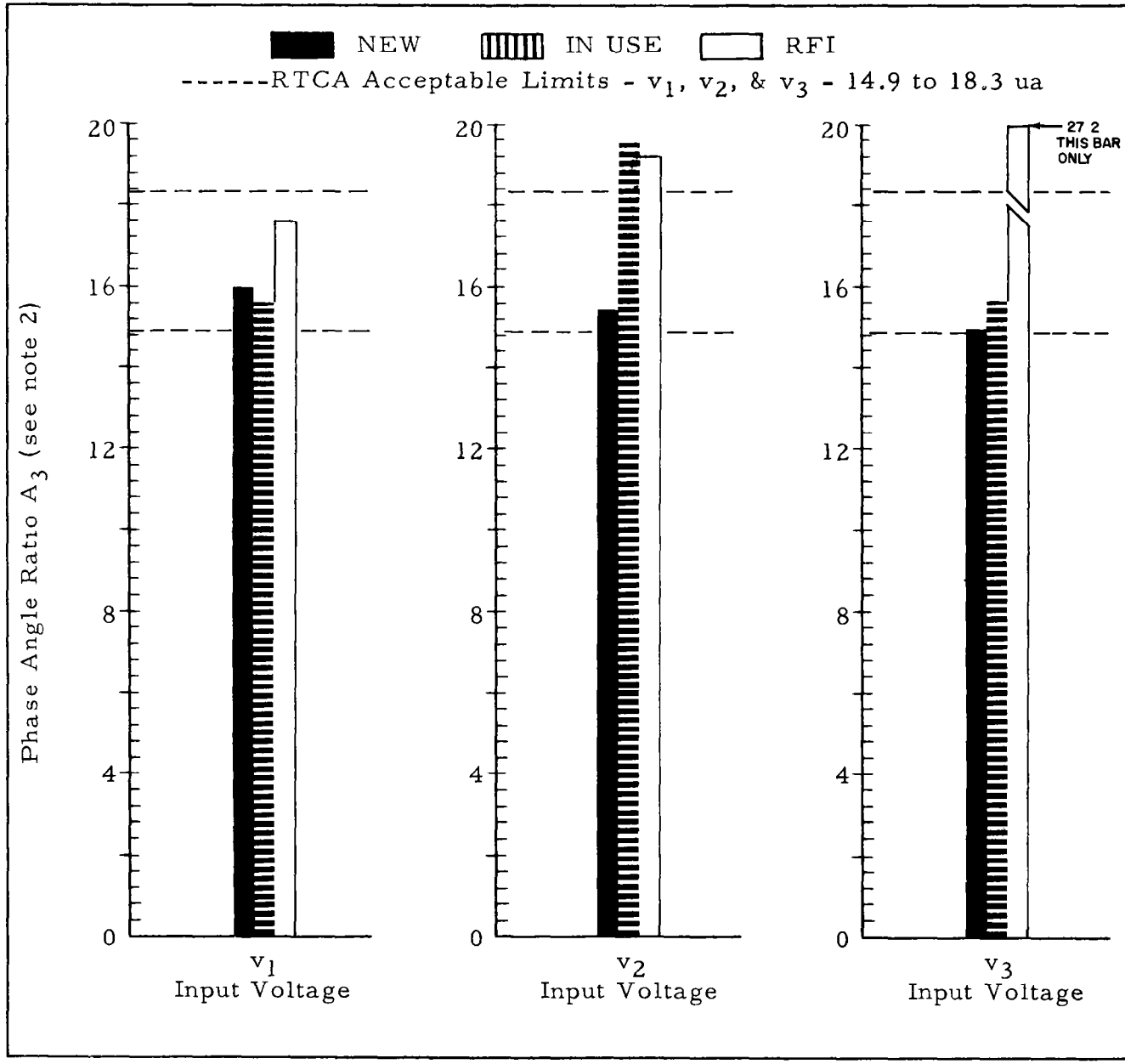
Test	New	In Use	RFI
v_1	0.45	1.10	0.18
v_2	0.26	0.25	3.50
v_3	0.26	0.14	6.20

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. A_2 is the ratio of the angle which gives standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 9 to 11 ua.
4. No change in characteristics before and after adjustments of the "In Use" units.

Figure C-2(d)

(II) DEFLECTION LINEARITY - VOR RECEIVER - VO-4



DEFLECTION LINEARITY

(III)

VOR Receiver: VO-4

Project DANCE

BRD-61, Task-2

RTCA Paper 225-55/DO-69, Para 2.4

LEGEND

v_1 - 10 uv

v_2 - 1000 uv

v_3 - 10,000 uv

Full Scale Deflection - 150 ua

Standard Deviation

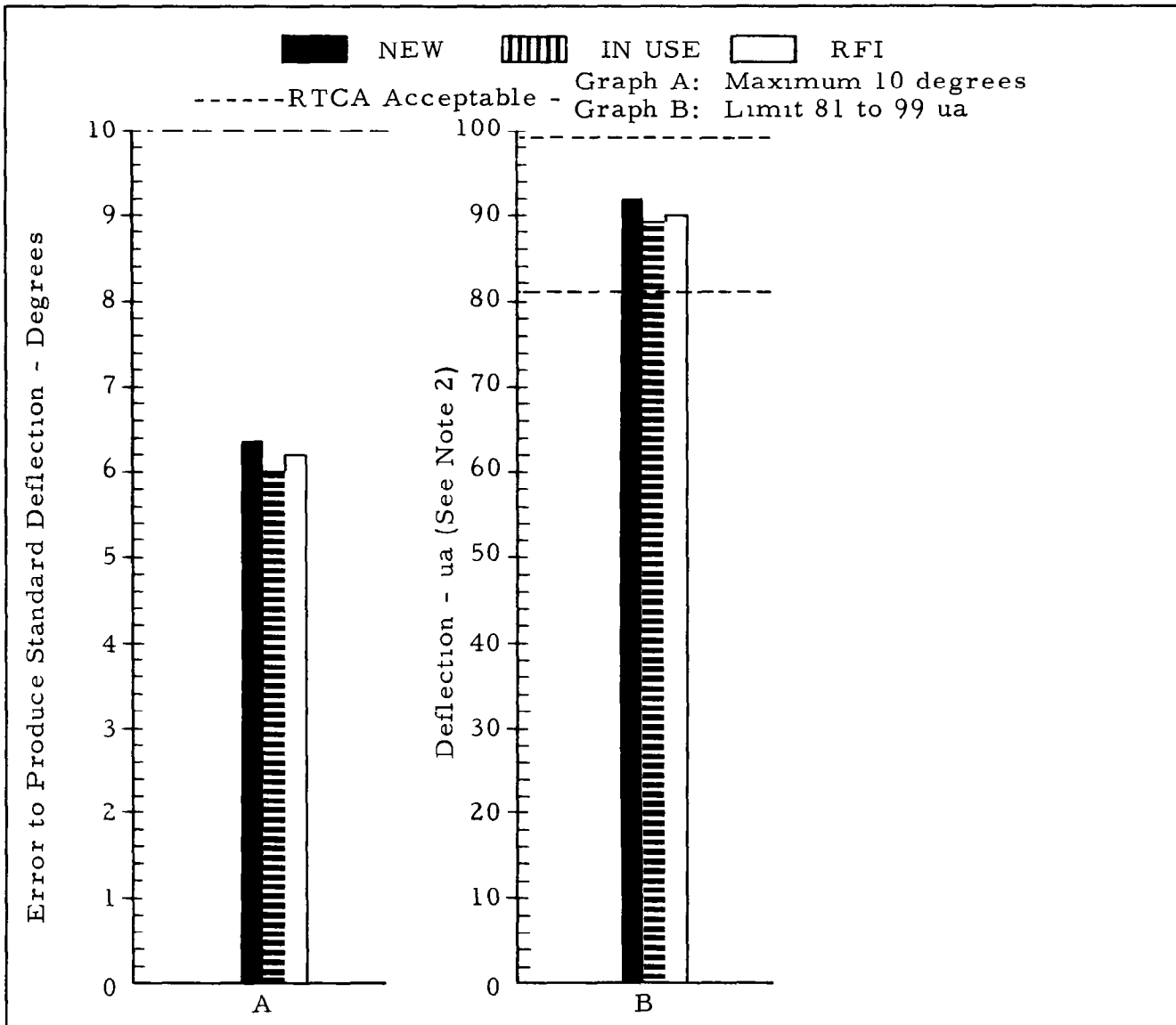
Test	New	In Use	RFI
v_1	1.00	1.80	0.52
v_2	1.30	1.45	5.60
v_3	0.25	0.64	11.60

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. A_3 is the ratio of the angle which gives full scale deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 14.9 to 18.3 ua.
4. No change in characteristics before and after adjustments of the "In Use" units.

Figure C-2(d)

(III) DEFLECTION LINEARITY - VOR RECEIVER - VO-4



DEFLECTION SENSITIVITY
VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.11

Standard Deviation

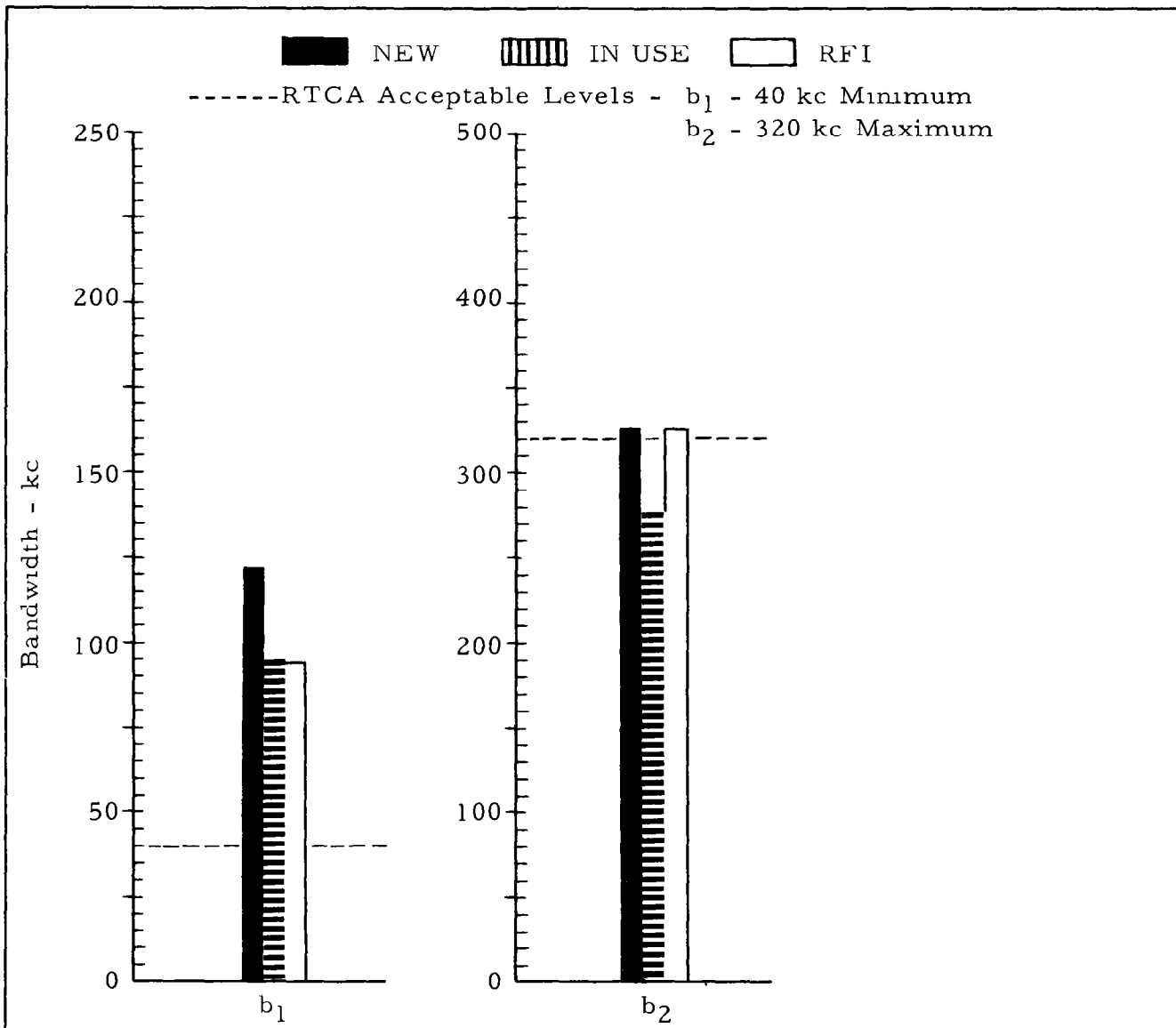
Test	New	In Use	RFI
A	.5	.74	.26
B	2.4	3.60	4.60

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Deflection on one side of center with input that produced standard deflection on the other side of center - ua.
3. The "In Use" bar represents the same value for before and after adjustment.
4. Graph A: RTCA maximum acceptable level to produce standard deflection - 10 degrees.
5. Graph B: RTCA acceptable level for deflection on one side of center with input that produced standard deviation on the other side of center:

   Upper Level - 99 ua
   Lower Level - 81 ua

DEFLECTION SENSITIVITY - VOR RECEIVER - VO-4



SELECTIVITY

VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.5(b)

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 114.9 mc

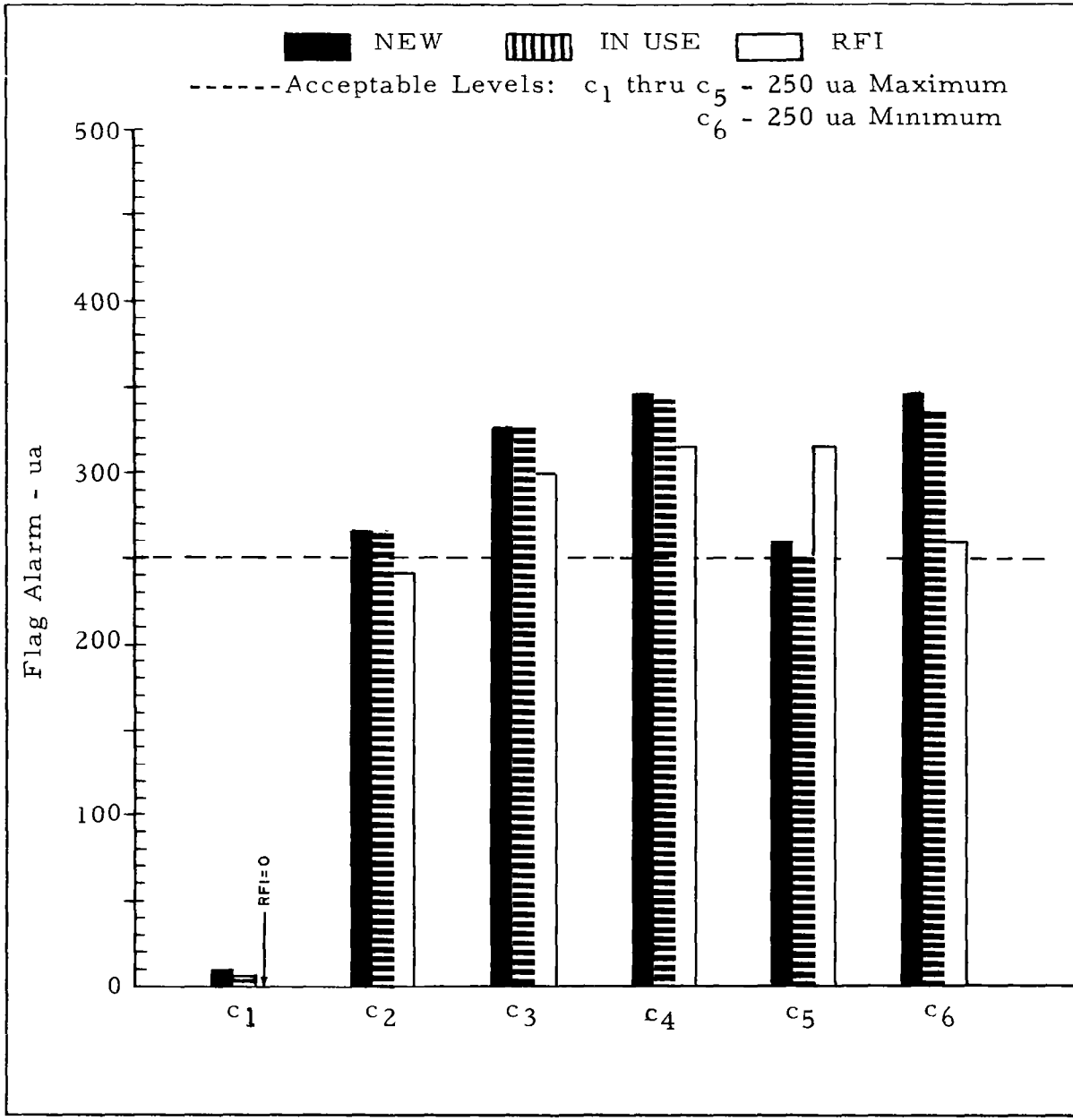
Standard Deviation

Test	New	In Use	RFI
b_1	1.54	15.9	32.8
b_2	32.60	139.0	72.6

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA Acceptable levels:
b_1 - 40 kc minimum
b_2 - 320 kc maximum
3. This receiver is continuously tunable.

SELECTIVITY - VOR RECEIVER - VO-4

Figure C-2(d)



ALARM SIGNAL
VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.8

LEGEND

c_1 - absence of R.F.
c_2 - absence of 9960 cps
c_3 - absence of 30 cps
c_4 - 15% mod. of 9960 & 30 cps
c_5 - VOR signal @ 50% deflection
c_6 - standard signal - 10 uv

Standard Deviation

Test	New	In Use	RFI
c_1	17.3	0	0
c_2	29.4	10.6	3.64
c_3	33.5	82.4	34.80
c_4	39.0	61.0	30.40
c_5	55.5	81.0	20.20
c_6	63.2	44.5	40.00

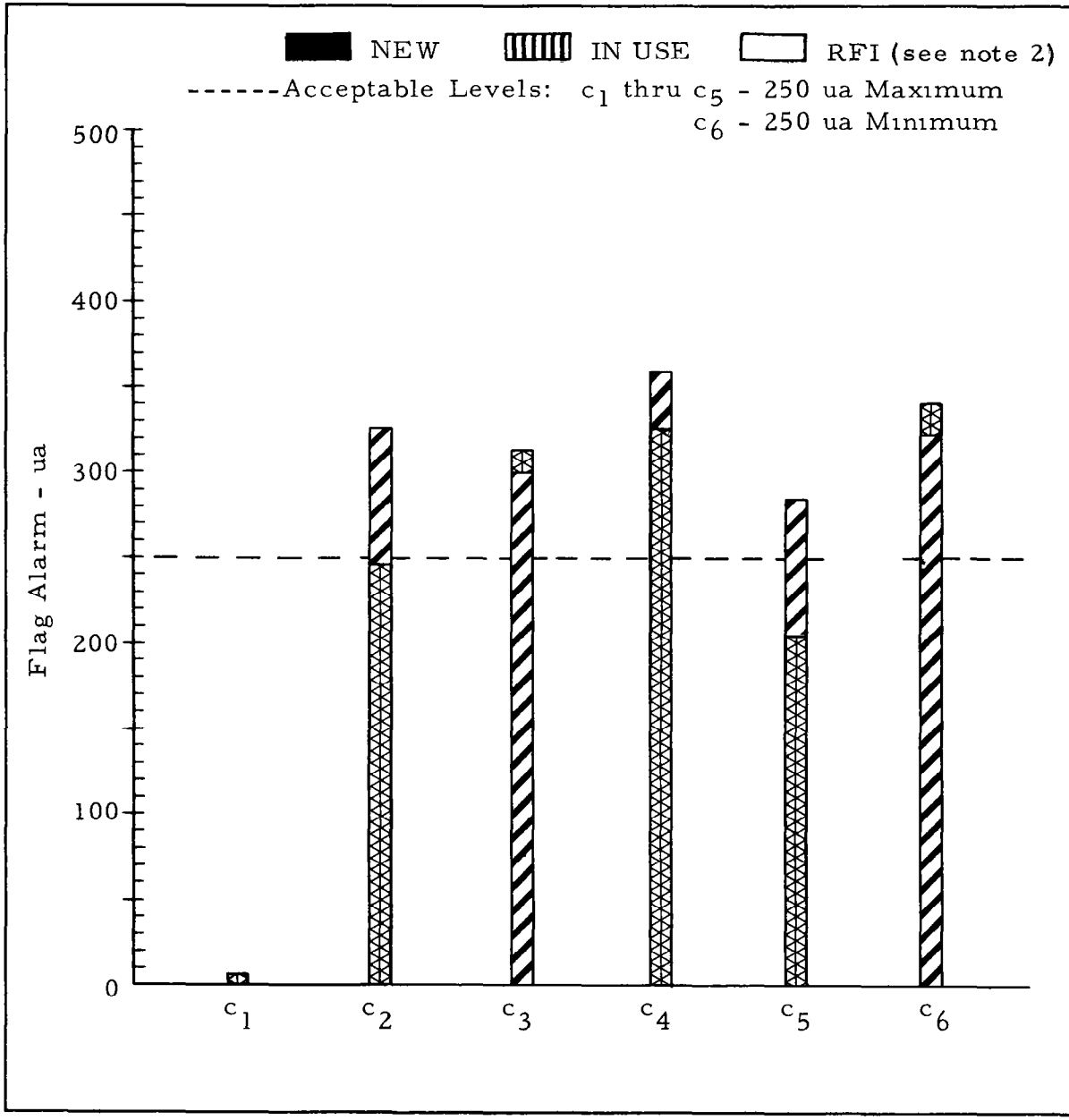
Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA paper as a guide.

ALARM SIGNAL - VOR RECEIVER - VO-4

(continued on Page C-165)

Figure C-2(d)



ALARM SIGNAL

VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.8

LEGEND

c_1 - absence of R. F.
c_2 - absence of 9960 cps
c_3 - absence of 30 cps
c_4 - 15% mod. of 9960 & 30 cps
c_5 - VOR signal @ 50% deflection
c_6 - standard signal - 10 uv

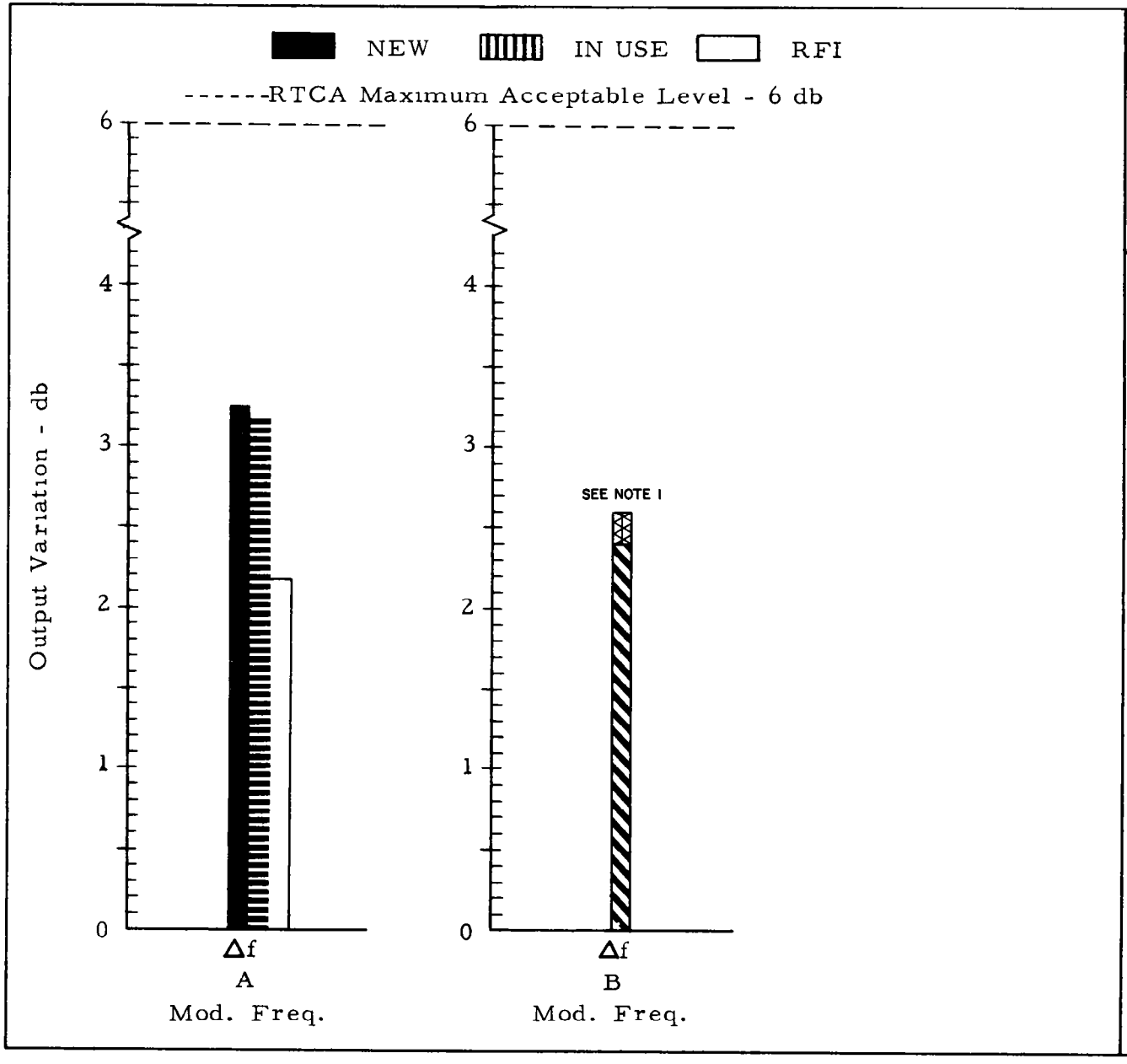
Standard Deviation

Test	In Use	
	Before	After
c_1	0	0
c_2	5.05	18.70
c_3	83.40	5.65
c_4	68.00	44.60
c_5	8.48	49.50
c_6	62.10	16.20

Notes:

1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. "In Use" units before adjust
   "In Use" units after adjust.
3. Acceptable level was determined by using RTCA paper as a guide.
4. Adjustments were made in accordance with manufacturer's recommended practices.

ALARM SIGNAL - VOR RECEIVER - VO-4



AUDIO FREQ. RESPONSE

VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.12

LEGEND

Δ f - 350 - 2500 cps

Standard Deviation

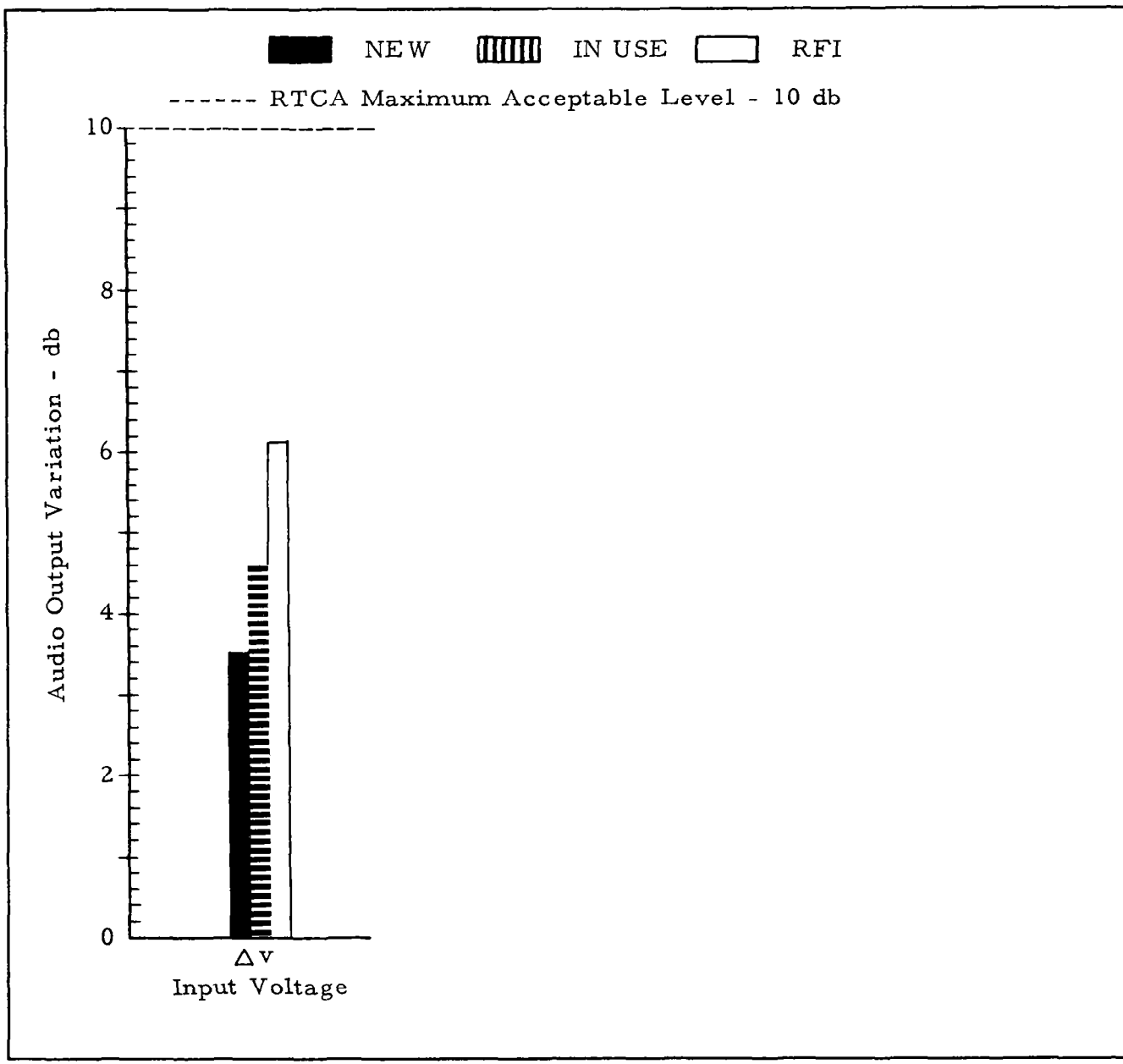
Test	New	In Use	RFI
A	.47	1.1	.57
B		0.5 0.0	

Notes:

1. Each bar represents the arithmetic mean for 3 units, except in B, which represents the arithmetic mean for 2 units as follows:
   - "In Use" units before adjustments.
   - "In Use" units after adjustments.
2. RTCA maximum acceptable level - 6 db.
3. Adjustments were made in accordance with manufacturer's recommended practices.

AUDIO FREQUENCY RESPONSE - VOR RECEIVER - VO-4

Figure C-2(d)



AVC CHARACTERISTIC
VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.14

LEGEND

Δv - 10 - 10,000 uv

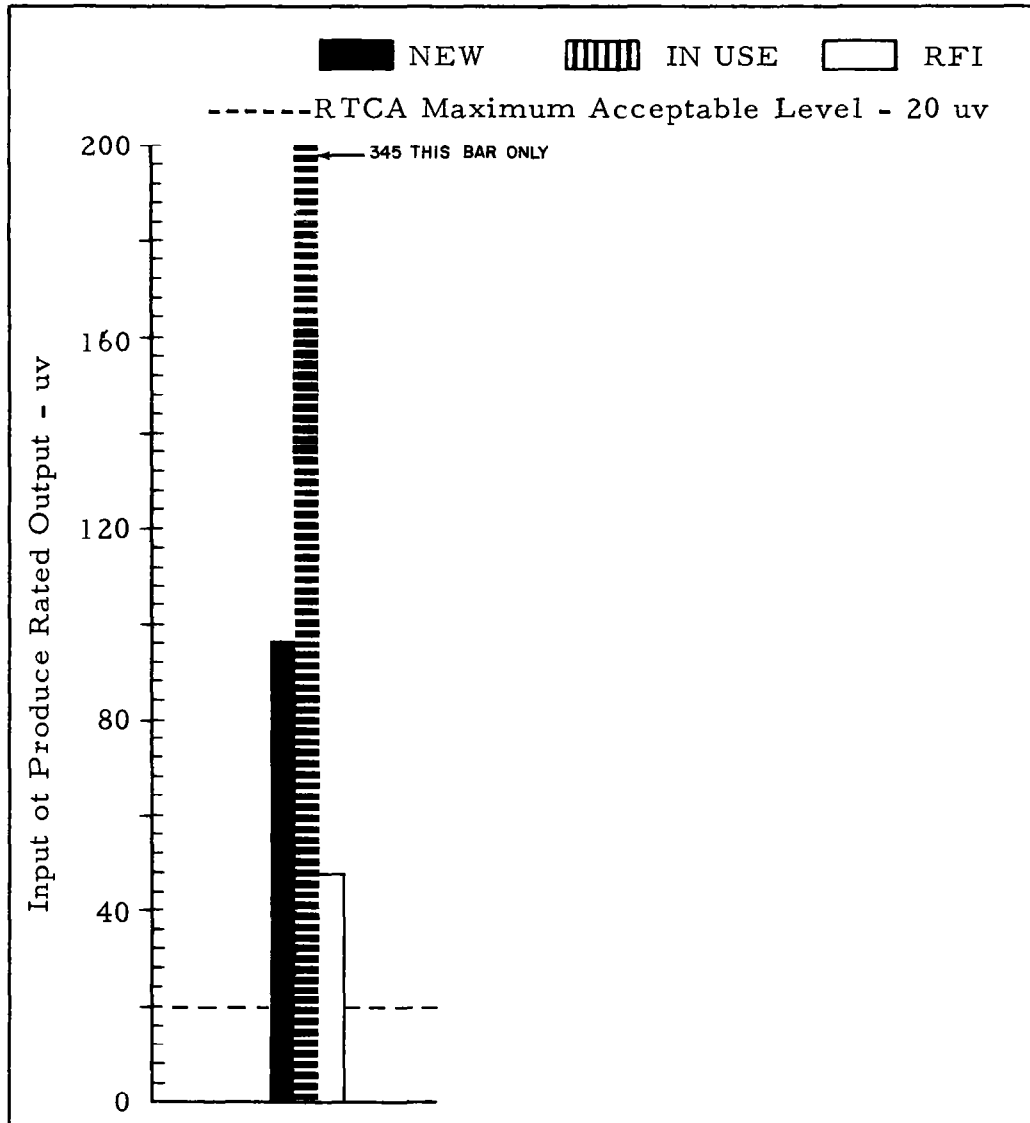
Standard Deviation

New	In Use	RFI
1.92	1.93	2.42

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 10 db.

AVC CHARACTERISTICS - VOR RECEIVER - VO-4

Figure C-2(d)



GAIN

VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.15

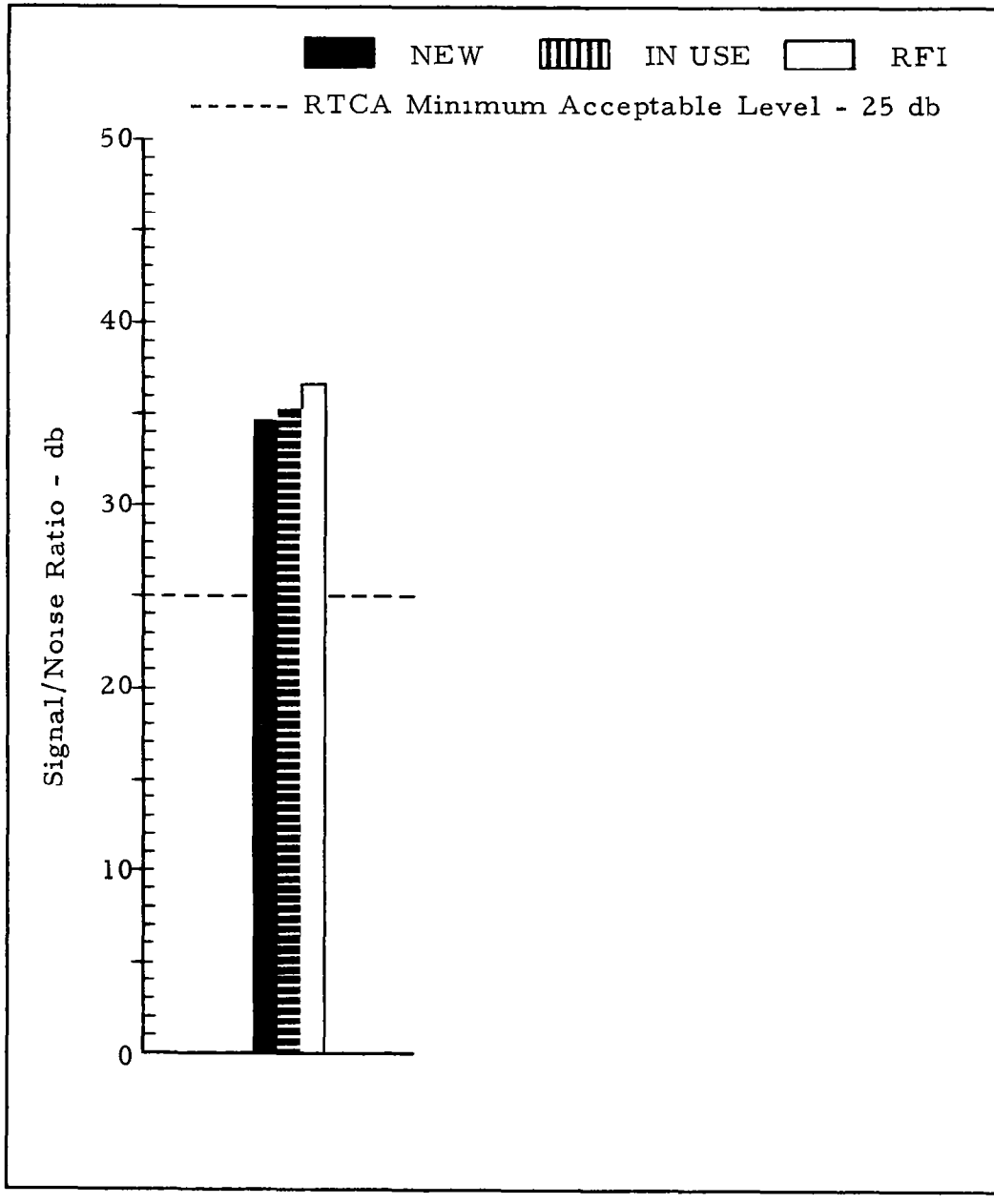
Standard Deviation

New	In Use	RFI
134	565	28.1

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 20 uv.
3. Rated output - 170 mw

GAIN - VOR RECEIVER - VO-4

Figure C-2(d)



AUDIO OUTPUT
NOISE LEVEL
VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.16

Standard Deviation

New	In Use	RFI
3.04	.70	1.13

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 25 db.

AUDIO OUTPUT NOISE LEVEL - VOR RECEIVER - VO-4

Figure C-2(d)

INTERFERENCE TESTS

VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.6	.19 to 1500	114.9	Acceptable level excluding the band of 107.8 to 118.2 mc: ≥60 db.	Actual Level: ≥60 db. All frequencies within performance standards.	Yes
Cross Modulation & Inter Modulation RTCA Para: 2.7	108 to 118	114.9	Acceptable level excluding the band within F_c ±200 kc. Bearing Error: ≤1 Deg. Alarm Meter: ≥250 microamps. *	Actual Level: 0 degrees. >340 microamps	Yes
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25	118.0	Acceptable Emission: ≤200 microvolts.	Actual emission on +28 v line: ≤200 microvolts. All frequencies within performance standards.	Yes
Antenna Conducted Interference RTCA Para: 2.9(b)	.15 to 1500	118.0	Acceptable Emission: ≤400 micro-microvolts. * Acceptable level was determined using RTCA Paper as a guide.	Actual Emission: <400 micro-microwatts. All frequencies within performance standards.	Yes

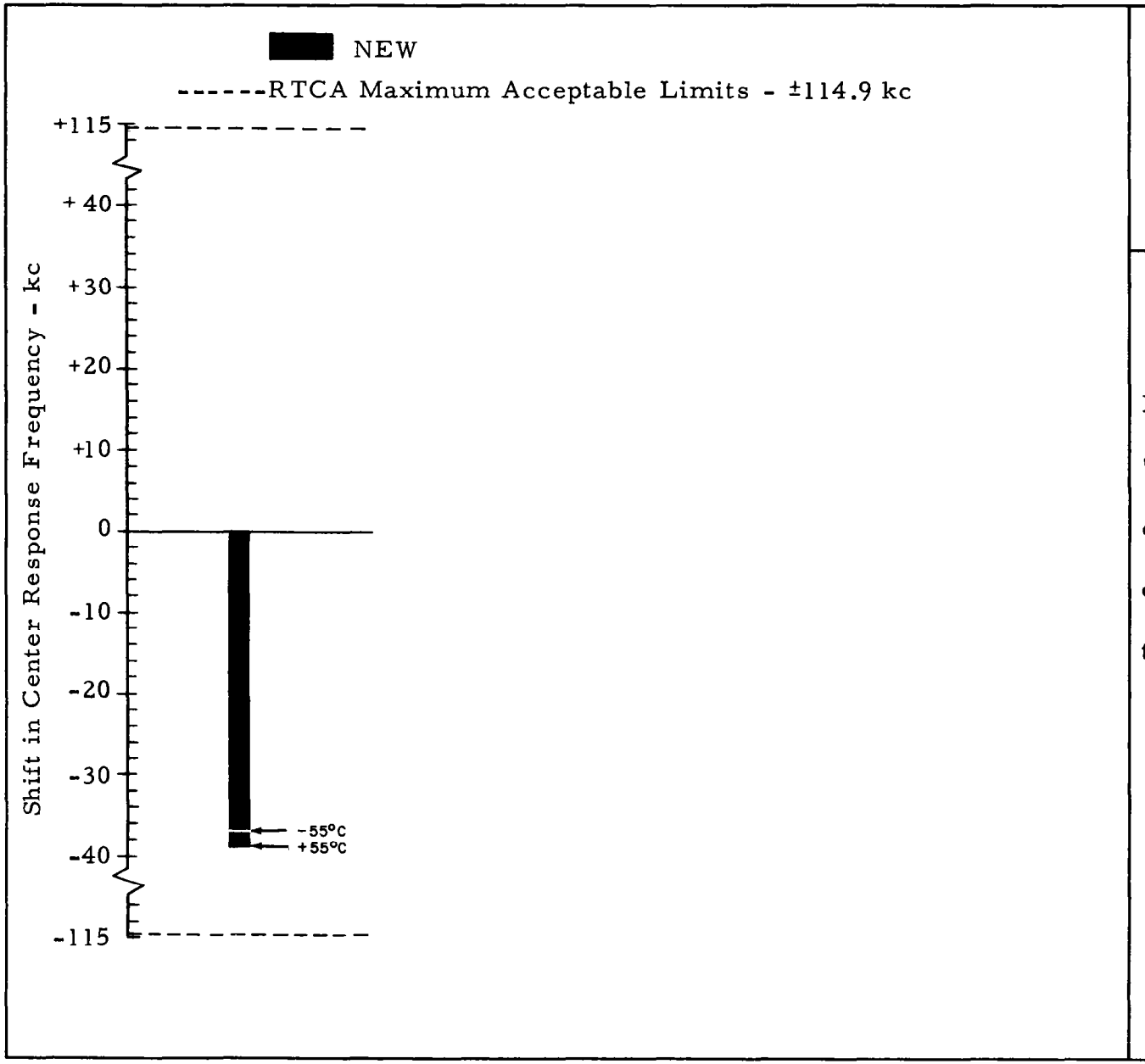
INTERFERENCE TESTS - VOR RECEIVER - VO-4

(continued on Page C-171)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.17	112 to 118	Varied over VOR band	Acceptable Operation: Deviation indicator shall not depart from its center position.	Actual Operation: No departure of deviation indicator from centered position.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	114.9	None over the range from 100 to 2000 mc.	(Not Applicable)

INTERFERENCE TESTS - VOR RECEIVER - VO-4



TEMPERATURE VARIATION TEST
VOR Receiver: VO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 3.1(b)

Notes:
1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits - ±114.9 kc.
3. This unit is designed to operate above 15,000 feet.
4. This unit is continuously tunable.

TEMPERATURE VARIATION TEST - VOR RECEIVER - VO-4

Figure C-2(d)

Notes: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

2. Adjustments were made in accordance with manufacturer's recommended practices.

3. No change in this test "After Adjustments".

AUDIO OUTPUT
REGULATION & DISTORTION
VOR Receiver: VO-4
Project DANCE
RTCA Paper 225-55/DO-69,
Para 2.13

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	75	90	117	58	68	86	71	83	107
	500	112	140	170	78	92	120	119	140	168
	1000	168	191	232	112	137	169	172	192	225
	1800	153	170	196	114	136	160	148	162	182
	2500	120	135	155	99	110	130	114	131	151
New Unit No. 2	350	120	145	169	85	100	133	110	135	161
	500	170	192	235	115	140	178	162	185	220
	1000	219	252	300	158	181	220	200	230	269
	1800	186	205	240	150	170	195	162	180	200
	2500	120	135	155	100	110	130	110	145	162
New Unit No. 3	350	120	144	168	79	99	131	100	128	156
	500	168	198	242	115	148	179	160	182	218
	1000	225	260	300	167	196	240	201	235	270
	1800	180	201	237	154	174	199	164	182	209
	2500	122	140	159	109	124	141	128	148	166
In Use Unit No. 1 Before Adjust. (See note 3)	350	150	162	178	90	100	128	132	158	179
	500	180	200	240	100	125	150	182	205	240
	1000	220	255	300	155	180	205	220	260	290
	1800	172	195	220	147	162	182	179	195	220
	2500	112	132	150	90	100	118	108	122	142

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-4

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 2 Before Adjust. (See note 3)	350	95	112	140	70	80	98	98	115	138
	500	148	168	195	99	118	148	150	170	190
	1000	180	200	238	135	160	185	190	205	230
	1800	155	170	190	122	140	160	150	165	180
	2500	98	110	129	80	90	100	92	110	125
In Use Unit No. 3 Before Adjust. (See note 3)	350	68	80	99	58	72	86	60	75	90
	500	120	150	170	90	110	140	120	140	165
	1000	172	200	238	138	160	180	171	192	218
	1800	150	162	175	110	130	150	150	168	181
	2500	87	100	115	70	80	90	95	110	130
RFI Unit No. 1	350	100	130	155	75	90	110	100	125	150
	500	140	165	195	100	120	99	150	175	200
	1000	170	190	225	130	150	180	180	200	240
	1800	150	170	190	120	140	165	140	160	180
	2500	190	100	120	70	90	100	72	98	119
RFI Unit No. 2	350	100	120	142	70	80	100	105	128	150
	500	132	158	180	90	110	138	150	165	185
	1000	160	182	205	110	140	157	165	185	210
	1800	132	152	180	110	130	150	130	148	162
	2500	89	100	115	75	82	93	85	98	110
RFI Unit No. 3	350	132	159	188	100	122	153	133	155	180
	500	181	215	250	130	157	189	182	210	242
	1000	210	243	280	160	185	220	210	232	263
	1800	170	190	218	140	160	180	165	182	200
	2500	110	122	140	90	100	110	108	122	140

Figure C-2(d)

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-4

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	11.0	11.5	12.0	10.0	10.5	11.5	12.5	12.5	12.5
	500	8.5	9.0	10.0	8.9	9.3	10.5	8.4	8.6	9.2
	1000	6.2	6.5	7.2	8.0	8.6	9.7	6.5	6.9	7.7
	1800	3.3	3.4	3.6	4.0	4.2	4.4	3.6	3.8	4.0
	2500	3.4	3.4	3.6	3.6	3.6	3.7	3.6	3.7	4.1
New Unit No. 2	350	6.5	6.7	7.2	7.5	7.8	8.3	6.1	6.3	7.0
	500	5.5	5.8	6.7	6.9	7.1	8.0	6.0	6.6	7.6
	1000	5.0	5.3	6.1	6.2	6.6	7.6	6.6	7.0	7.6
	1800	3.5	3.6	3.7	4.0	4.0	4.2	4.1	4.2	4.5
	2500	4.1	4.2	4.4	4.4	4.6	4.8	4.3	4.2	4.6
New Unit No. 3	350	8.8	8.9	9.6	9.2	9.2	10.0	8.5	8.7	9.0
	500	7.6	7.9	8.7	8.7	9.0	10.0	7.7	8.1	9.1
	1000	6.2	6.6	7.4	7.8	8.3	9.0	7.3	7.8	8.4
	1800	3.5	3.4	3.8	4.1	3.8	3.9	4.0	4.0	4.4
	2500	4.5	4.2	4.5	4.2	4.0	4.3	4.2	4.1	4.5
In Use Unit No. 1 Before Adjust. (See note 3)	350	10.0	11.0	11.5	11.0	11.5	12.5	10.5	11.0	12.0
	500	8.5	9.5	10.0	10.0	10.5	11.5	8.5	9.0	10.0
	1000	7.0	7.5	9.0	9.5	10.0	12.0	7.5	8.0	9.0
	1800	4.5	4.5	4.5	5.0	5.0	5.0	4.0	4.5	5.0
	2500	5.0	5.2	5.7	6.0	6.0	6.0	5.0	5.2	5.6
In Use Unit No. 2 Before Adjust. (See note 3)	350	8.0	8.2	8.8	7.6	8.0	8.0	8.6	8.1	9.0
	500	5.8	6.1	6.6	6.1	6.2	6.9	6.6	7.0	8.3
	1000	4.9	5.4	5.8	4.6	5.1	5.7	6.6	7.2	7.4
	1800	3.8	3.8	4.0	3.6	3.7	3.8	4.4	4.5	4.7
	2500	4.0	4.0	4.4	4.0	4.0	4.2	4.4	4.4	4.8

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-4

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 3 Before Adjust. (See note 3)	350	10.5	11.0	11.0	9.6	9.4	9.4	12.5	12.0	12.5
	500	7.1	7.4	7.7	6.4	6.4	6.8	8.9	9.0	9.6
	1000	6.4	7.1	7.2	5.1	5.4	5.8	8.6	9.0	9.4
	1800	5.0	5.4	5.5	4.2	4.4	4.4	6.0	6.3	6.8
	2500	5.2	5.6	5.9	4.4	4.6	4.4	5.8	6.4	6.8
RFI Unit No. 1	350	7.4	7.4	7.9	8.0	8.1	8.7	7.3	7.5	7.9
	500	5.5	5.6	6.0	6.5	6.8	6.7	5.6	5.9	6.3
	1000	4.1	4.3	4.4	5.2	5.4	6.0	5.4	5.8	6.2
	1800	4.2	4.2	4.4	4.7	4.8	4.9	4.5	4.7	4.8
	2500	4.8	4.8	5.0	5.6	5.7	6.0	4.6	4.6	5.0
RFI Unit No. 2	350	8.5	9.2	9.9	9.5	10.0	11.0	7.8	8.0	8.7
	500	8.2	9.0	9.9	9.7	10.3	11.5	7.5	8.4	9.3
	1000	7.2	8.0	9.0	9.8	10.5	11.8	7.3	8.0	8.5
	1800	4.5	4.7	5.0	5.7	6.0	6.0	4.5	4.9	5.2
	2500	5.0	5.3	5.8	5.5	5.9	6.0	5.6	5.8	5.0
RFI Unit No. 3	350	7.5	8.0	9.0	8.8	9.5	10.5	7.0	7.5	8.3
	500	7.0	8.0	9.0	8.5	9.3	10.3	7.6	8.3	9.4
	1000	6.4	7.0	7.5	8.0	8.7	9.5	7.7	8.0	8.9
	1800	4.0	4.2	4.5	5.0	5.0	5.3	5.0	5.2	5.6
	2500	4.5	5.0	5.3	5.0	5.5	6.0	4.6	5.0	5.3

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-4

Figure C-2(d)

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SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

3. Laboratory and Field Test Data

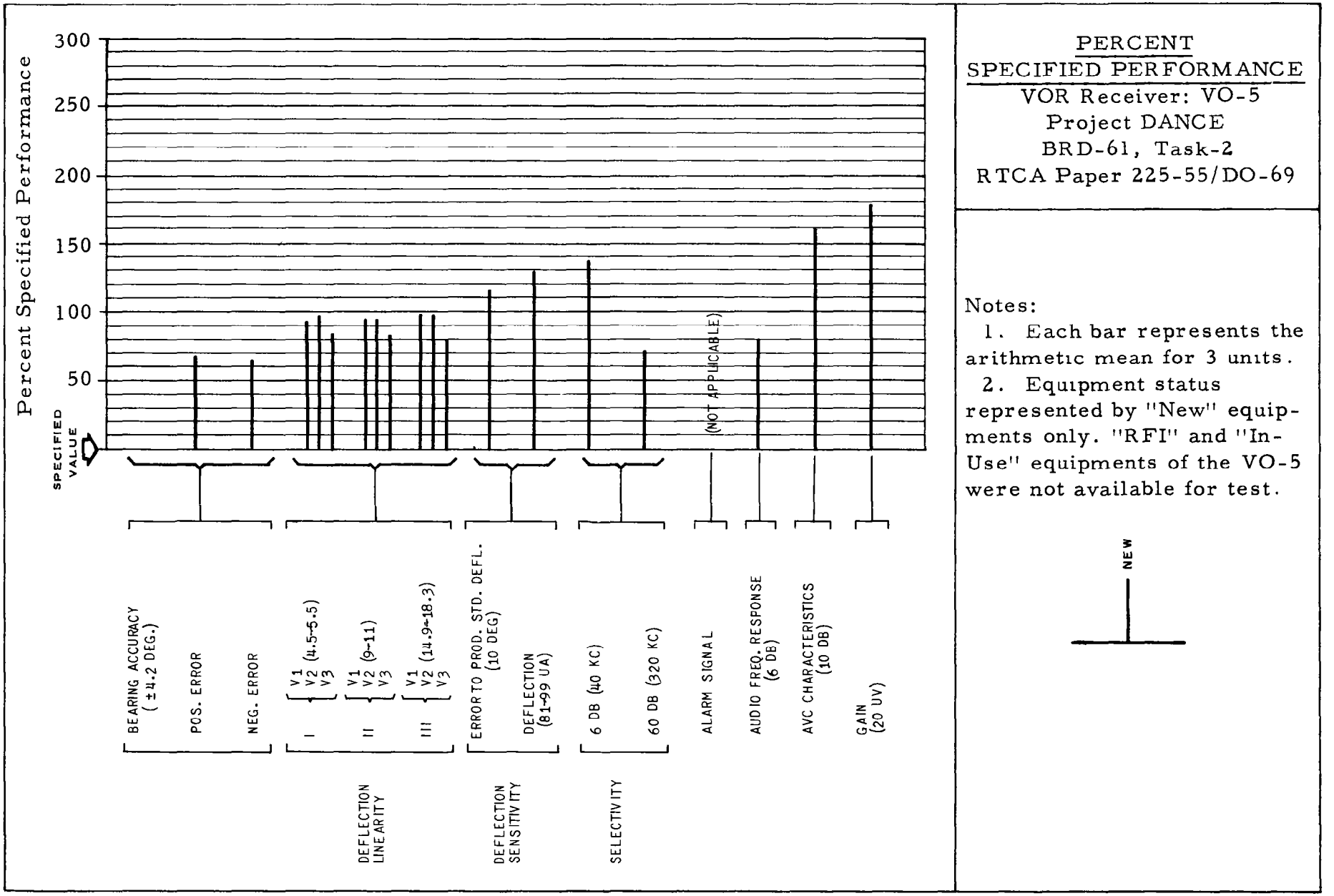
e. VO-5, VOR Receiver

General:

Frequency Range:	108.0 - 126.7 mc
Means of Frequency Control:	Master Oscillator
Total Number of Channels:	Continuously Tunable
Number of Channels Available at Operator's Position:	Continuously Tunable
Means of Frequency Selection:	Continuously Tunable

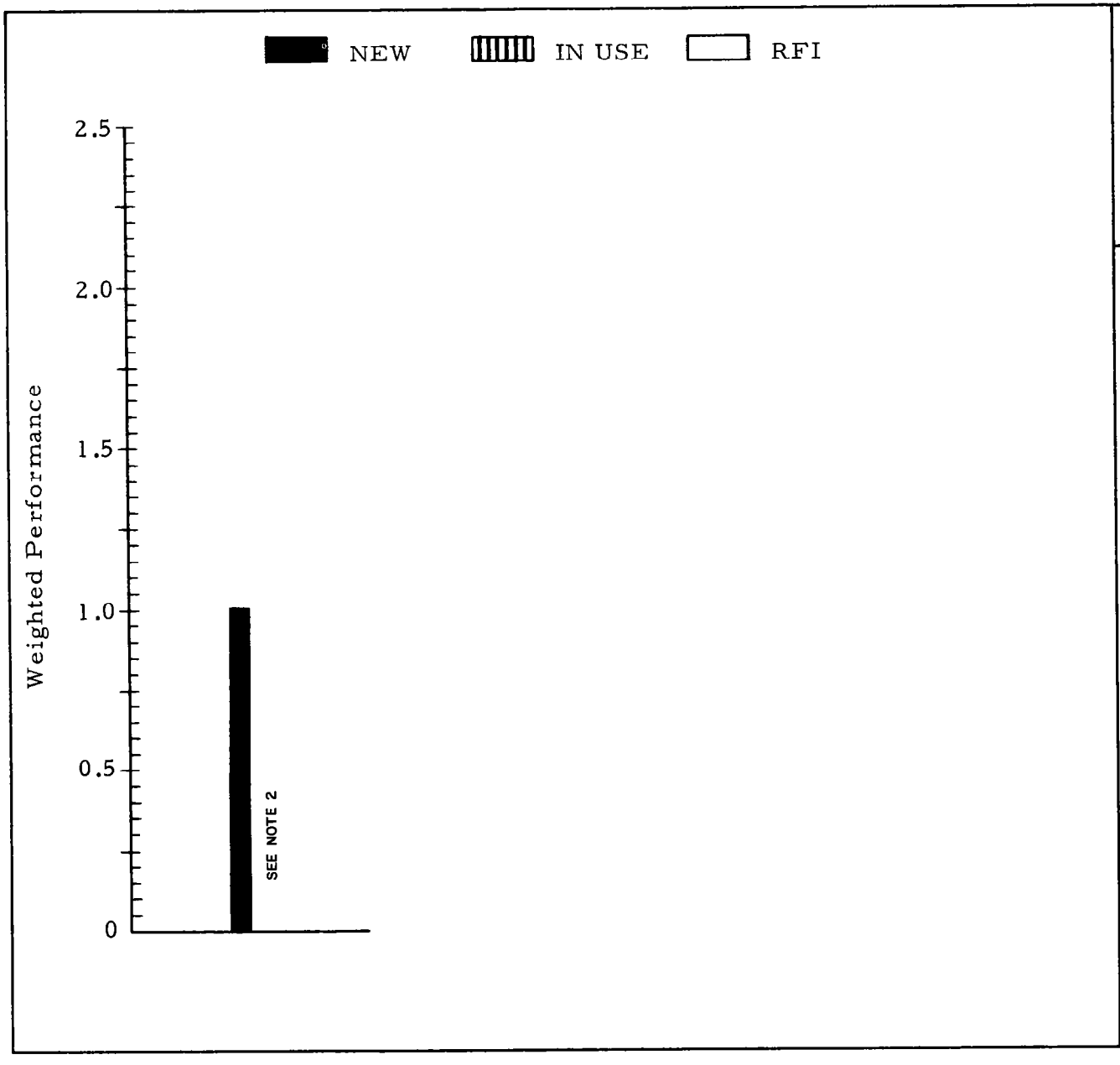
Technical:

	Page(s)
Percent Specified Performance	C-176
Weighted Performance	C-177
Bearing Accuracy	C-178
Deflection Linearity	C-179-181
Deflection Sensitivity	C-182
Selectivity	C-183
Audio Frequency Response	C-184
AVC Characteristic	C-185
Gain	C-186
Noise Level	C-187
Interference Tests	C-188-189
Temperature Variation Test	C-190
Audio Output Regulation & Distortion	C-191



PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-5

Figure C-2(e)



WEIGHTED PERFORMANCE

VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2

WEIGHTING FACTORS

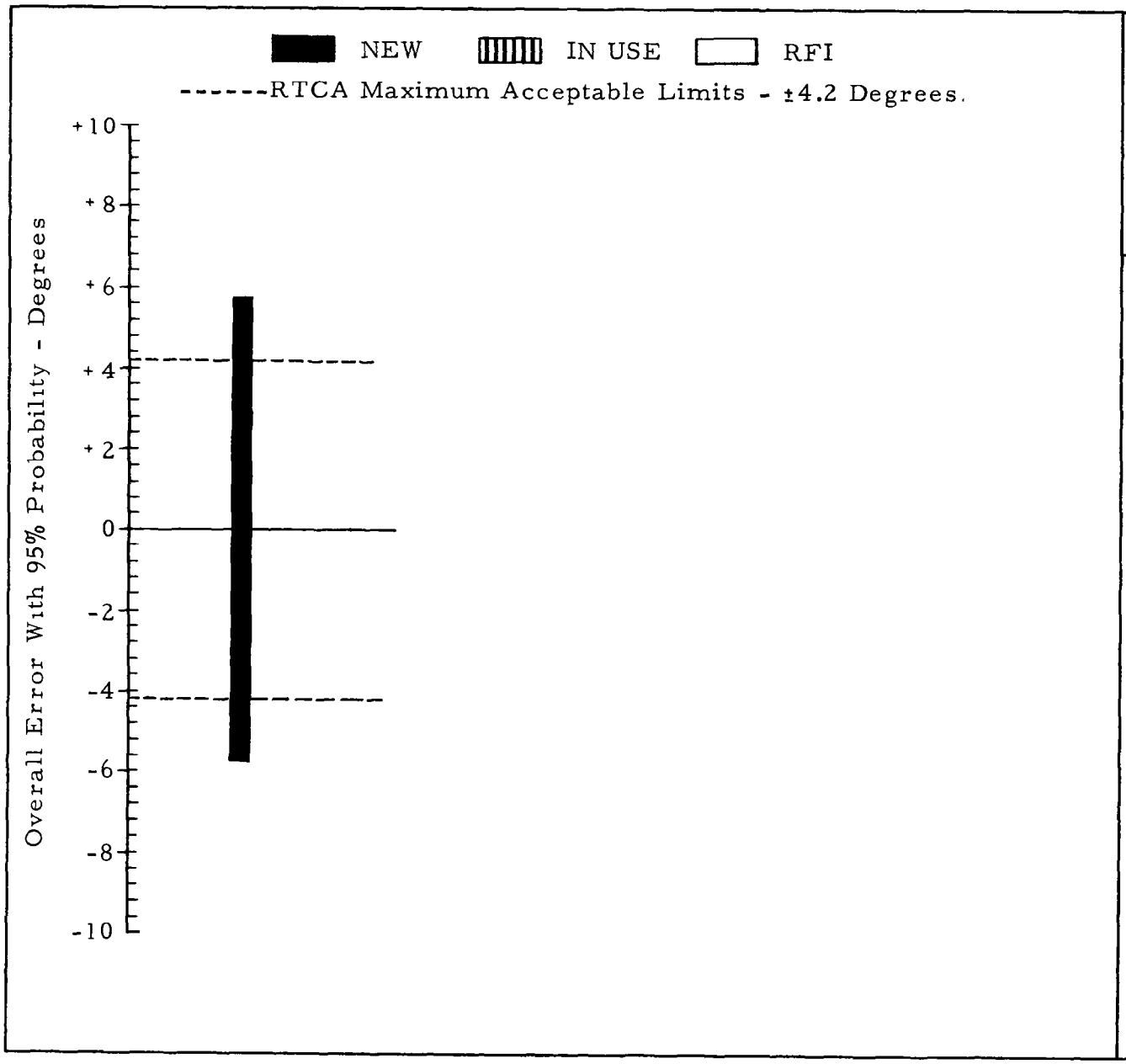
Bearing Accuracy:	
± error	1/8 ea.
Deflection Linearity:	
(I) v_1, v_2, v_3	1/60 ea.
(II) v_1, v_2, v_3	1/60 ea.
(III) v_1, v_2, v_3	1/60 ea.
Deflection Sensitivity:	
(I), (II)	3/40 ea.
Selectivity:	
b_1, b_2	3/40 ea.
Alarm Signal:	N/A
Audio Frequency Response:	1/10
AVC Characteristics:	1/10
Gain:	1/10

Notes:

1. Graph based on arithmetic mean for above characteristics.
2. "RFI" and "In Use" equipments of the VO-5 and were not available for test.

WEIGHTED PERFORMANCE - VOR RECEIVER - VO-5

Figure C-2(e)



BEARING ACCURACY

VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.3

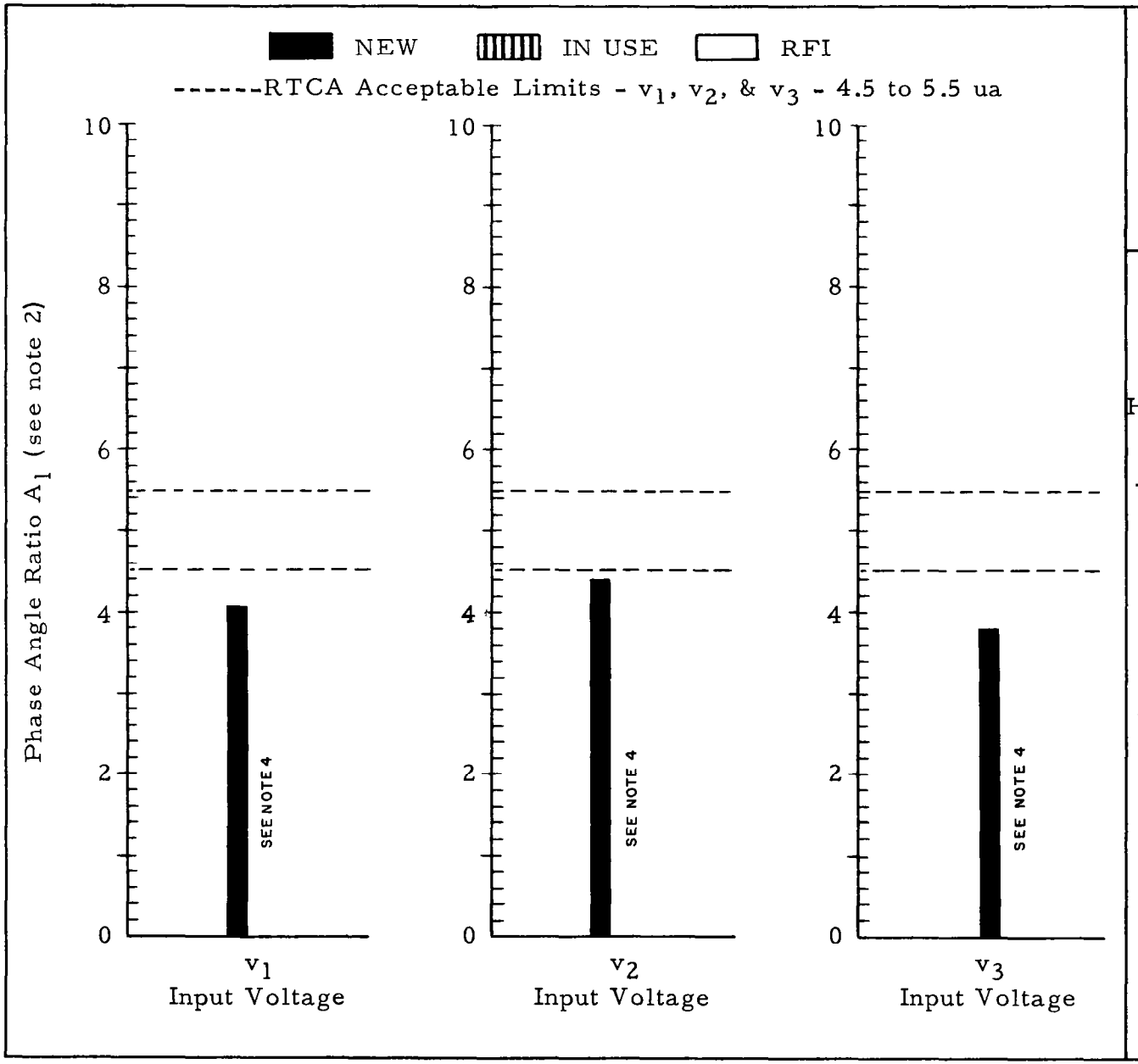
Standard Deviation

Test	New	In Use	RFI
+error	2.75	——	——
-error	4.20	——	——

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Each bar represents 95% statistical probability.
3. RTCA maximum acceptable limits - ± 4.2 degrees.
4. This unit is designed for operation below 15,000 feet.
5. "RFI" and "In Use" equipments of the VO-5 were not available for test.

BEARING ACCURACY - VOR RECEIVER - VO-5



DEFLECTION LINEARITY
(I)
VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

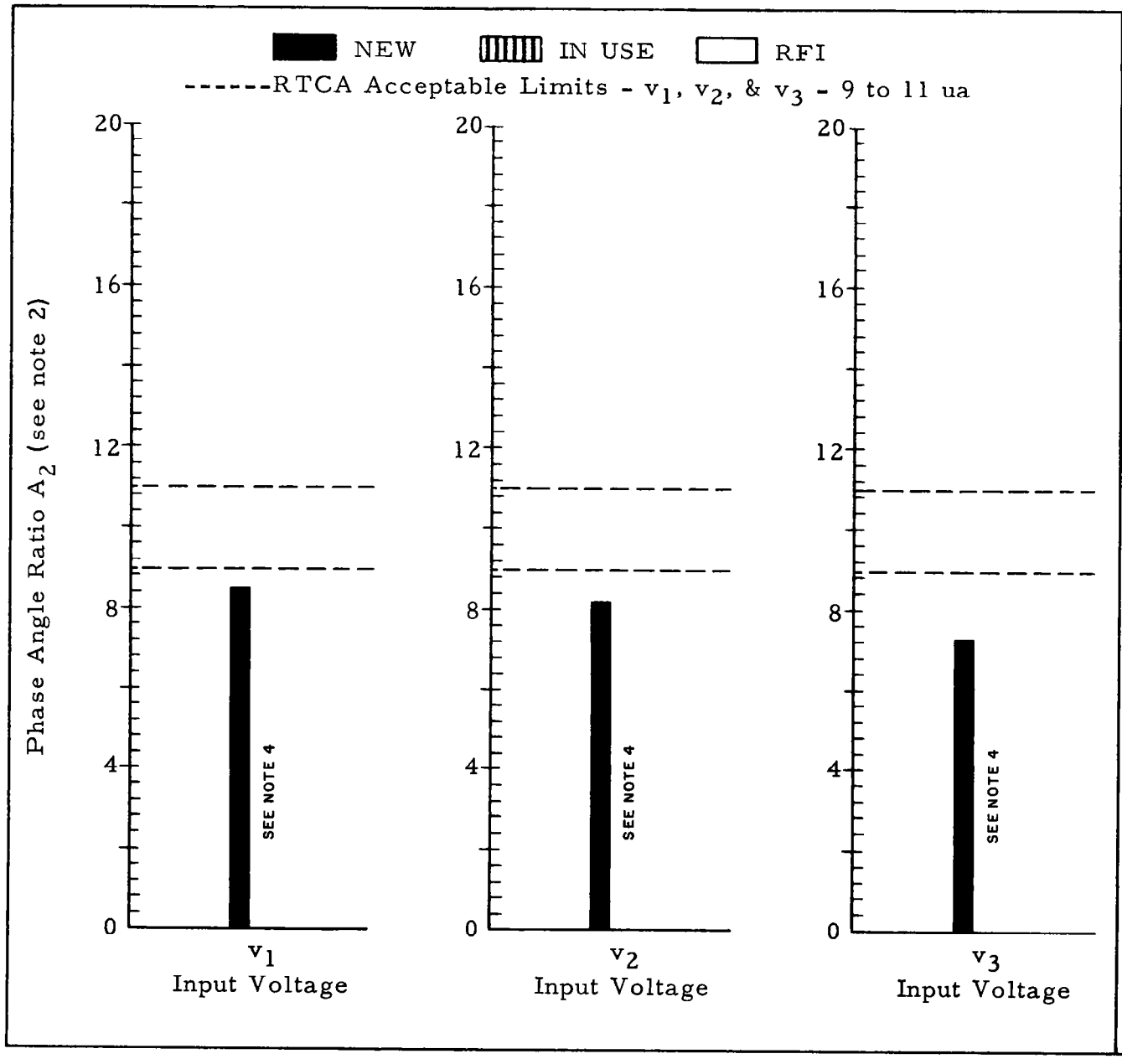
LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Half-Standard Deflection - 45ua
Standard Deviation

Test	New	In Use	RFI
v_1	1.36	—	—
v_2	0.51	—	—
v_3	0.59	—	—

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. A_1 is the ratio of the angle which gives .5 standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 4.5 to 5.5 ua.
4. "RFI" and "In Use" equipments of the VO-5 were not available for test.

(I) DEFLECTION LINEARITY - VOR RECEIVER - VO-5

Figure C-2(e)



DEFLECTION LINEARITY
(II)
VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/Do-69,
Para 2.4

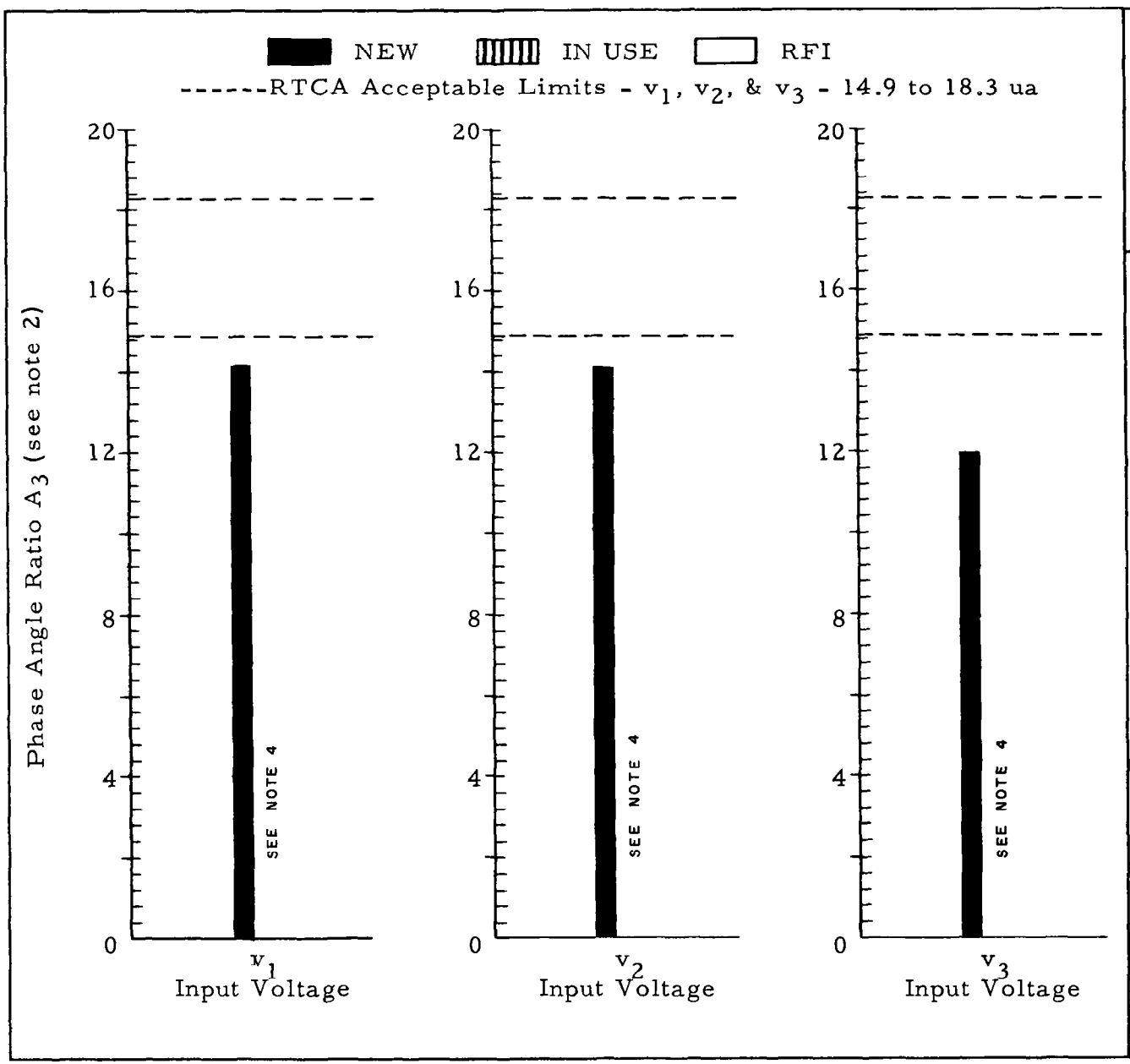
LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Standard Deflection - 90 ua
Standard Deviation

Test	New	In Use	RFI
v_1	2.31	—	—
v_2	1.18	—	—
v_3	1.38	—	—

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. A_2 is the ratio of the angle which gives standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 9 to 11 ua.
4. "RFI" and "In Use" equipments of the VO-5 were not available for test.

Figure C-2(e)

(II) DEFLECTION LINEARITY - VOR RECEIVER - VO-5



DEFLECTION LINEARITY
(III)
VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

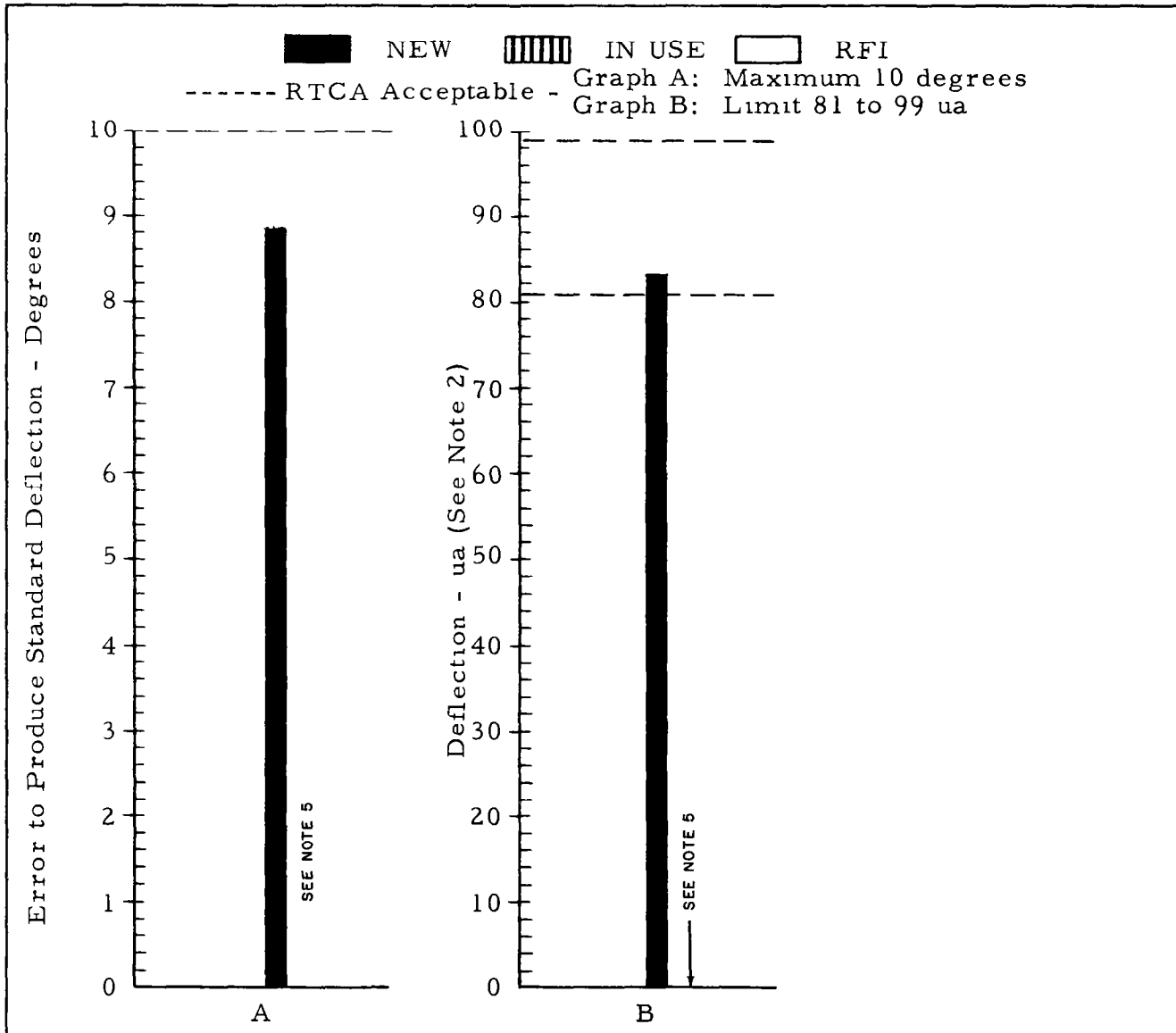
LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Full Scale Deflection - 150 ua
Standard Deviation

Test	New	In Use	RFI
v_1	4.15	—	—
v_2	2.16	—	—
v_3	2.51	—	—

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. A_3 is the ratio of the angle which gives full scale deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 14.9 to 18.3 ua.
4. "RFI" and "In Use" equipments of the VO-5 were not available for test.

(III) DEFLECTION LINEARITY - VOR RECEIVER - VO-5

Figure C-2(e)



DEFLECTION SENSITIVITY

VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.11

Standard Deviation

Test	New	In Use	RFI
A	.55	——	——
B	5.60	——	——

Notes:

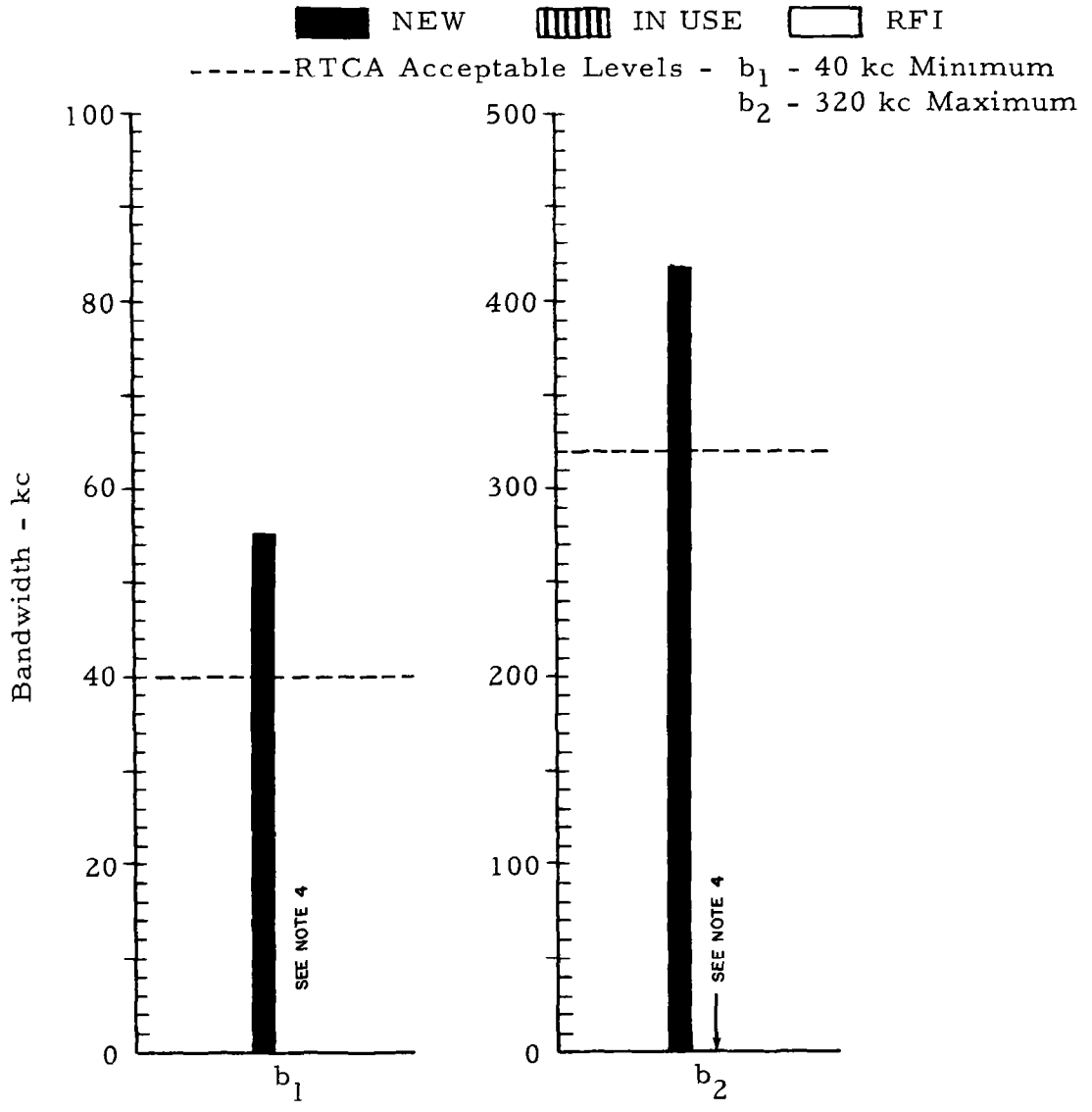
1. Each bar represents the arithmetic mean for 3 units.
2. Deflection on one side of center with input that produced standard deflection on the other side of center - ua.
3. Graph A: RTCA maximum acceptable level to produce standard deflection - 10 degrees.
4. Graph B: RTCA acceptable level for deflection on one side of center with input that produced standard deflection on the other side of center:

   Upper Level - 99 ua
   Lower Level - 81 ua

5. "RFI" and "In Use" equipments of the VO-5 were not available for test.

DEFLECTION SENSITIVITY - VOR RECEIVER - VO-5

Figure C-2(e)



SELECTIVITY

VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.5(b)

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 114.9 mc
Standard Deviation

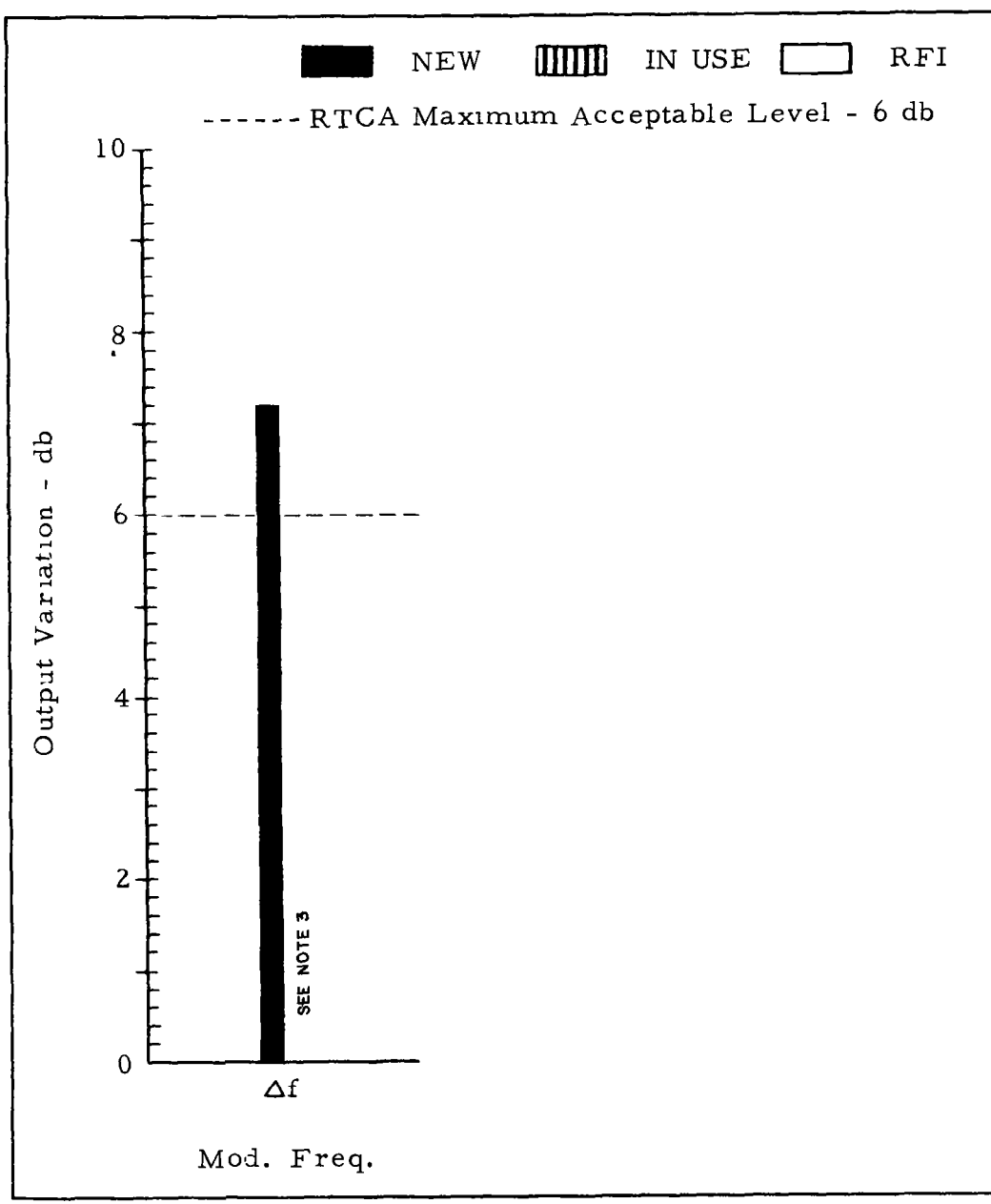
Test	New	In Use	RFI
b_1	12.5	—	—
b_2	34.1	—	—

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable levels:
b_1 - 40 kc minimum
b_2 - 320 kc maximum
3. This receiver is continuously tunable.
4. "RFI" and "In Use" equipments of the VO-5 were not available for test.

Figure C-2(e)

SELECTIVITY - VOR RECEIVER - VO-5



AUDIO FREQ. RESPONSE

VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.12

LEGEND

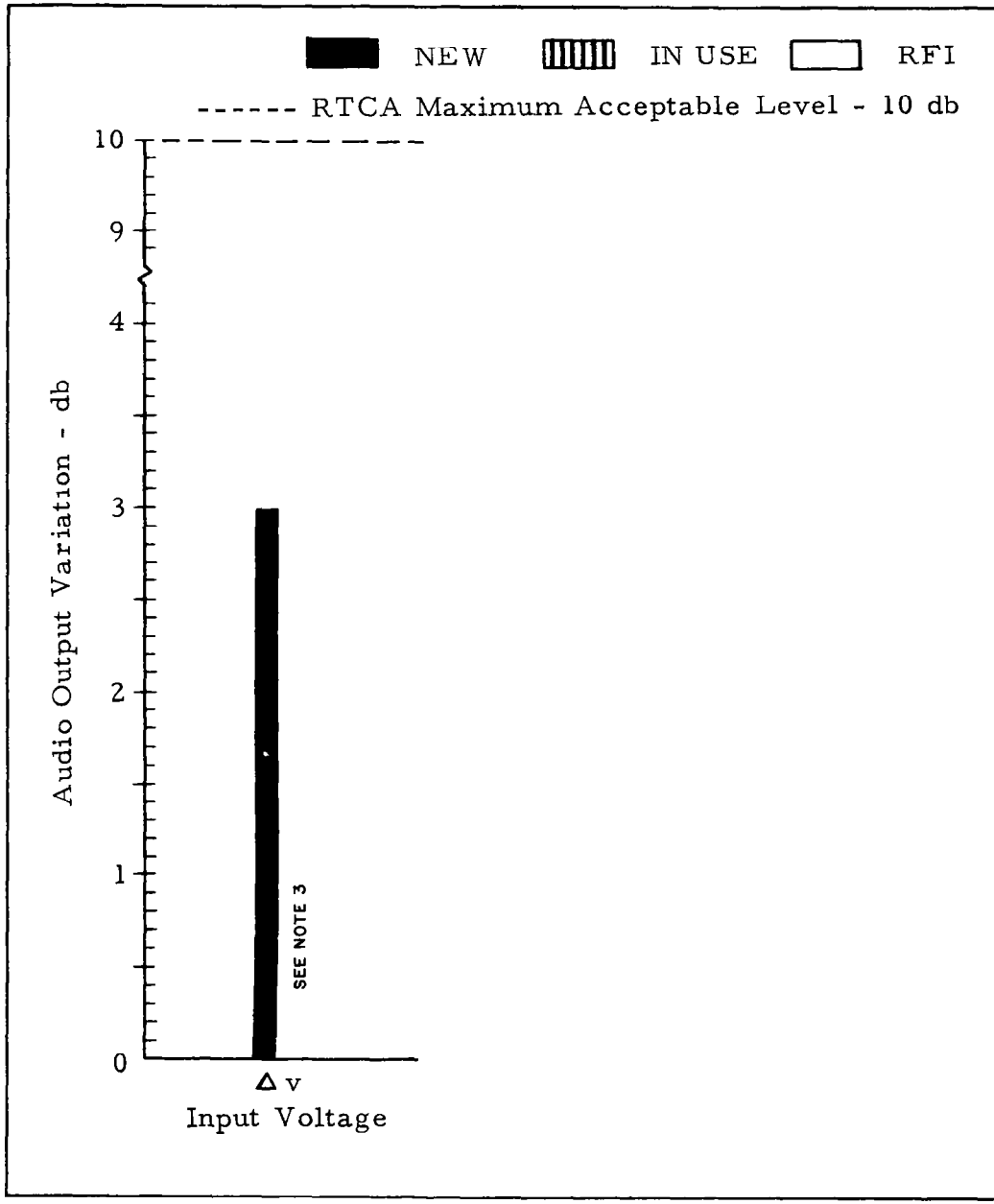
Δf - 350 - 2500 cps

Standard Deviation		
New	In Use	RFI
.91	—	—

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 6 db.
3. "RFI" and "In Use" equipments of the VO-5 were not available for test.

Figure C-2(e)

AUDIO FREQUENCY RESPONSE - VOR RECEIVER - VO-5



AVC CHARACTERISTIC
VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.14

LEGEND

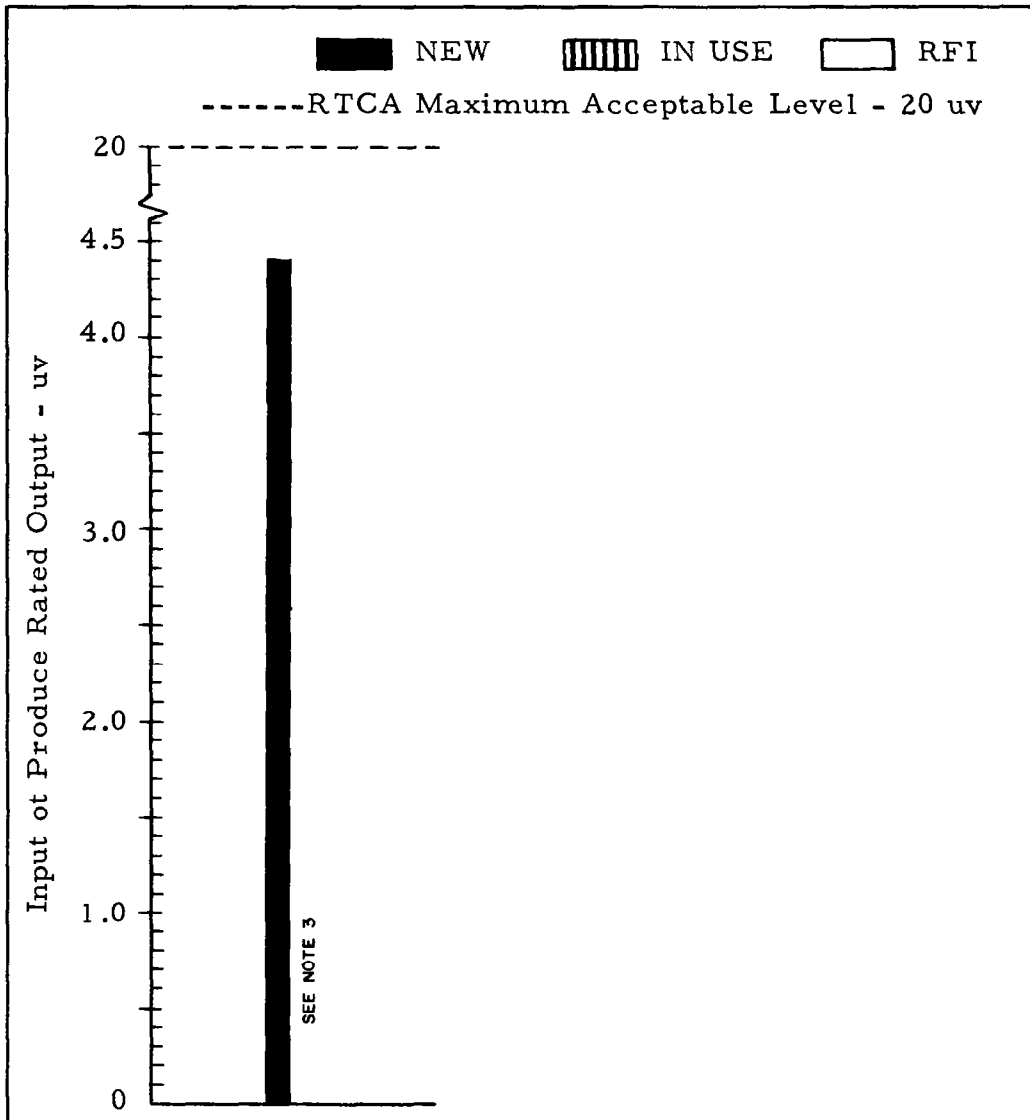
Δv - 10 - 10,000 uv

Standard Deviation		
New	In Use	RFI
3.35	—	—

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 10 db.
3. "RFI" and "In Use" equipments of the VO-5 were not available for test.

Figure C-2(e)

AVC CHARACTERISTICS - VOR RECEIVER - VO-5



GAIN

VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.15

Standard Deviation

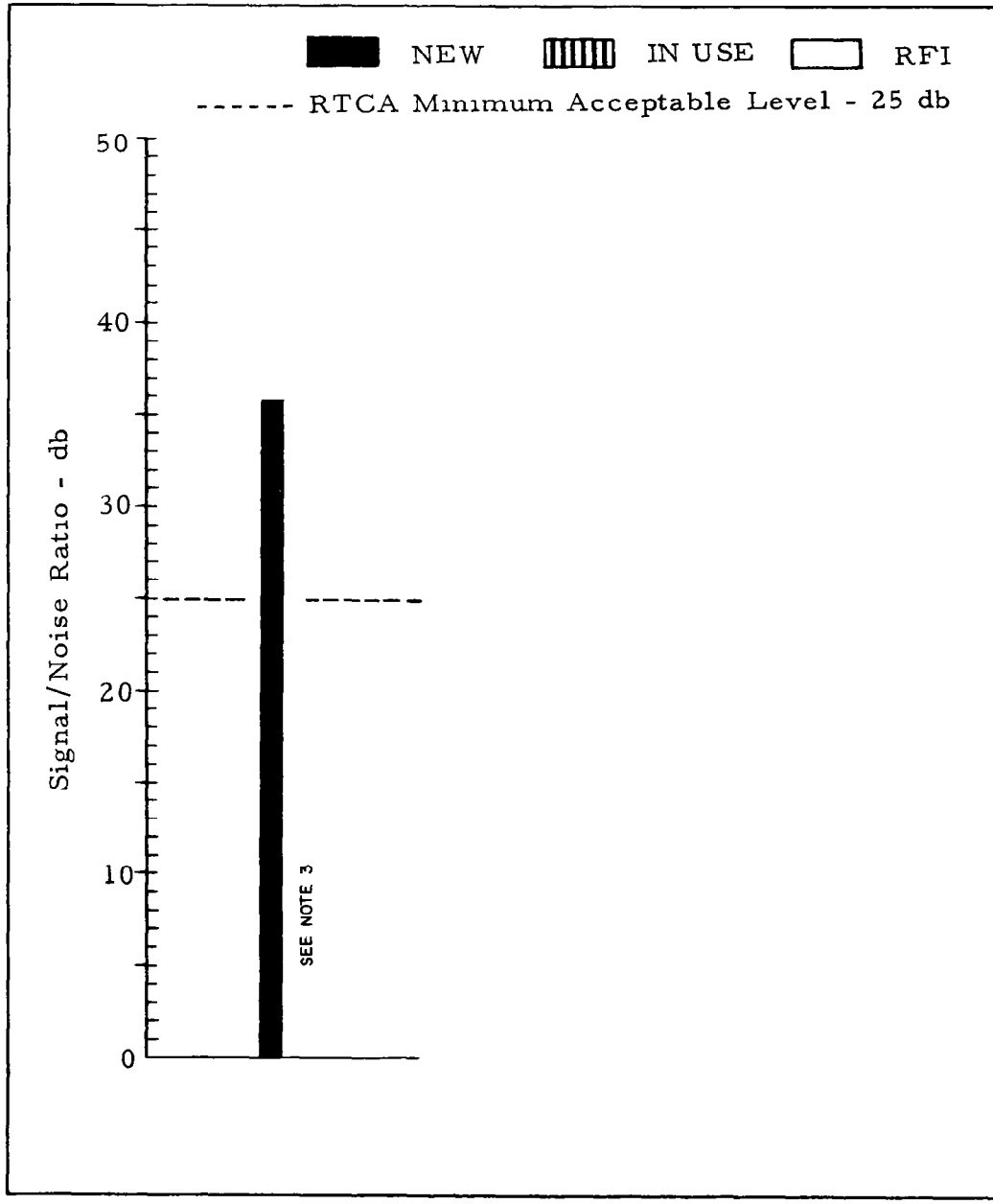
New	In Use	RFI
3.35	----	---

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 20 uv.
3. "RFI" and "In Use" equipments of the VO-5 were not available for test.
4. Rated Output - 200 mw.

GAIN - VOR RECEIVER - VO-5

Figure C-2(e)



AUDIO OUTPUT
NOISE LEVEL
VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.16

Standard Deviation

New	In Use	RFI
4.2	—	—

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA minimum acceptable level - 25 db.
3. "RFI" and "In Use" equipments of the VO-5 were not available for test.

AUDIO OUTPUT NOISE LEVEL - VOR RECEIVER - VO-5

Figure C-2(e)

INTERFERENCE TESTS

VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

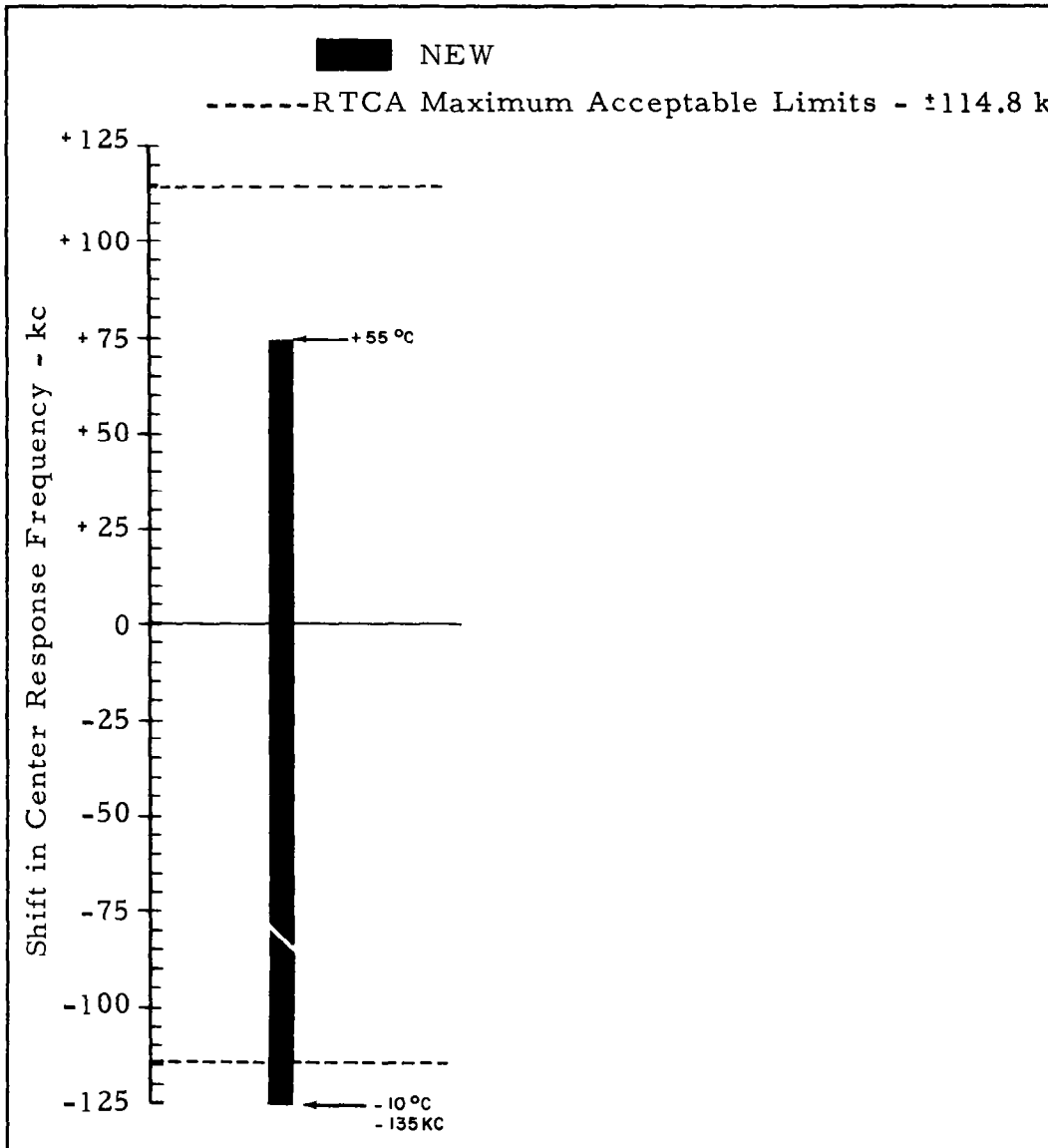
Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.6	.19 to 1500	114.5	Acceptable level excluding band of 107.8 to 118.2 mc. ≥ 60 db.	Actual Level: > 60 db except at 131 mc. All other frequencies within performance standards.	Yes
Cross Modulation & Inter Modulation RTCA Para: 2.7	108 to 118	114.9	Acceptable level excluding the band within $F_c \pm 200$ kc. Bearing Error: ≤1 Deg.	Actual Level: 5.1 degrees at 114.688 mc. All other frequencies within performance standards.	No
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25	114.5	Acceptable Emission: ≤200 microvolts.	Actual Emission on +28 v line: < 200 microvolts. All frequencies within performance standards.	Yes
Antenna Conducted Interference RTCA Para: 2.9(b)	.09 to 1500	114.9	Acceptable Emission: ≤400 micro-microwatts.	Actual Emission: < 400 micro-microwatts except at 123 and 500 mc. All other frequencies within performance standards.	Partially

INTERFERENCE TESTS - VOR RECEIVER - VO-5
(continued on Page C-189)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.17	112 to 118	Varied over VOR band	Acceptable Operation: Deviation indicator shall not depart from its center position.	Actual Operation: No departure of deviation indicator from centered position.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	114.9	When rcvr. is tuned anywhere within the band of 108 to 126 mc, the rcvr will probably be susceptible from 102-144 mc.	None

INTERFERENCE TESTS - VOR RECEIVER - VO-5



TEMPERATURE VARIATION TEST
VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 3.1(b)

Notes:
1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits - ±114.8 kc.
3. This unit is designed to operate below 15,000 feet.
4. This unit is continuously tunable.

Figure C-2(e)

TEMPERATURE VARIATION TEST - VOR RECEIVER - VO-5

Note: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

AUDIO OUTPUT REGULATION & DISTORTION
VOR Receiver: VO-5
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 2.13

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	900	890	900	680	710	700	820	890	900
	500	1390	1310	1350	910	980	950	1320	1410	1450
	1000	1650	1690	1610	1240	1260	1290	1600	1610	1600
	1800	1350	1390	1350	1000	1000	1090	1210	1290	1290
	2500	1010	1110	1100	810	840	880	950	1000	1000
New Unit No. 2	350	810	890	900	650	700	710	840	910	950
	500	1210	1300	1310	870	950	980	1400	1460	1500
	1000	1500	1510	1530	1090	1100	1190	1550	1590	1600
	1800	1150	1200	1250	880	890	970	1150	1200	1210
	2500	800	900	910	650	690	760	800	870	900
New Unit No. 3	350	740	700	700	510	550	550	610	670	680
	500	1180	1150	1090	780	800	800	1050	1110	1120
	1000	1780	1790	1620	1200	1200	1200	1600	1600	1560
	1800	1500	1510	1400	1000	1000	1010	1250	1280	1290
	2500	1200	1220	1110	820	820	860	980	1000	1000

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-5

Figure C-2(e)

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	39.0	46.0	49.0	35.0	40.0	44.0	46.0	54.0	56.0
	500	33.8	42.0	43.0	30.0	36.0	38.0	42.0	48.0	49.0
	1000	18.0	19.0	19.2	17.8	19.0	19.8	18.0	18.0	18.8
	1800	12.5	14.0	14.8	11.5	13.2	14.5	13.5	14.9	15.6
	2500	11.8	14.0	14.8	10.5	13.0	14.8	12.2	14.9	15.7
New Unit No. 2	350	52.0	54.0	54.2	48.0	50.0	50.0	58.0	60.0	61.0
	500	43.0	46.0	47.0	40.0	42.0	43.0	50.0	52.0	53.0
	1000	18.0	18.5	19.0	18.5	19.0	19.5	17.2	17.5	17.8
	1800	11.2	12.2	13.2	11.5	12.6	13.8	12.0	13.0	14.0
	2500	11.6	13.0	14.0	12.0	13.5	14.0	12.0	13.5	14.0
New Unit No. 3	350	45.0	48.0	50.0	37.0	40.0	45.0	46.0	53.0	56.0
	500	41.0	42.0	45.0	32.0	36.0	39.0	46.0	50.0	52.0
	1000	19.5	20.0	20.5	18.0	19.5	20.5	19.8	20.0	20.0
	1800	12.5	13.0	13.5	11.2	12.8	13.5	13.0	13.8	14.5
	2500	12.0	13.0	13.5	10.8	12.0	13.0	12.5	13.5	14.5

Figure C-2(e)

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-5

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SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

3. Laboratory and Field Test Data

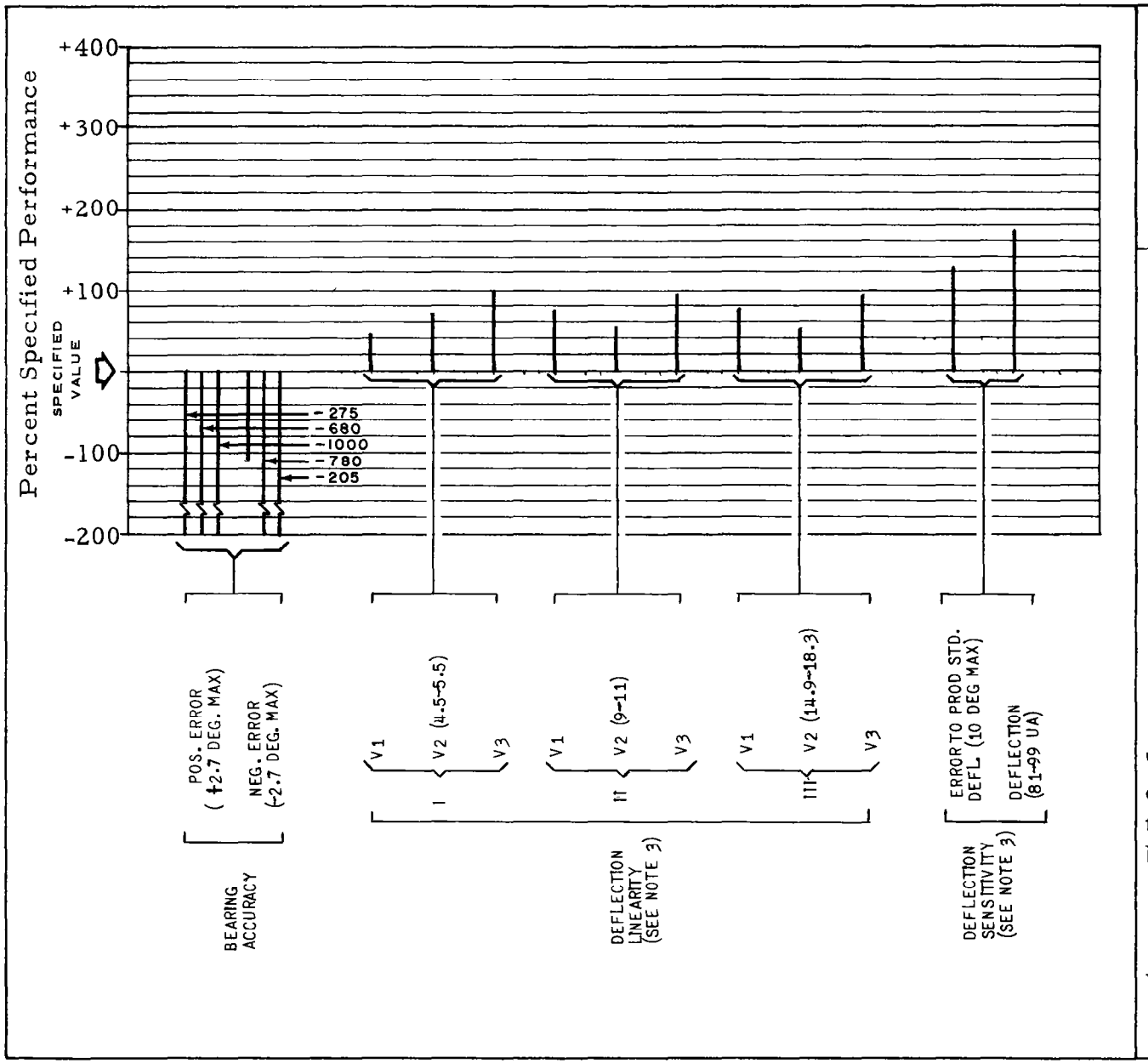
f. VO-6, VOR Receiver

General:

Frequency Range:	108.0 - 127.0 mc
Means of Frequency Control:	Master Oscillator
Total Number of Channels:	Continuously Tunable
Number of Channels Available at Operator's Position:	Continuously Tunable
Means of Frequency Selection:	Knob - Continuously Tunable

Technical:

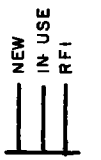
	Page(s)
Percent Specified Performance	C-194
Weighted Performance	C-195
Bearing Accuracy	C-196
Deflection Linearity	C-197-199
Deflection Sensitivity	C-200
Selectivity	C-201
Audio Frequency Response	C-202
AVC Characteristic	C-203
Gain	C-204
Noise Level	C-205
Interference Tests	C-206-208
Temperature Variation Test	C-209
Audio Output Regulation & Distortion	C-210



PERCENT
SPECIFIED PERFORMANCE
VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Notes:

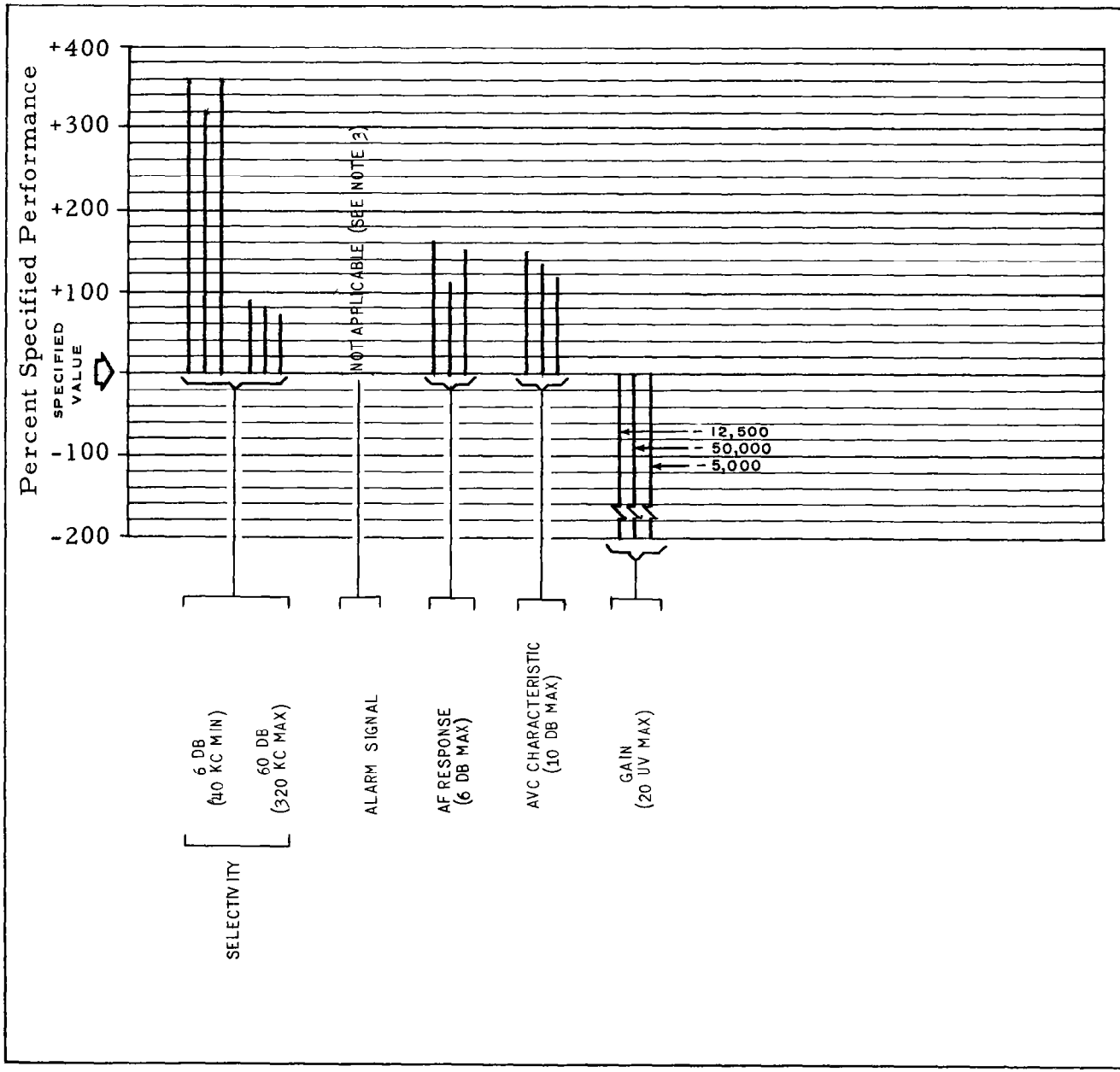
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



3. The indicators for the "New" and "In Use" equipment did not have microammeters, therefore this test could not be performed.
4. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-6

(continued on Page C-194a)



PERCENT
SPECIFIED PERFORMANCE
VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Notes:

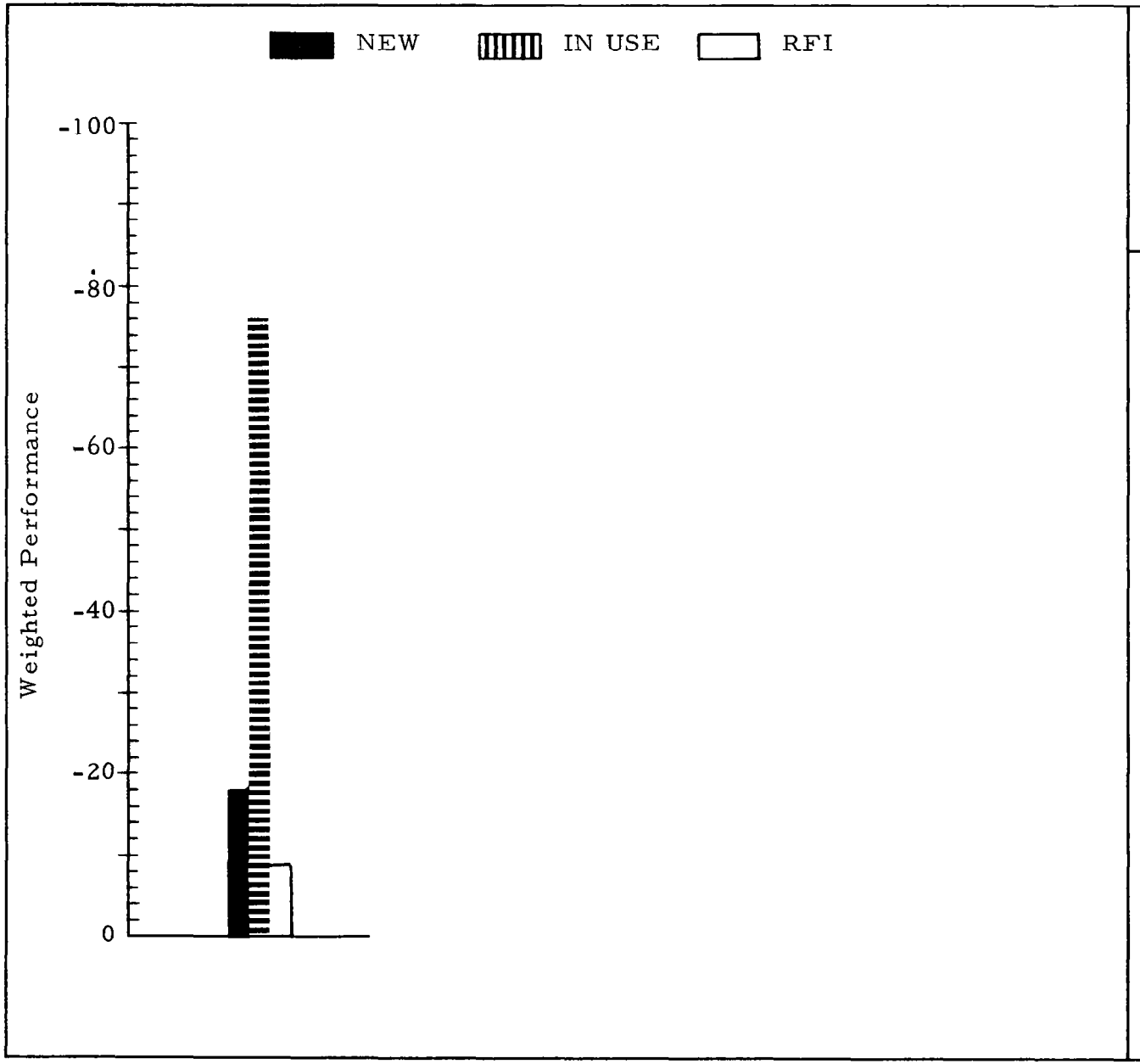
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



3. The indicators for the "New" and "In Use" equipment did not have microammeters, therefore, this test could not be performed.
4. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - VOR RECEIVER - VO-6

Figure C-2(f)



WEIGHTED PERFORMANCE

VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2

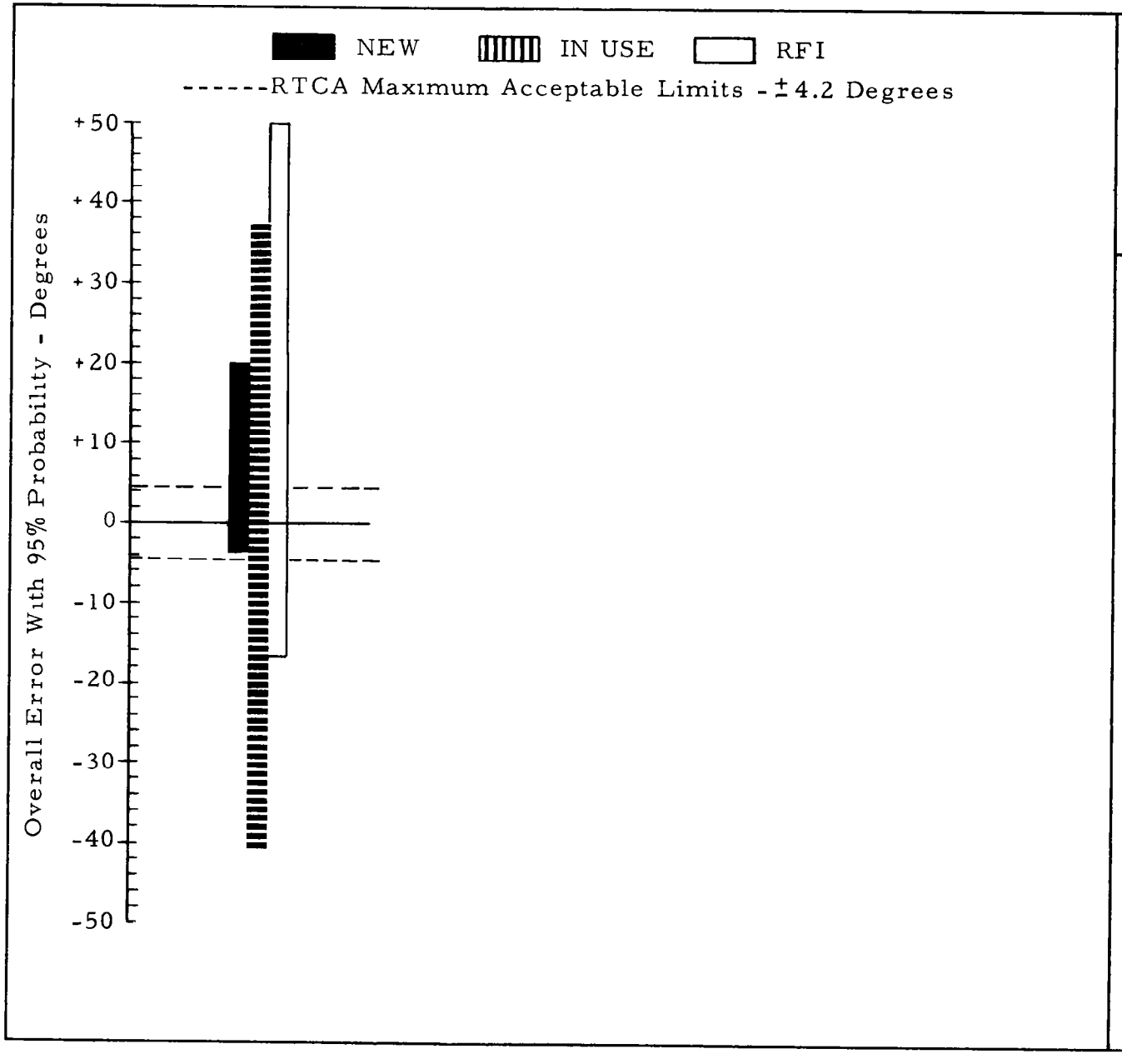
WEIGHTING FACTORS

Bearing Accuracy:	
± error	3/20 ea.
Selectivity:	
b_1, b_2	1/8 ea.
Audio Frequency Response:	3/20
AVC Characteristics:	3/20
Gain:	3/20

Note:
1. Graph based on arithmetic mean for above characteristics.

WEIGHTED PERFORMANCE - VOR RECEIVER - VO-6

Figure C-2(f)



BEARING ACCURACY

VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.3

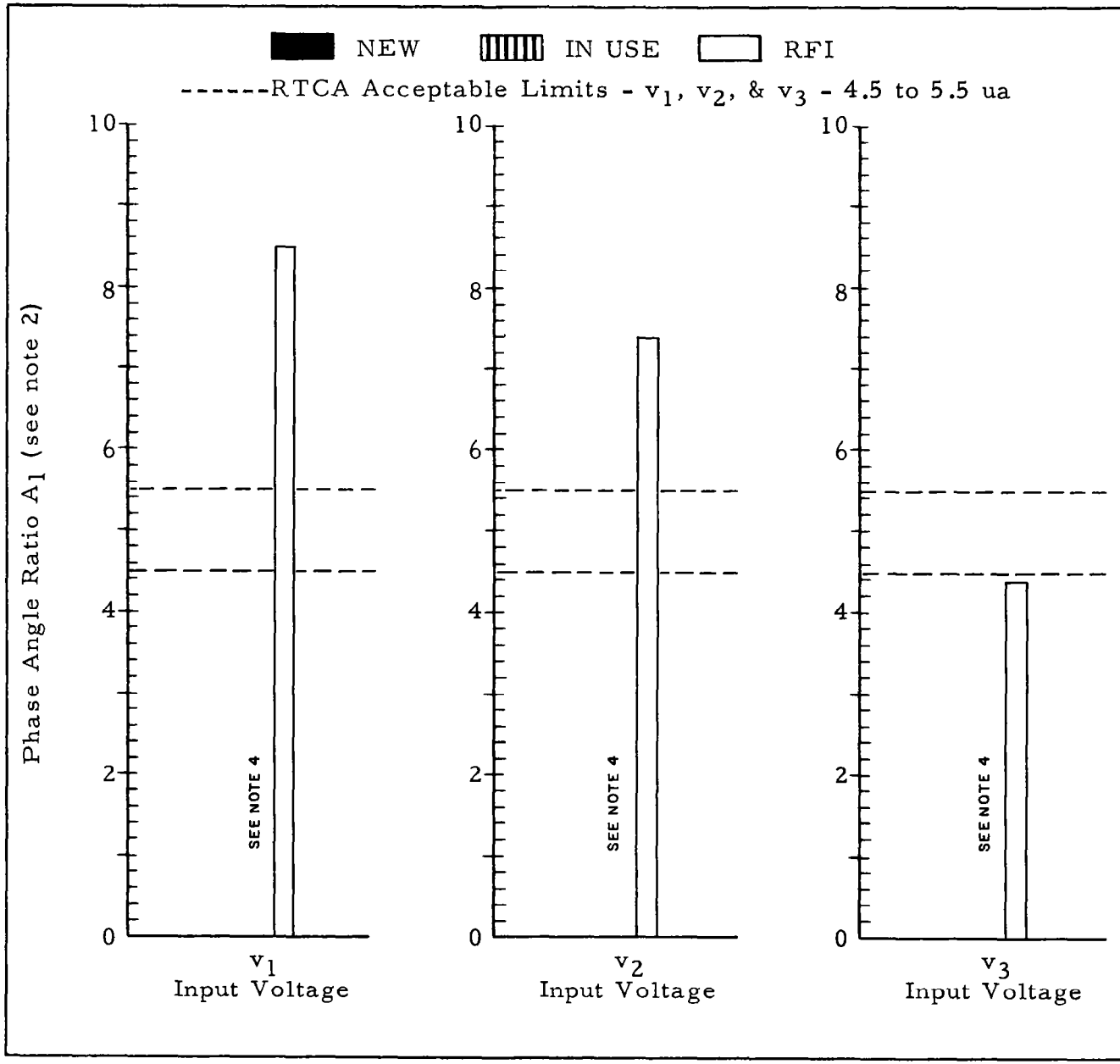
Standard Deviation

Test	New	In Use	RFI
+error	37.6	3.04	28.9
-error	30.2	16.20	47.0

Notes:

1. The "RFI" bar represents the arithmetic mean for 3 units. "New" and "In Use" bars represent the arithmetic mean for 2 units each.
2. Each bar represents 95% statistical probability.
3. RTCA maximum acceptable limits - ± 4.2 degrees.
4. This unit is designed to operate below 15,000 feet.

BEARING ACCURACY - VOR RECEIVER - VO-6



DEFLECTION LINEARITY
(I)
VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Half-Standard Deflection - 45ua
Standard Deviation

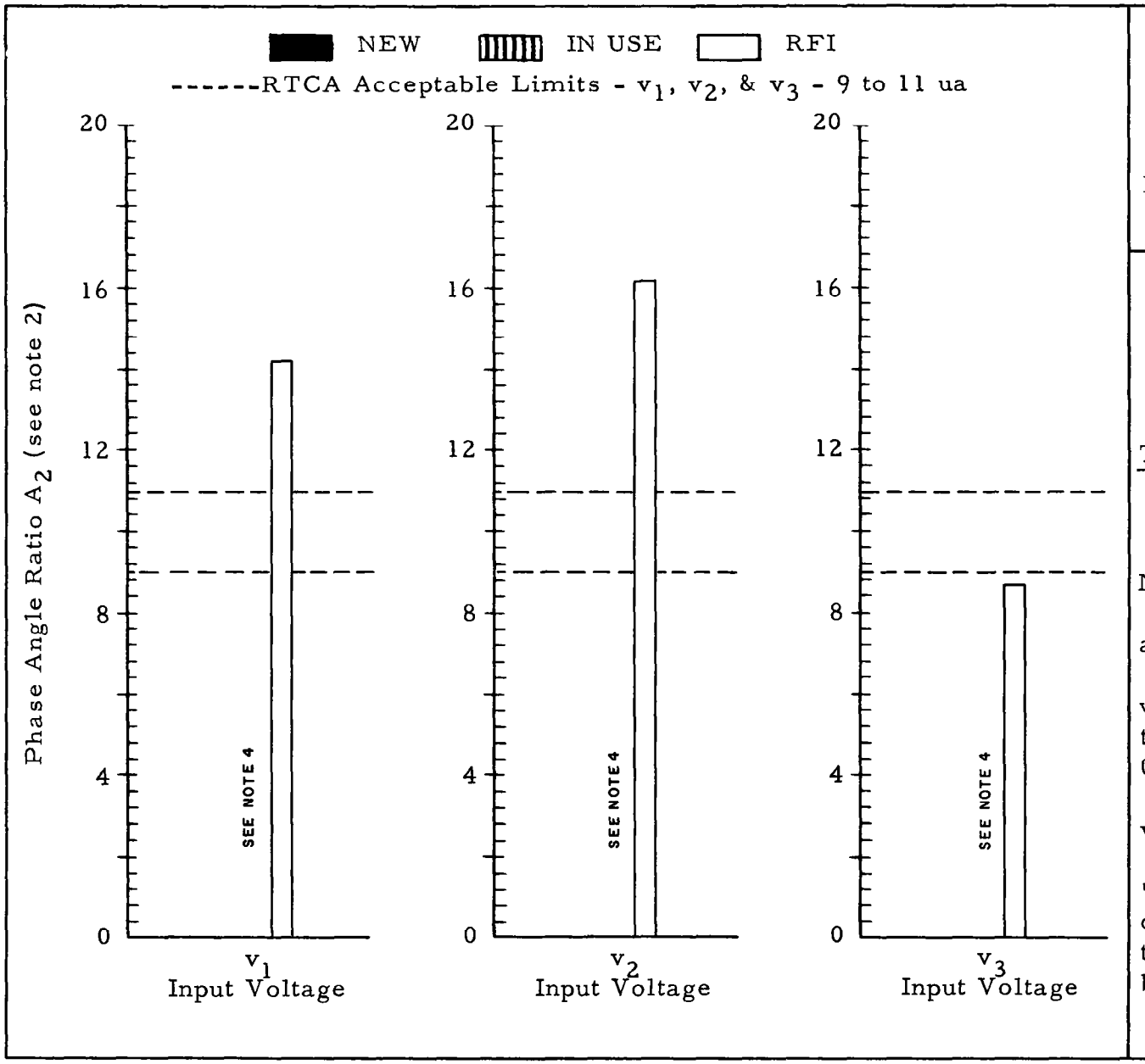
Test	New	In Use	RFI
v_1	—	—	6.99
v_2	—	—	1.40
v_3	—	—	0.79

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. A_1 is the ratio of the angle which gives .5 standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 4.5 to 5.5 ua.
4. The indicators for the "New" and "In Use" units did not have microammeters, therefore, this test could not be performed.

(I) DEFLECTION LINEARITY - VOR RECEIVER - VO-6

Figure C-2(f)



DEFLECTION LINEARITY

(II)

VOR Receiver: VO-6

Project DANCE

BRD-61, Task-2

RTCA Paper 225-55/DO-69, Para 2.4

LEGEND

v_1 - 10 uv

v_2 - 1000 uv

v_3 - 10,000 uv

Standard Deflection - 90 ua

Standard Deviation

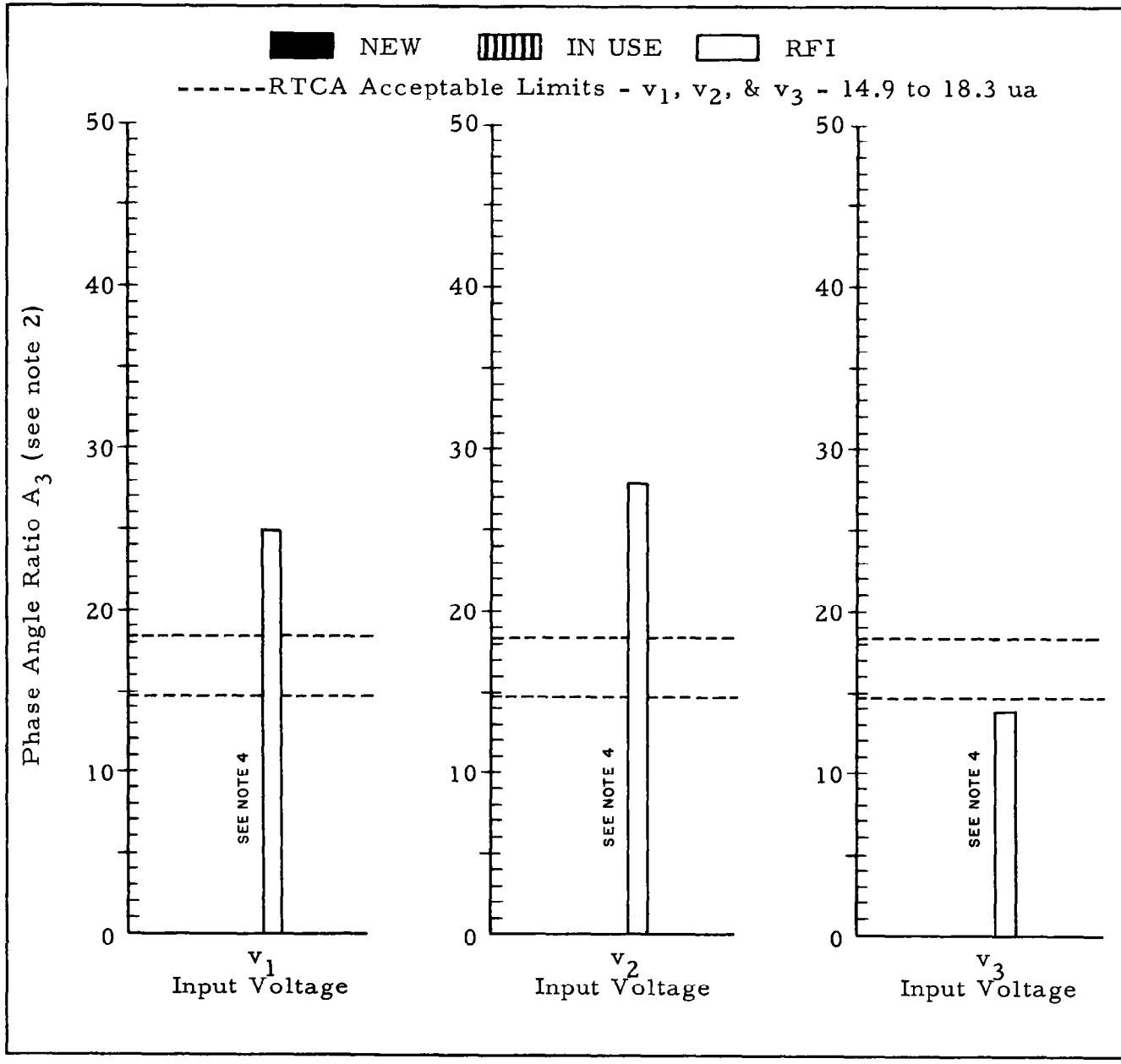
Test	New	In Use	RFI
v_1	——	——	12.14
v_2	——	——	2.69
v_3	——	——	1.02

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. A_2 is the ratio of the angle which gives standard deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 9 to 11 ua.
4. The indicators for the "New" and "In Use" equipment did not have microammeters, therefore, this test could not be performed.

(II) DEFLECTION LINEARITY - VOR RECEIVER - VO-6

Figure C-2(f)



DEFLECTION LINEARITY
(III)
VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.4

LEGEND

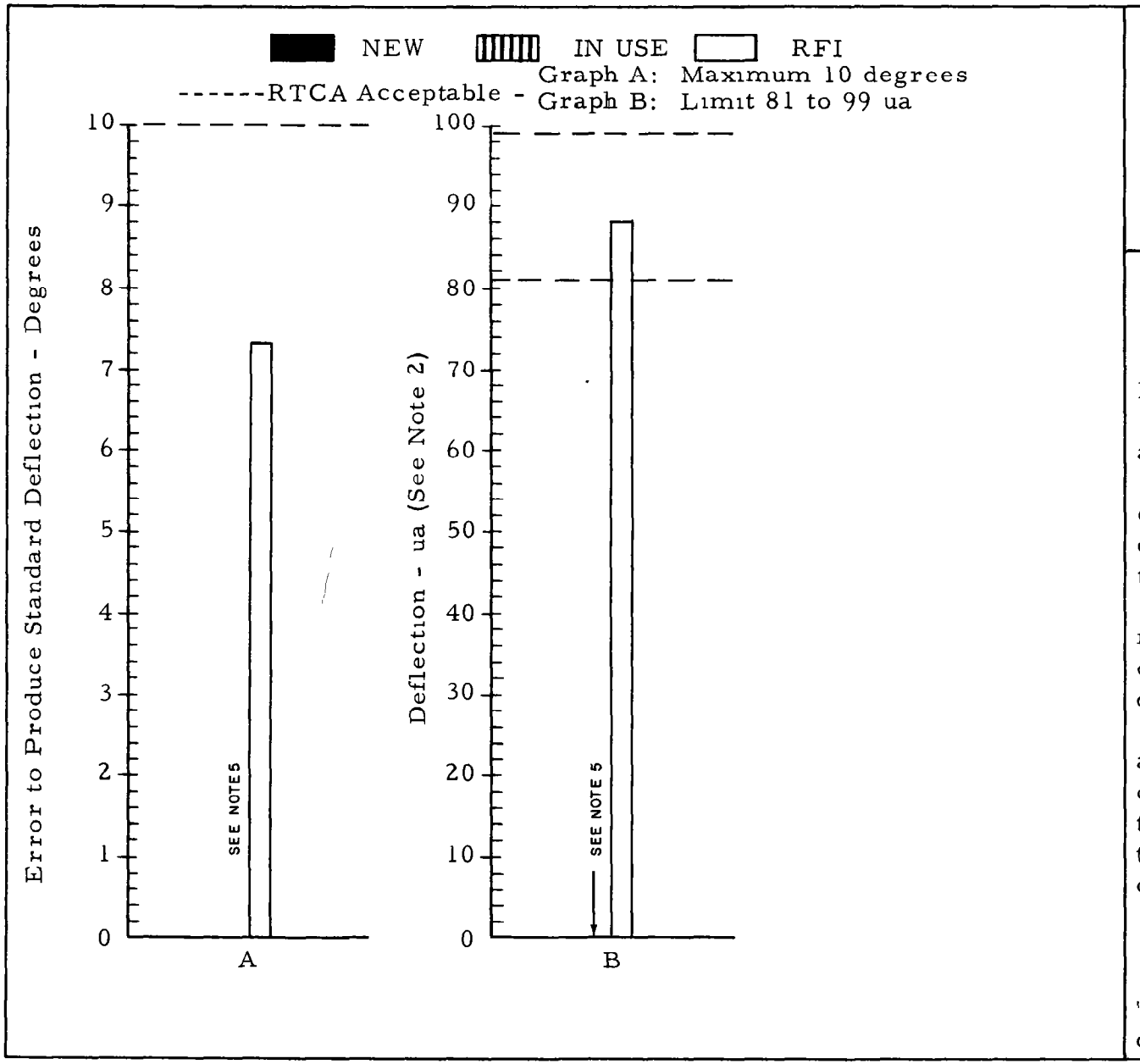
v_1 - 10 uv
v_2 - 1000 uv
v_3 - 10,000 uv
Full Scale Deflection - 150 ua
Standard Deviation

Test	New	In Use	RFI
v_1	—	—	23.05
v_2	—	—	4.79
v_3	—	—	7.24

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. A_3 is the ratio of the angle which gives full scale deflection/to the angle which gives 0.1 standard deflection.
3. RTCA acceptable limits: v_1, v_2, & v_3 - 14.9 ot 18.3 ua.
4. The indicators for the "New" and "In Use" equipment did not have microammeters, therefore, this test could not be performed.

(III) DEFLECTION LINEARITY - VOR RECEIVER - VO-6



DEFLECTION SENSITIVITY
VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.11

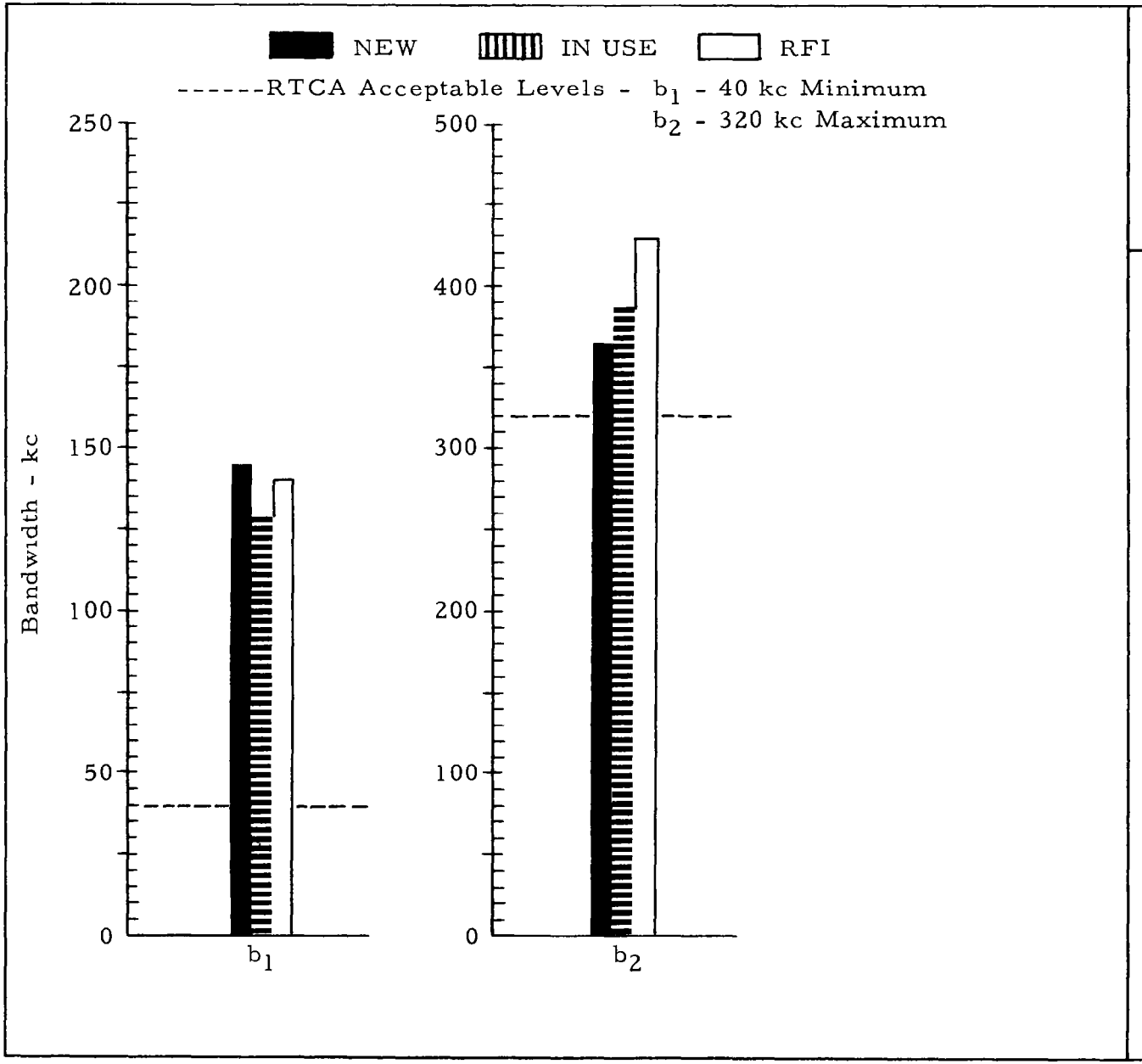
Test	Standard Deviation New	In Use	RFI
A	—	—	1.0
B	—	—	2.5

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Deflection on one side of center with input that produced standard deflection on the other side of center - ua.
3. Graph A: RTCA maximum acceptable level to produce standard deflection - 10 degrees.
4. Graph B: RTCA acceptable level for deflection on one side of center with input that produced standard deflection on the other side of center:
   Upper Level - 99 ua
   Lower Level - 81 ua
5. The indicators for the "New" and "In Use" equipment did not have microammeters.

Figure C-2(f)

DEFLECTION SENSITIVITY - VOR RECEIVER - VO-6



SELECTIVITY

VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.5(b)

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 114.9 mc

Standard Deviation

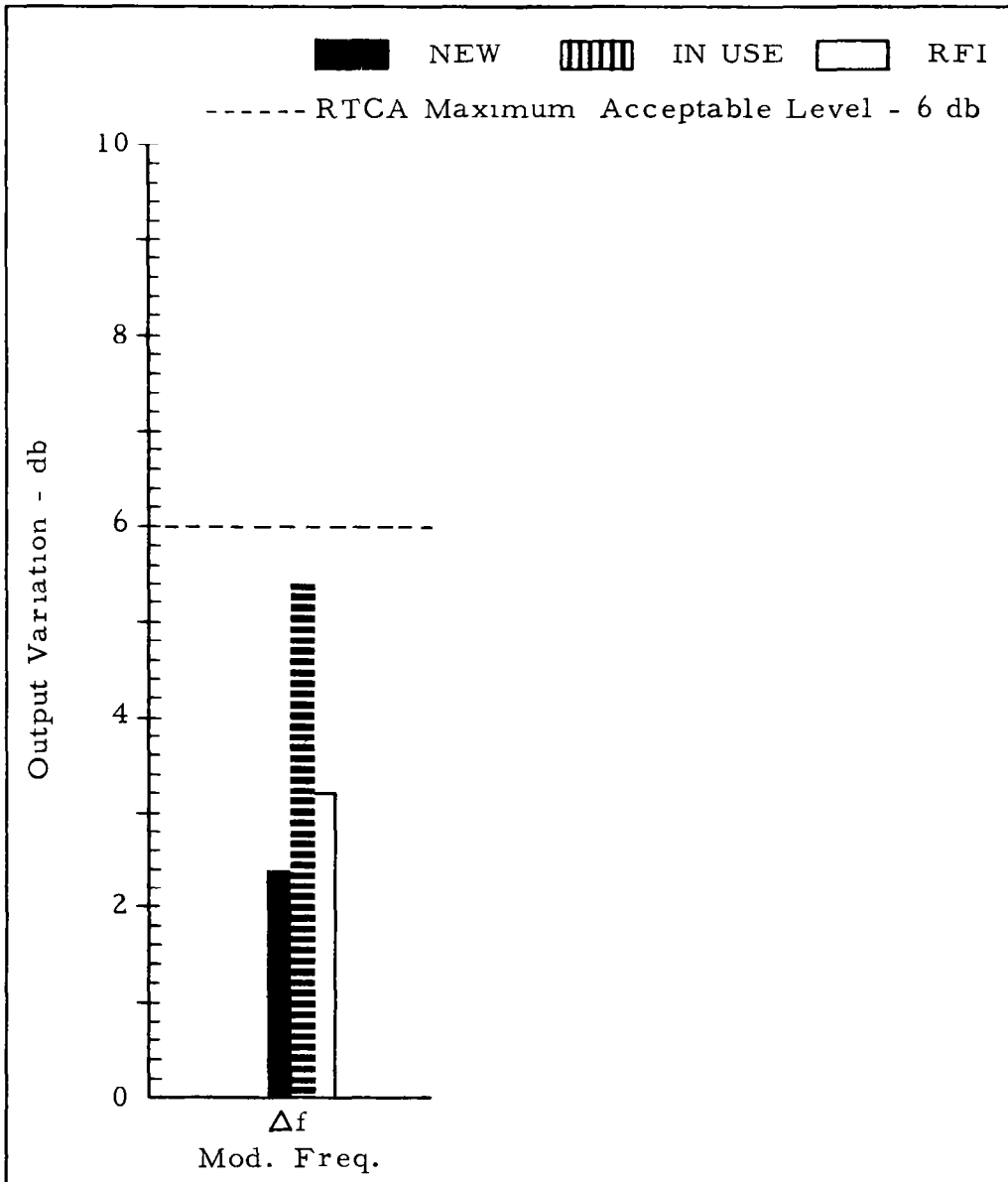
Test	New	In Use	RFI
b_1	1.9	10.8	7.0
b_2	122.3	107.6	4.9

Notes:

1. Each bar represents the arithmetic mean for 3 "In Use" and "RFI" units and 2 "New" units.
2. RTCA acceptable levels:
   b_1 - 40 kc minimum
   b_2 - 320 kc maximum
3. This receiver is continuously tunable.

SELECTIVITY - VOR RECEIVER - VO-6

Figure C-2(f)



AUDIO FREQ. RESPONSE

VOR Receiver. VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.12

LEGEND

Δf - 350 - 2500 cps

Standard Deviation

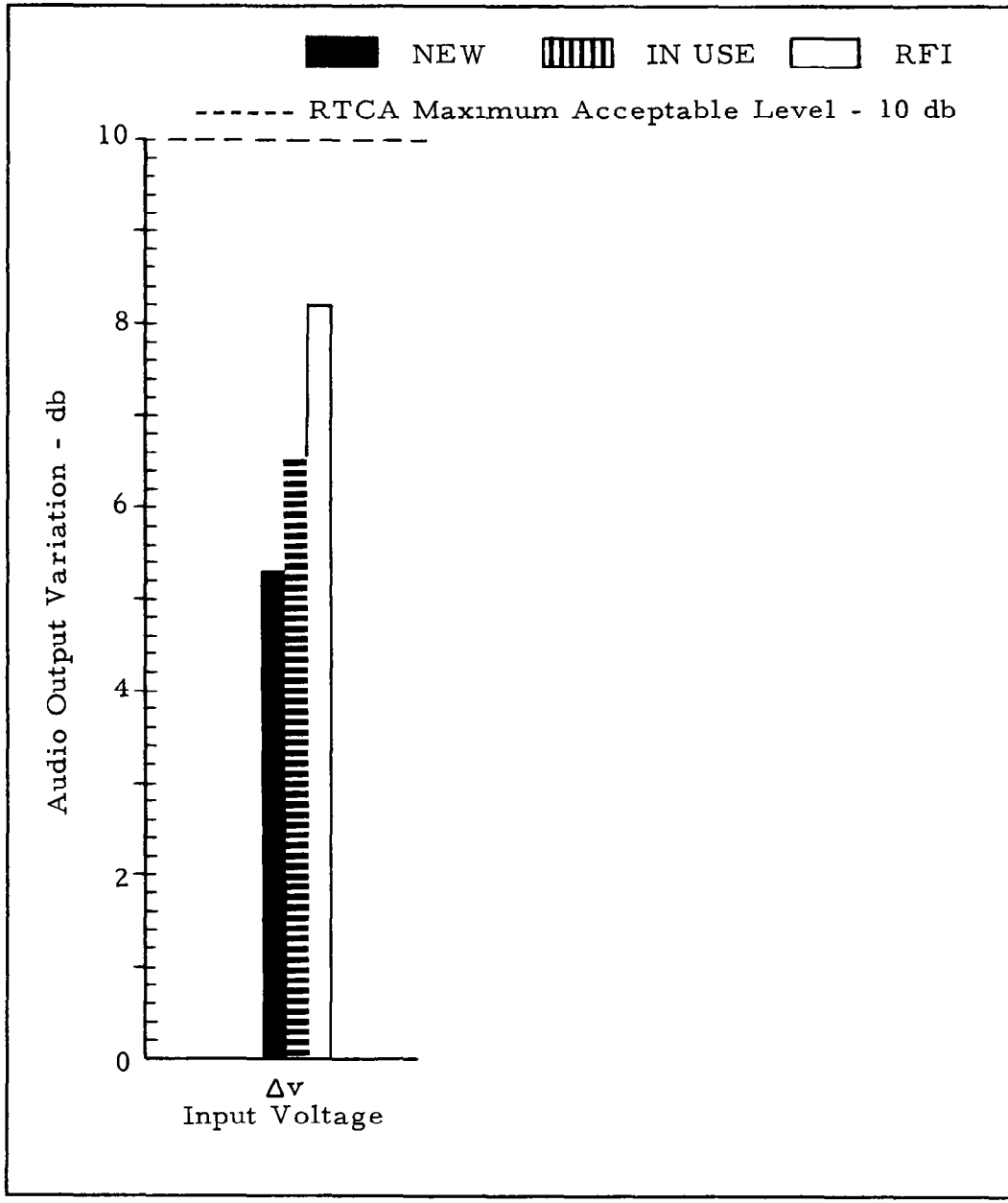
New	In Use	RFI
.99	1.7	0.1

Notes:

1. Each bar represents the arithmetic mean for 3 "In Use" and "RFI" units and 2 "New" units.
2. RTCA maximum acceptable level - 6 db.

Figure C-2(f)

AUDIO FREQUENCY RESPONSE - VOR RECEIVER - VO-6



AVC CHARACTERISTIC
VOR Receiver: VO-6
Project DANCE
Brd-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.14

LEGEND

Δv - 10 - 10,000 uv

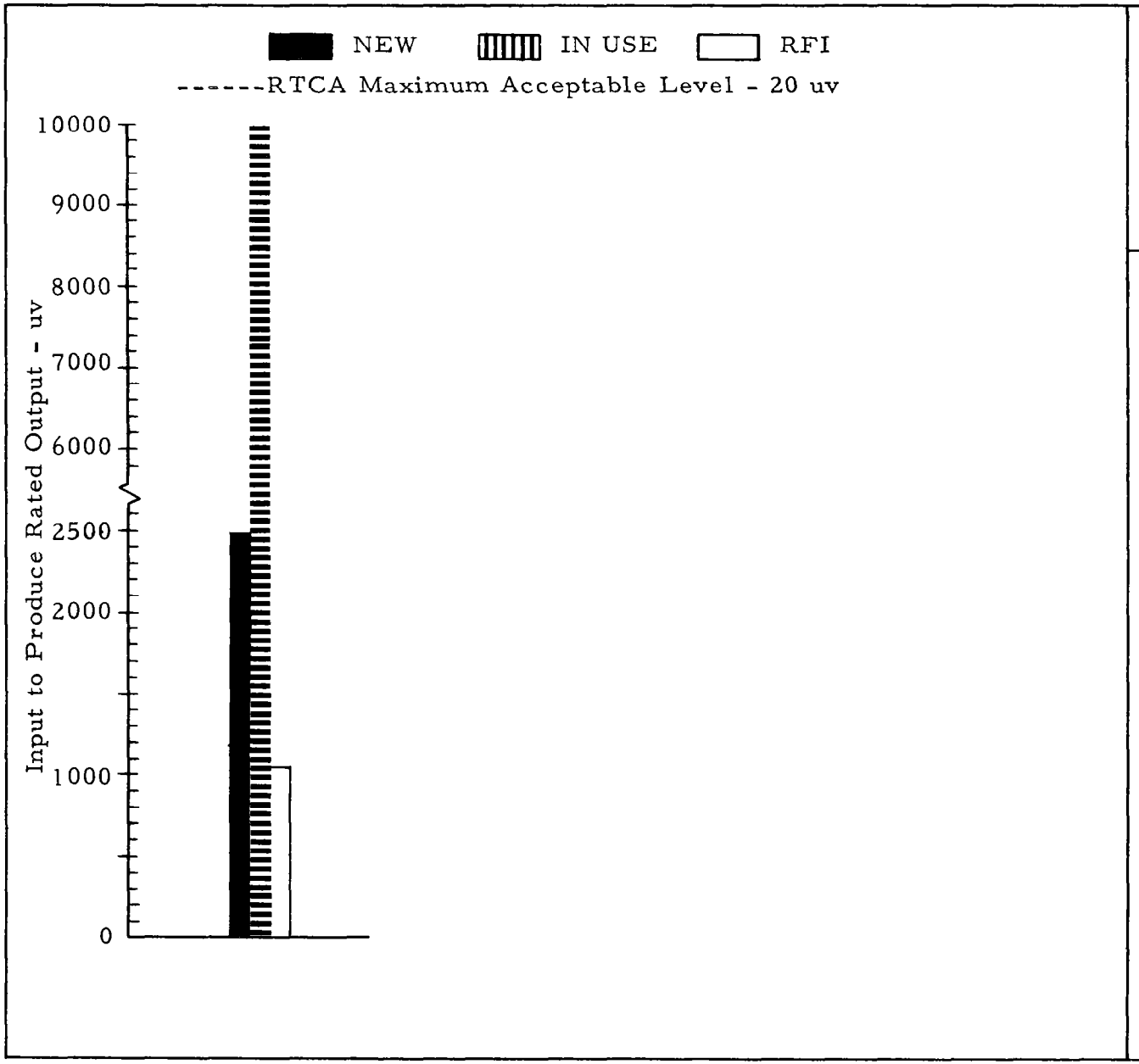
Standard Deviation

New	In Use	RFI
4.1	6.9	4.7

Notes:
1. Each bar represents the arithmetic mean for 3 "In Use" and "RFI" units and 2 "New" units.
2. RTCA maximum acceptable level - 10 db.

Figure C-2(f)

AVC CHARACTERISTICS - VOR RECEIVER - VO-6



GAIN

VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.15

Standard Deviation

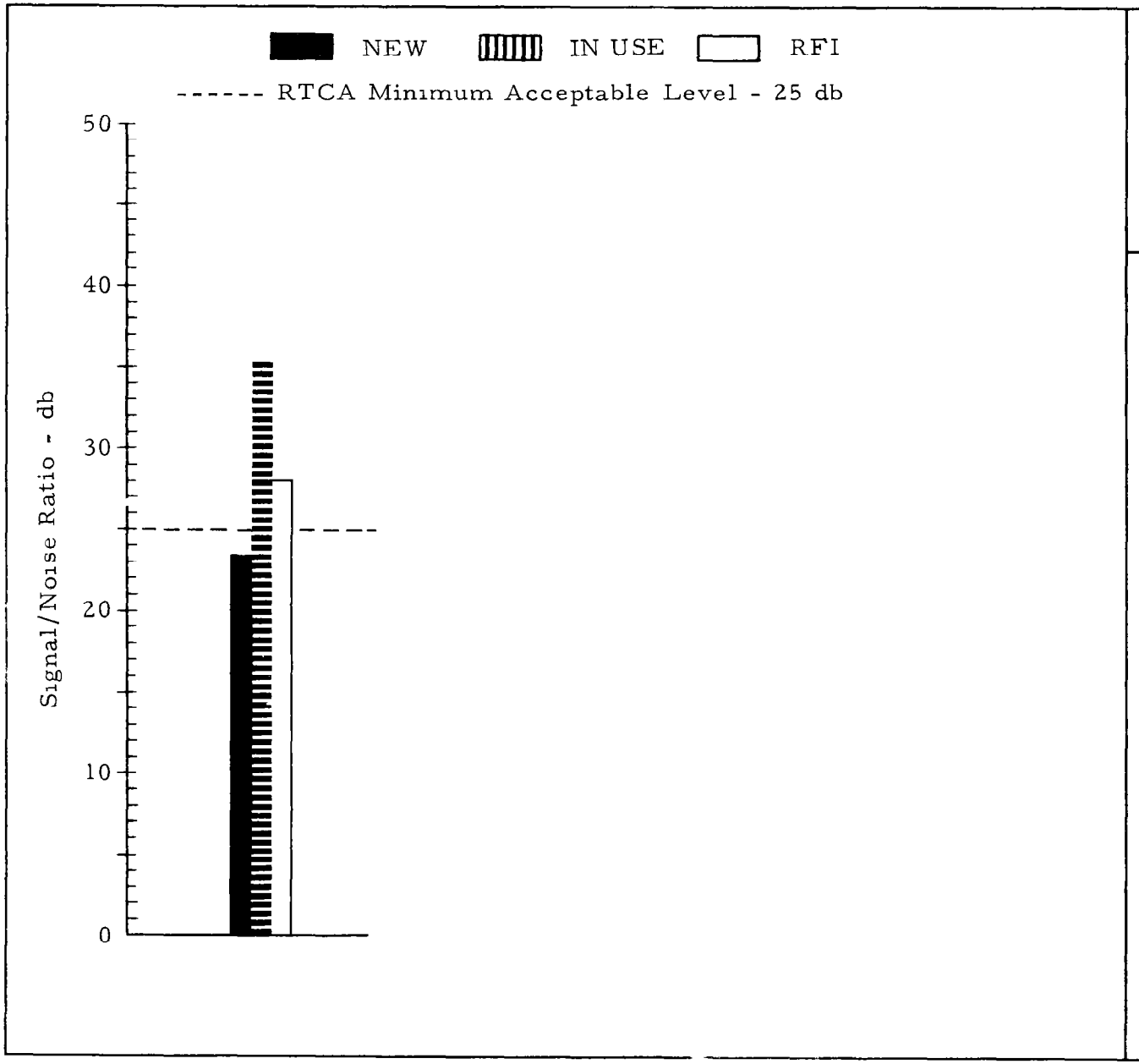
New	In Use	RFI
3489	2140	804

Notes:

1. Each bar represents the arithmetic mean for 3 "In Use" and "RFI" units and 2 "New" units.
2. RTCA maximum acceptable level - 20 uv.
3. Rated output - 2 watts.

Figure C-2(f)

GAIN - VOR RECEIVER - VO-6



AUDIO OUTPUT
NOISE LEVEL
VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69,
Para 2.16

Standard Deviation

New	In Use	RFI
1.32	4.18	1.95

Notes:
1. Each bar represents the arithmetic mean for 3 "In Use" and "RFI" units and 2 "New" units.
2. RTCA minimum acceptable level - 25 db.

AUDIO OUTPUT NOISE LEVEL - VOR RECEIVER - VO-6

Figure C-2(f)

INTERFERENCE TESTS

VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69

Test	Frequency (mc)	F_C (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.6	.19 to 1500	114.9	Acceptable level excluding the band of 107.8 to 118.2 mc: ≥60 db.	Actual Level: <60 db except at: 8.5, 9.1, 10.5, 13.6, 15.2, 34.1, 45.4, 68, 120, 128, 129, 131, 134, 240, 262, 366, 388, 487, and 510 mc. All other frequencies within performance standards.	No
Cross Modulation & Inter Modulation RTCA Para: 2.7	108 to 118	114.9	Acceptable level excluding the band within $F_C \pm 200$ kc: Bearing Error: ≤1 Deg.	Actual Level: 0 degrees.	Yes
Cable Conducted Interference RTCA Para: 2.9(a)	.15 to 25	114.9	Acceptable Emission: ≤200 microvolts.	Actual Emission: <200 microvolts. All frequencies within performance standards	Yes
Antenna Conducted Interference RTCA Para: 2.9(b)	.09 to 1500	114.9	Acceptable Emission: ≤400 micro-microwatts.	Actual Emission: <400 micro-microwatts except at: 125, 250, 372, 510, and 630 mc.	Partially

INTERFERENCE TESTS - VOR RECEIVER - VO-6

(continued on Page C-207)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.17	112 to 118	Varied over VOR band	Acceptable Operation: Deviation indicator shall not depart from its center position.	Actual Operation: No departure of deviation indicator from center position	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	114.9		The following lists the relationship between a radar type signal and the receiver oscillator frequency which will produce a spurious output which will be near the intermediate frequency (10.7 mc) or the image frequency (136.3 mc) of the receiver or the receiver frequency (114.9 mc). (Cont'd on Page C-208)

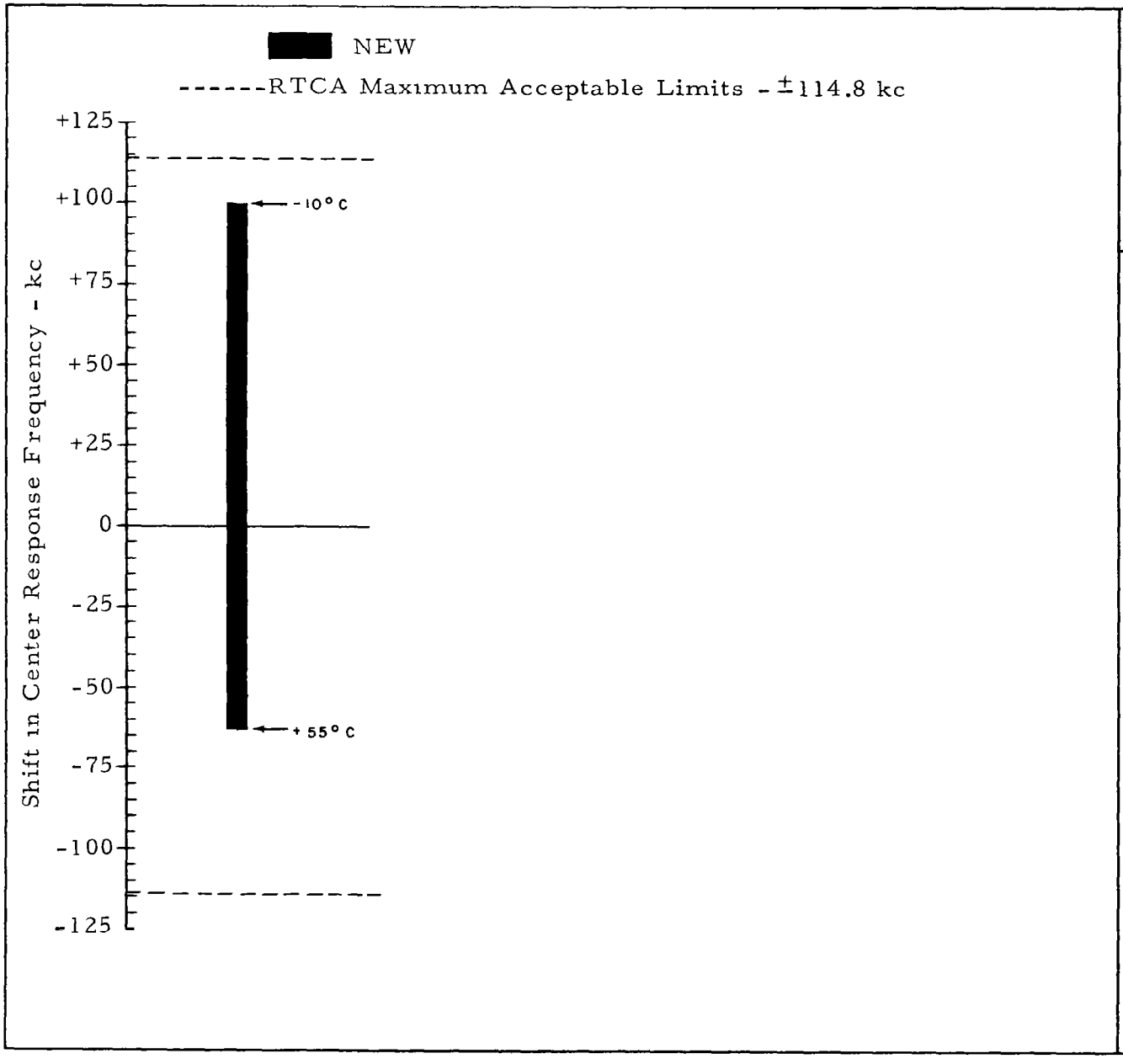
INTERFERENCE TESTS - VOR RECEIVER - VO-6

(continued on Page C-208)

Probable Susceptibility	Relation to Frequency Synthesis					
Radar Type Signal (mc)	Radar Type Signal (Harmonic)	minus	Receiver Oscillator (Harmonic)	approx.	Intermediate Freq. (mc)	Image Freq. (mc)	Receiver Freq. (mc)
102.0	5 th		4 th		10.0		
106.5	6 th		5 th		12.0	135.0	
109.0	7 th		5 th				
132.0	2 nd		3 rd				112.0
144.0	6 th		6 th				113.0
152.0	5 th		6 th		10.0		
169.0	6 th		7 th			136.0	
181.0	7 th		10 th		11.0		
184.0	2 nd		2 nd				116.8
192.0	2 nd		4 th				118.6
204.0	3 rd		6 th			138.0	
211.0	6 th		10 th		10.0		
260.0	1 st		3 rd				115.0
317.0	4 th		10 th		12.0		
367.0	1 st		2 nd				116.0
390.0	1 st		4 th				112.0
495.0	1 st		3 rd				118.0
510.0	1 st		4 th		10.0		
870.0	1 st		8 th			135.0	
125.0, 161.0, 216.0	No Relationship to Frequency Synthesis						
237.0, 305.0, 360.0	No Relationship to Frequency Synthesis						
440.0, 462.0, 500.0	No Relationship to Frequency Synthesis						
516.0, 545.0, 565.0	No Relationship to Frequency Synthesis						

Figure C-2(f)

INTERFERENCE TESTS - VOR RECEIVER - VO-6



TEMPERATURE VARIATION TEST
VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 3.1(b)

Notes:
1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits - ±114.8 kc.
3. This unit is designed to operate below 15,000 feet.
4. This unit is continuously tunable.

Figure C-2(f)

TEMPERATURE VARIATION TEST - VOR RECEIVER - VO-6

Note: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

AUDIO OUTPUT REGULATION & DISTORTION
VOR Receiver: VO-6
Project DANCE
BRD-61, Task-2
RTCA Paper 225-55/DO-69, Para 2.13

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	1500	2190	1800	1100	1350	1500	1270	1500	1520
	500	1800	2000	2100	1300	1590	1700	1650	1890	1600
	1000	2100	2300	2400	1550	1790	1900	1850	2000	2100
	1800	2150	2300	2450	1550	1800	1980	1750	2000	2100
	2500	2100	2300	2400	1600	1860	2000	1870	2000	2100
New Unit No. 2	350	1400	1500	1530	1250	1350	1400	1150	1200	1250
	500	1700	1780	1800	1400	1510	1600	1450	1500	1550
	1000	1850	1980	2000	1500	1620	1700	1650	1750	1780
	1800	1700	1890	1950	1200	1400	1500	1610	1750	1790
	2500	1500	1700	1800	950	1180	1300	1510	1700	1750
In Use Unit No. 1	350	880	1010	1170	750	1080	1250	690	760	820
	500	1300	1500	1600	1110	1370	1520	1000	1130	1200
	1000	1610	1740	1750	1490	1680	1750	1300	1300	1300
	1800	1700	1790	1770	1500	1710	1800	1300	1300	1310
	2500	1700	1710	1750	1510	1730	1780	1250	1300	1300
In Use Unit No. 2	350	170	210	275	500	610	700	290	340	375
	500	320	380	475	700	800	910	510	600	610
	1000	500	630	710	800	950	1100	700	700	850
	1800	330	420	580	490	550	650	500	600	650
	2500	260	340	440	230	290	370	300	370	470

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-6

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
In Use Unit No. 3	350	400	550	610	500	650	740	280	390	410
	500	610	800	880	660	890	990	470	600	630
	1000	920	1100	1190	890	1110	1250	700	770	800
	1800	910	1100	1180	880	1140	1250	690	750	528
	2500	790	950	1000	720	990	1110	590	670	700
RFI Unit No. 1	350	1270	1400	1500	1270	1500	1600	900	970	1000
	500	1670	1800	1900	1520	1700	1810	1380	1490	1550
	1000	1950	2080	2200	1800	1980	2100	1610	1700	1710
	1800	2050	2200	2310	1850	2000	2200	1700	1750	1800
	2500	2100	2270	2330	1870	2050	2250	1700	1750	1790
RFI Unit No. 2	350	1100	1350	1500	1100	1200	1500	1050	1250	1370
	500	1550	1750	1800	1500	1700	1800	1500	1650	1710
	1000	1900	2100	2300	1900	2050	2250	1800	1900	1990
	1800	1900	2100	2250	1900	2010	2200	1800	1890	1920
	2500	1800	2000	2150	1800	2000	2150	1700	1800	1850
RFI Unit No. 3	350	1120	1350	1400	1100	1300	1400	1000	1280	1300
	500	1760	1920	2000	1710	1900	1900	1500	1600	1710
	1000	1900	2090	2100	1880	2000	2000	1750	1770	1800
	1800	1910	2100	2100	1900	1950	1970	1750	1800	1800
	2500	1900	2000	2000	1900	1900	1950	1600	1710	1750

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-6

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
New Unit No. 1	350	24.0	23.0	22.5	32.0	30.0	28.5	23.0	22.0	22.0
	500	18.0	19.0	19.5	25.0	24.0	23.0	18.5	21.0	21.8
	1000	15.0	17.8	18.5	20.0	20.0	20.0	17.0	20.0	21.0
	1800	14.2	16.9	17.6	20.2	20.0	20.0	16.0	17.8	18.8
	2500	14.5	16.5	17.0	20.5	19.5	18.5	16.0	17.0	18.2
New Unit No. 2	350	20.5	22.0	23.1	21.0	22.5	24.0	20.5	22.0	23.1
	500	22.0	23.5	24.0	21.5	23.0	24.0	23.4	24.5	25.0
	1000	22.0	23.5	24.0	20.0	21.5	22.2	24.0	25.0	25.5
	1800	20.0	21.0	21.8	20.8	21.0	21.5	21.0	22.1	23.0
	2500	22.5	22.0	22.0	25.0	24.5	24.5	20.5	21.2	22.0
In Use Unit No. 1	350	23.5	24.0	23.0	32.0	31.0	29.4	23.0	23.0	23.0
	500	15.7	16.5	17.2	24.2	23.0	21.5	17.9	20.0	21.0
	1000	14.0	15.2	16.0	17.8	16.8	16.0	18.2	19.5	20.0
	1800	13.5	14.7	15.2	17.9	16.8	15.8	16.8	17.5	18.0
	2500	13.4	14.2	24.8	18.0	17.0	17.5	16.5	16.7	17.2
In Use Unit No. 2	350	18.0	20.0	23.0	21.7	23.0	25.0	21.5	25.5	29.0
	500	18.0	21.5	24.5	21.0	23.0	24.0	18.5	20.0	21.0
	1000	12.0	14.0	16.0	15.0	16.5	19.5	15.0	16.0	17.0
	1800	8.6	8.5	9.0	12.0	12.5	12.0	8.8	10.0	12.5
	2500	11.5	11.0	11.0	16.0	15.0	15.0	8.3	8.0	8.0
In Use Unit No. 3	350	16.5	17.0	18.0	20.0	20.0	20.0	17.0	19.0	20.0
	500	13.0	15.0	16.0	16.0	16.0	16.0	15.0	18.0	19.5
	1000	13.0	15.0	15.5	12.5	13.5	14.0	17.0	19.0	19.0
	1800	11.5	13.0	14.0	12.5	13.0	13.5	14.5	16.0	16.0
	2500	10.5	12.0	13.0	14.0	14.0	14.5	12.0	13.5	14.0

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-6

Figure C-2(f)

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input	100 uv Input	1000 uv Input	10,000 uv Input
RFI Unit No. 1	350	43.0	40.0	38.0	53.0	50.0	47.0	37.0	36.0	34.0
	500	29.0	28.0	27.0	42.0	39.0	37.0	25.5	25.5	25.5
	1000	21.5	24.7	22.0	32.0	29.4	28.0	20.5	21.5	22.0
	1800	20.0	20.0	20.0	30.0	29.0	27.5	19.0	20.0	20.5
	2500	20.0	20.0	20.0	30.0	30.0	29.0	19.0	19.5	20.0
RFI Unit No. 2	350	15.5	15.2	15.5	16.1	16.0	16.3	15.0	16.0	17.0
	500	13.0	14.0	15.0	13.5	14.0	15.0	16.0	17.6	19.0
	1000	13.0	14.5	16.0	12.8	14.2	15.3	18.0	19.1	20.5
	1800	11.0	12.3	13.8	11.4	12.5	13.2	15.2	16.7	17.8
	2500	10.5	11.5	12.5	11.1	12.0	13.0	13.5	15.0	15.9
RFI Unit No. 3	350	31.0	28.0	21.0	40.0	35.0	33.5	33.0	31.0	29.3
	500	21.0	18.0	17.5	32.0	29.5	27.0	24.2	20.8	19.6
	1000	15.0	14.8	10.0	25.0	21.8	20.0	21.0	19.0	14.5
	1800	10.5	9.5	8.5	26.0	25.5	24.0	20.2	19.5	18.8
	2500	10.0	10.0	9.0	27.1	26.8	25.0	21.5	20.7	19.4

Figure C-2(f)

AUDIO OUTPUT REGULATION & DISTORTION - VOR RECEIVER - VO-6

SECTION C

AIRBORNE NAVIGATION EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

4. Laboratory and Field Test Data

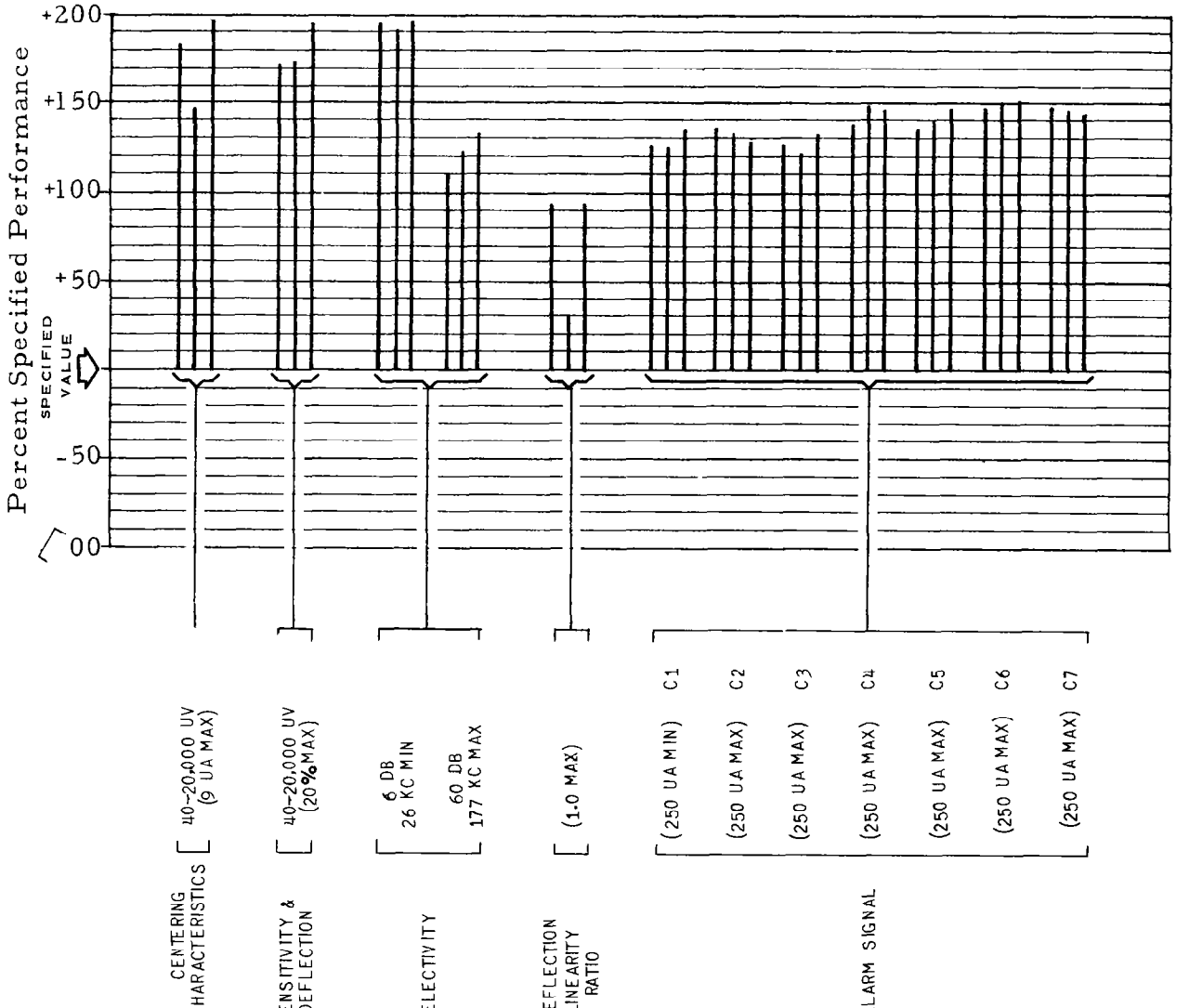
a. LO-1, Localizer Receiver

General:

Frequency Range:	108.0 - 135.9 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	280
Number of Channels Available at Operator's Position:	280
Means of Frequency Selection:	Rotary Switch

Technical:

	Page(s)
Percent Specified Performance	C-212
Weighted Performance	C-213
Centering Characteristic	C-214
Selectivity	C-215
Sensitivity and Deflection Characteristic	C-216
Deflection Linearity	C-217
Alarm Signal	C-218-219
Deviation Indicator Stability	C-220
Percentage Modulation Characteristic	C-221
Deviation Indicator Sensitivity Adjustment Range - Centering Characteristic	C-222
Deviation Indicator Sensitivity Adjustment Range - Sensitivity & Deflection Characteristic	C-223
Deviation Indicator Sensitivity Adjustment Range - Deflection Linearity	C-224
Audio Frequency Response	C-225
Interference Tests	C-226-227
Temperature Variation Test	C-228
Audio Output Regulation & Distortion	C-229

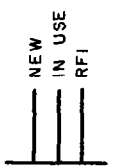


PERCENT
SPECIFIED PERFORMANCE
Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59

Notes:

1 Each bar represents the arithmetic mean for 3 units

2. Equipment status represented by bars.

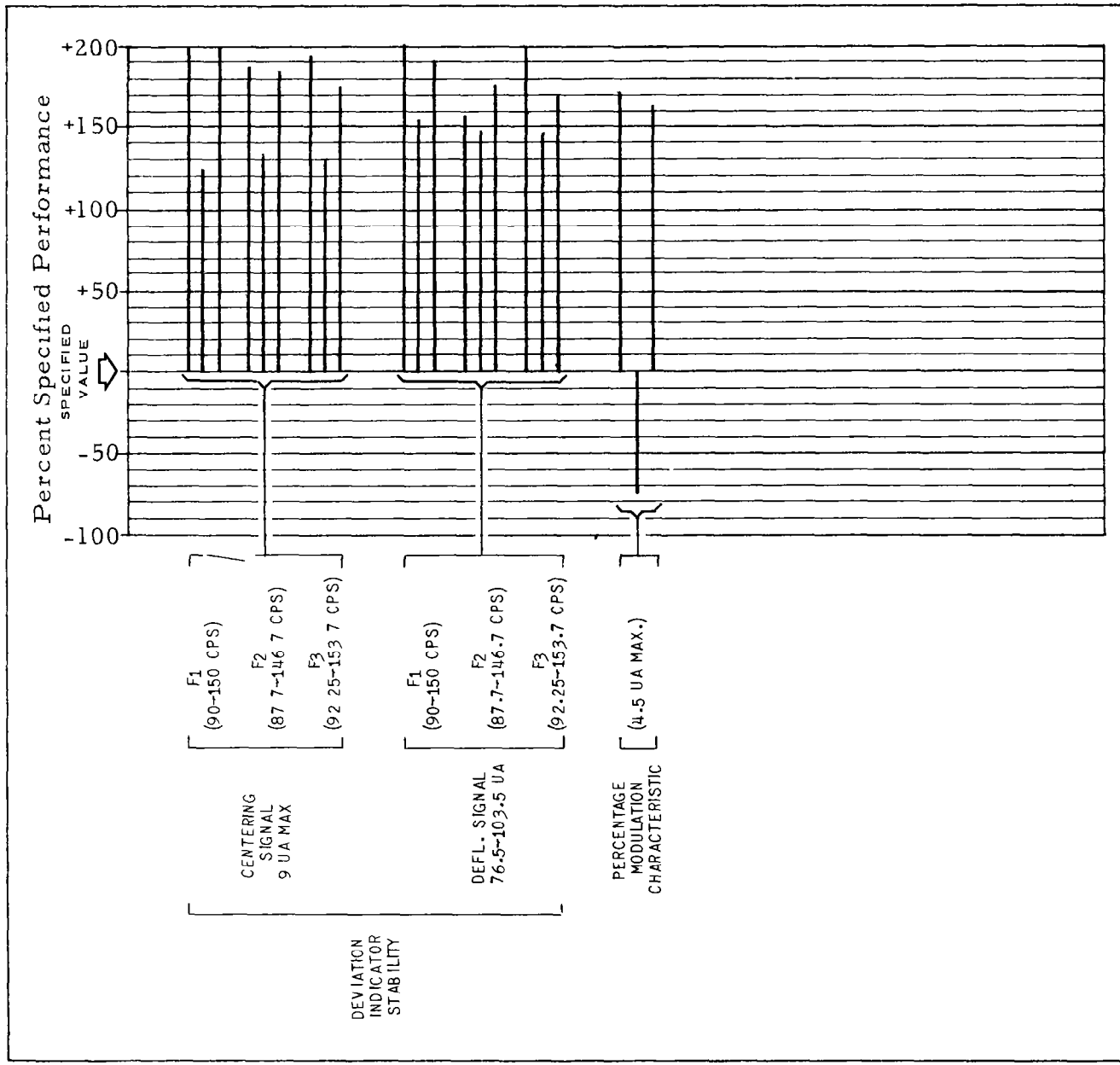


3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - LOCALIZER RECEIVER - LO-1

(continued on Page C-212a)

Figure C-3(a)



PERCENT
SPECIFIED PERFORMANCE

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59

Notes:

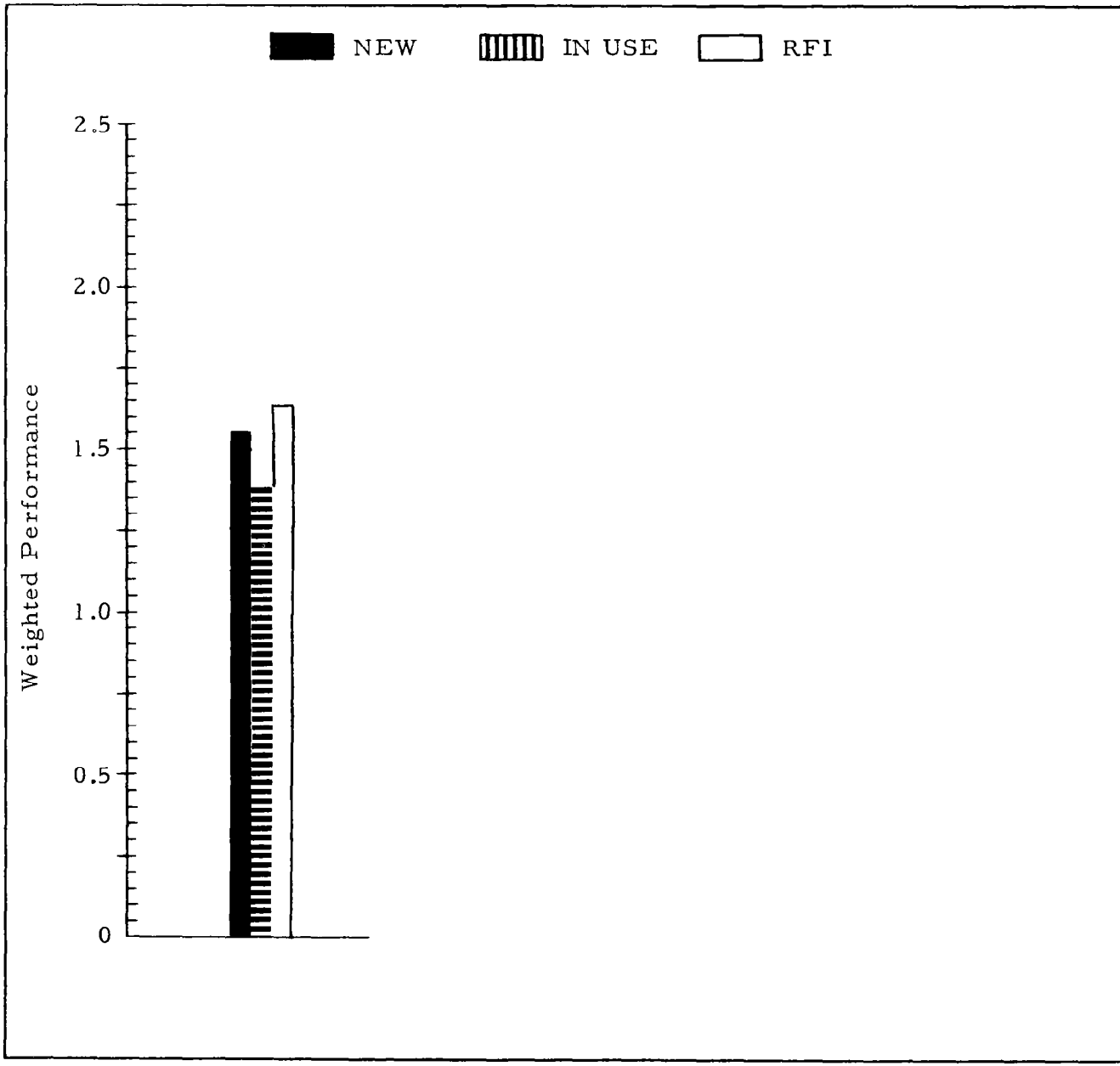
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - LOCALIZER RECEIVER - LO-1

Figure C-3(a)



WEIGHTED PERFORMANCE

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2

WEIGHTING FACTORS

Centering Characteristics: 1/4

Sensitivity & Deflection: 3/20

Selectivity:
b_1, b_2 1/8 ea.

Deflection Linearity: 1/10

Alarm Signal:
c_1, c_2, c_3, c_4, c_5, c_6, c_7 1/70 ea.

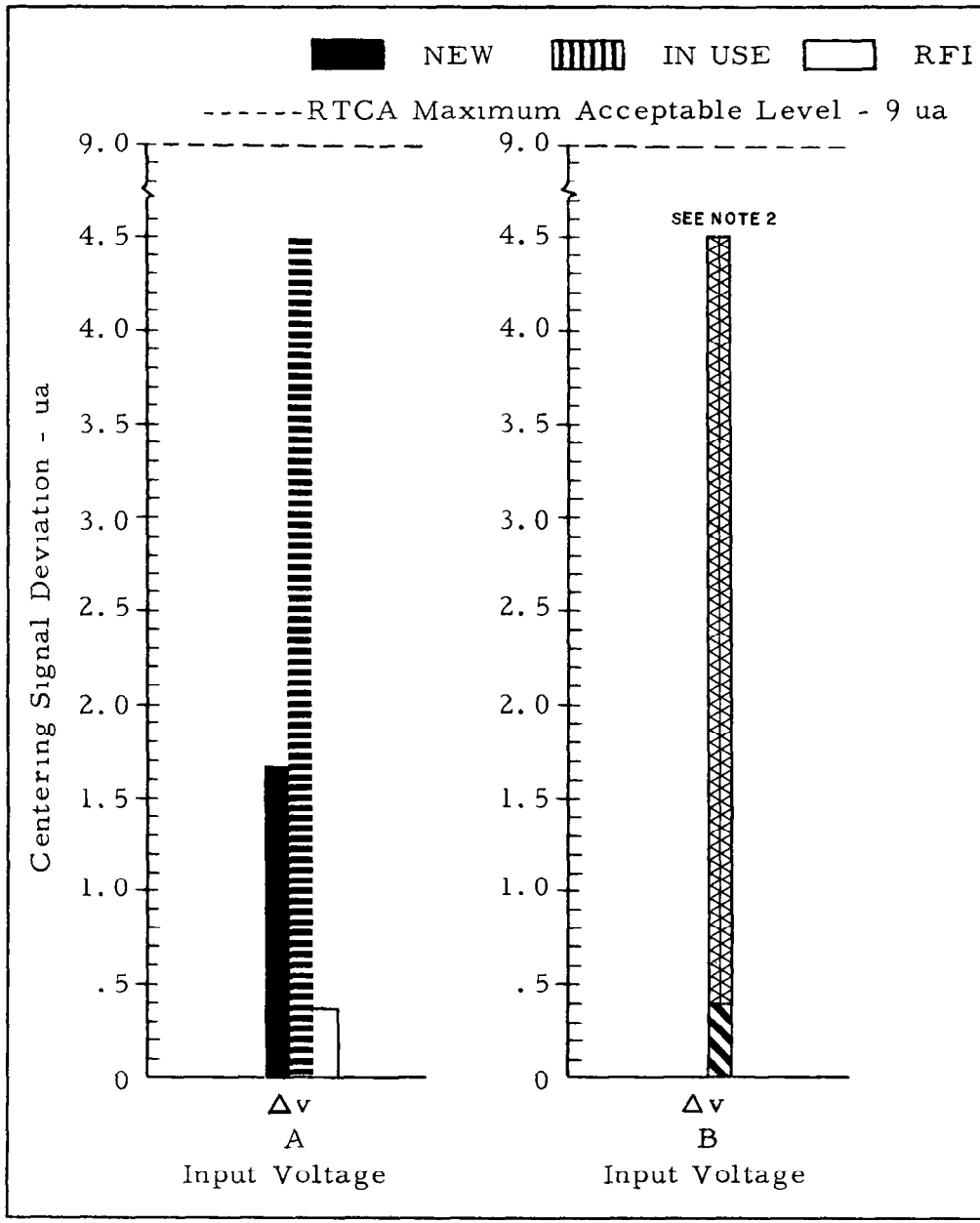
Deviation Indicator Stability:
(I) f_1, f_2, f_3 1/60 ea.
(II) f_1, f_2, f_3 1/60 ea.

Percentage Modulation Characteristic: 1/20

Note:
1. Graph based on arithmetic mean for above characteristics.

Figure C-3(a)

WEIGHTED PERFORMANCE - LOCALIZER RECEIVER - LO-1



CENTERING CHARACTERISTIC

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.3

LEGEND

Δv - 40 - 20,000 uv
Standard Deflection - 90 ua

Standard Deviation

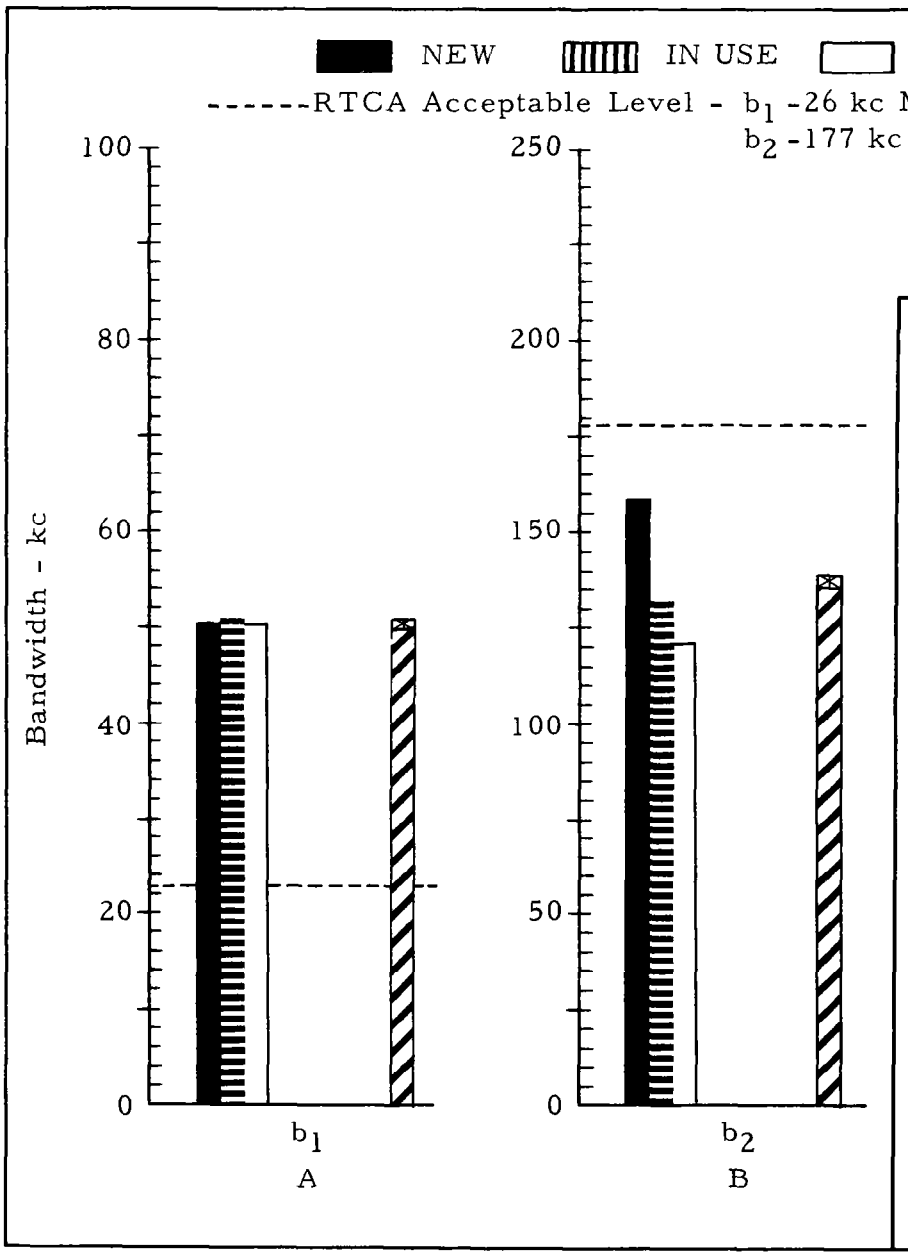
Test	New	In Use	RFI
A	2.04	2.89	.91
B		2.89	
		.53	

Notes:

1. Each bar in Graph "A" and "B" represents the arithmetic mean for 3 units.
2. "In Use" units before adjustments.
   "In Use" units after adjustments.
3. RTCA maximum acceptable level - 9 ua.
4. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-3(a)

CENTERING CHARACTERISTIC - LOCALIZER RECEIVER - LO-1



5. Adjustments were made in accordance with manufacturer's recommended practices.

SELECTIVITY

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.6

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 110.1 mc

Standard Deviation

Test	New	In Use		RFI
		Before	After	
b_1	3.4	6.3	9.2	4.5
b_2	6.4	8.9	7.5	22.7

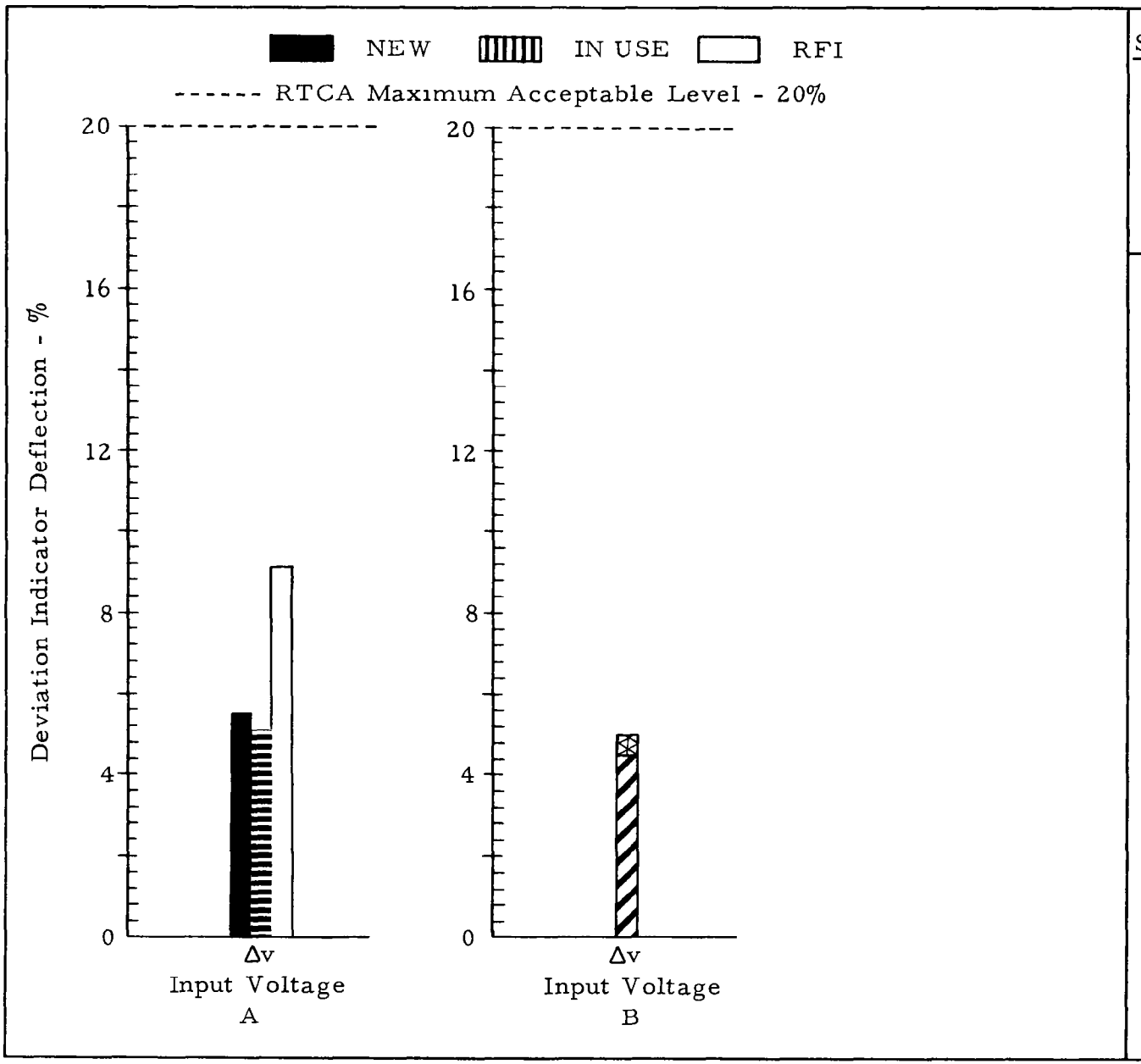
Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Graphs A and B:
   - "In Use" units after adjustments.
   - "In Use" units before adjustments.
3. RTCA acceptable levels:
   b_1 - 26 kc minimum
   b_2 - 177 kc maximum
4. This receiver is tuned in discrete steps.

← continued next column

Figure C-3(a)

SELECTIVITY - LOCALIZER RECEIVER - LO-1



SENSITIVITY & DEFLECTION CHARACTERISTIC
Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.4

LEGEND

Δv - 40 - 20,000 uv

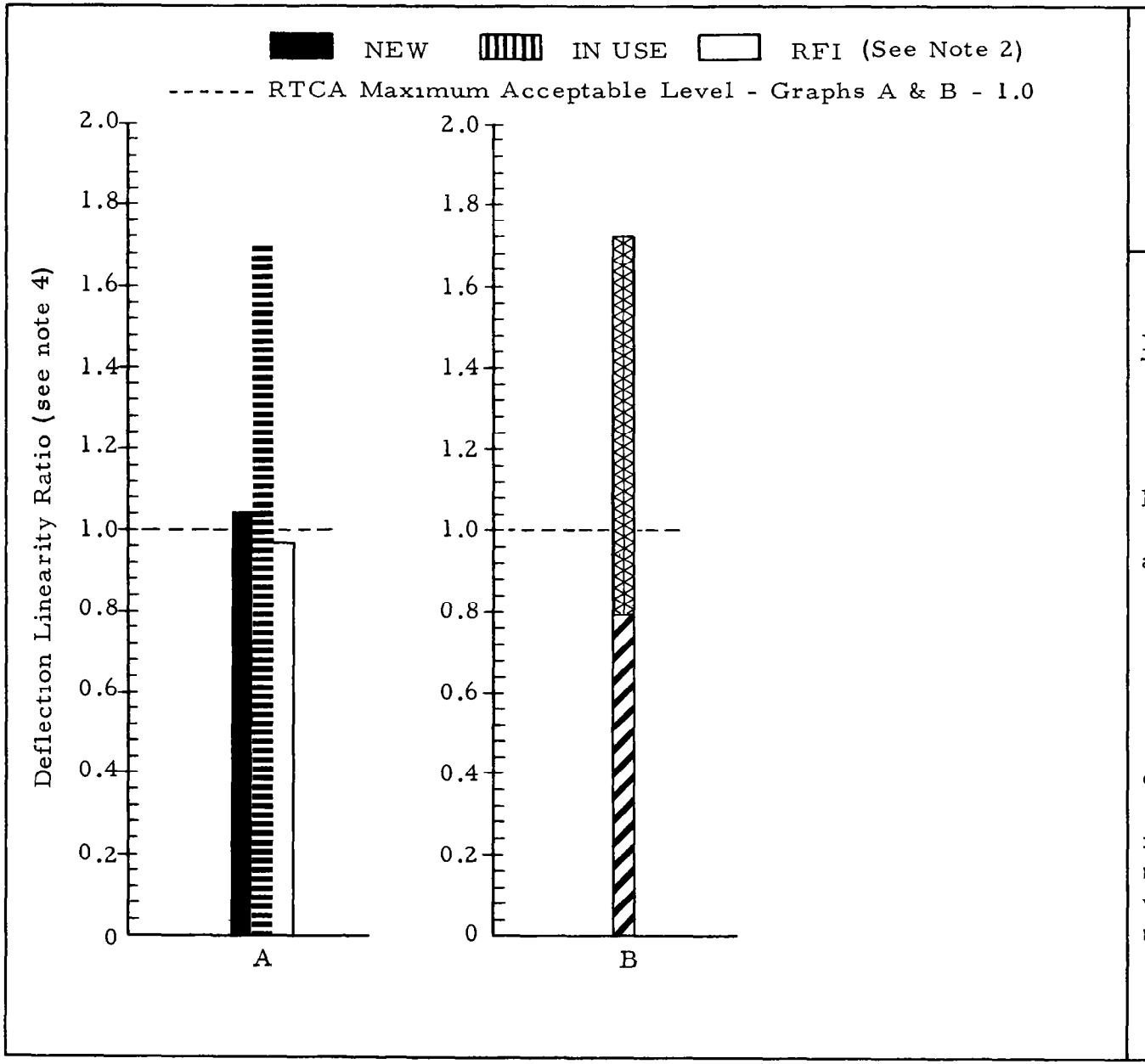
Standard Deviation

Test	New	In Use	RFI
A	5.9	2.36	4.85
B		2.36	
		4.70	

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. Graph B:
   - "In Use" units before adjustments.
   - "In Use" units after adjustments.
3. RTCA maximum acceptable level - 20%.
4. Adjustments were made in accordance with the manufacturer's recommended practices.

Figure C-3(a)

SENSITIVITY & DEFLECTION CHARACTERISTIC - LOCALIZER RECEIVER - LO-1



DEFLECTION LINEARITY

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.5

Standard Deviation

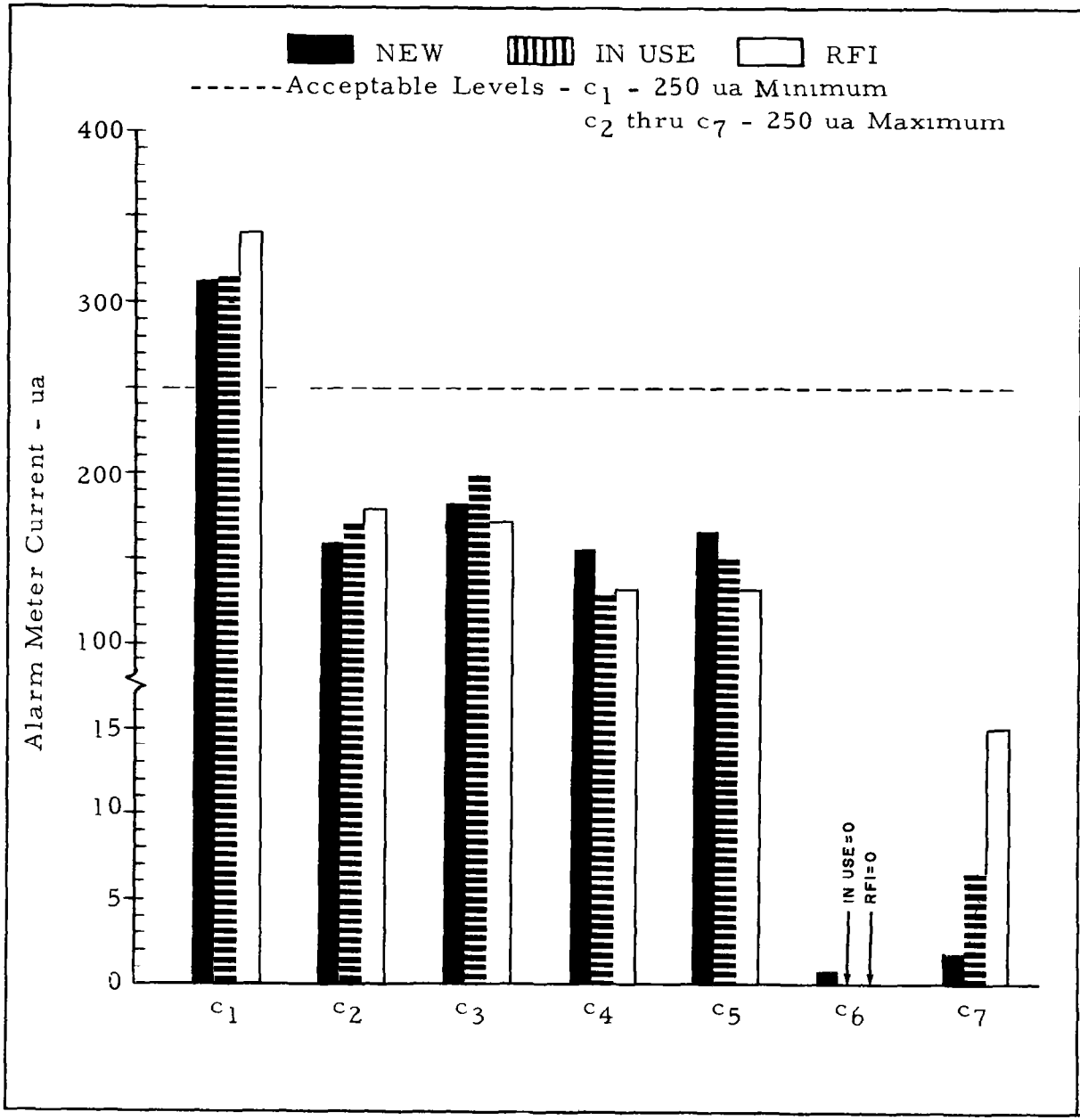
New	In Use		RFI
	Before	After	
0.7	0.4	0.1	0.1

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Graph B:
   - "In Use" units before adjustments.
   - "In Use" units after adjustments.
3. RTCA maximum acceptable level - 1.0.
4. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.

DEFLECTION LINEARITY - LOCALIZER RECEIVER - LO-1

Figure C-3(a)



ALARM SIGNAL

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.9

LEGEND

c_1 - std. test sig. - 40 uv
c_2 - mod. 0% - 150 cps & 20% - 90 cps
c_3 - mod. 0% - 90 cps & 20% - 150 cps
c_4 - mod. 10% - 90 cps & 10% - 150 cps
c_5 - std. dev. sig. @ 50% deflection
c_6 - absence of mod. - 1000 uv
c_7 - absence of R.F.

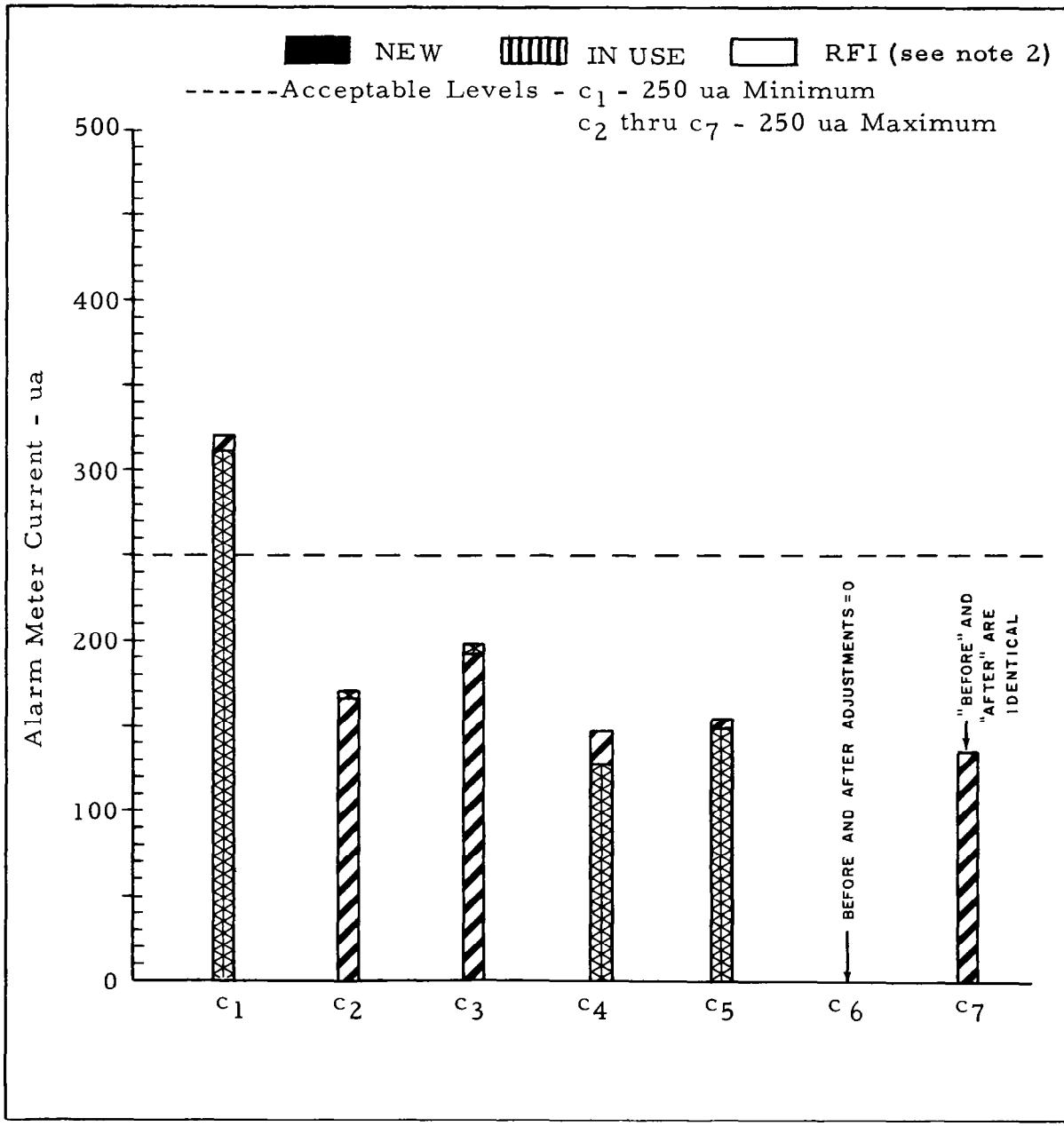
Test	Standard Deviation New	In Use	RFI
c_1	12.6	64.2	14.3
c_2	5.1	53.0	13.0
c_3	6.0	59.7	66.0
c_4	12.7	75.4	42.4
c_5	31.4	43.6	37.4
c_6	1.2	0	0
c_7	2.9	7.6	15.0

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA papers as a guide.

Figure C-3(a)

ALARM SIGNAL - LOCALIZER RECEIVER - LO-1

(continued on Page C-219)



ALARM SIGNAL

Loclaizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.9

LEGEND

c_1 - std. test sig. - 40 uv
c_2 - mod. 0% - 150 cps & 20% - 90 cps
c_3 - mod. 0% - 90 cps & 20% - 150 cps
c_4 - mod. 10% - 90 cps & 10% - 150 cps
c_5 - std. dev. sig. @ 50% deflection
c_6 - absence of mod. - 1000 uv
c_7 - absence of R.F.

Standard Deviation

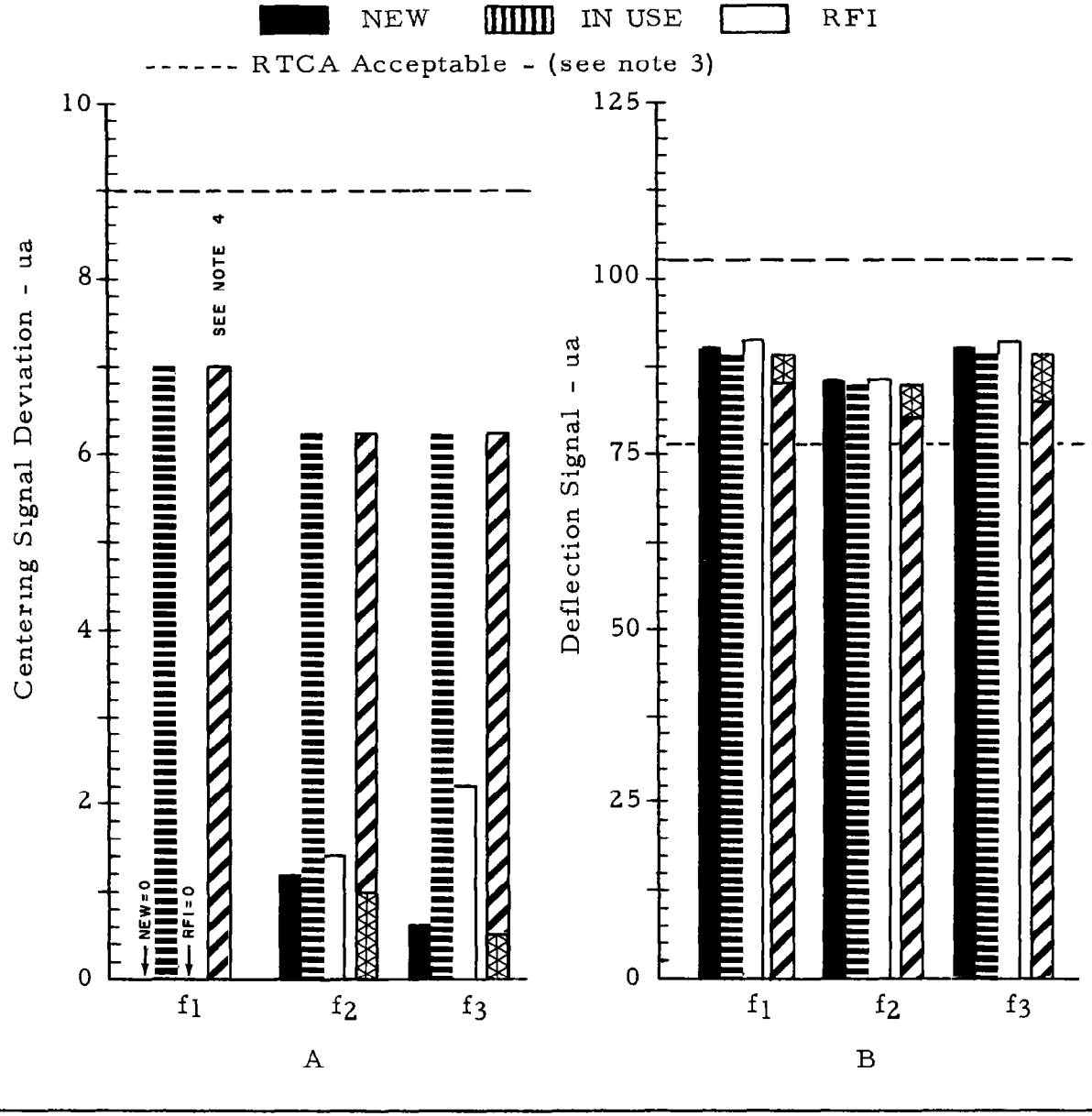
Test	In Use	
	Before	After
c_1	64.2	21.6
c_2	53.0	12.7
c_3	59.7	13.2
c_4	75.4	7.6
c_5	43.6	5.0
c_6	0	0
c_7	7.6	58.0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. "In Use" units before adjust.
   "In Use" units after adjust.
3. Acceptable levels were determined by using RTCA papers as a guide.
4. Adjustments were made in accordance with mfgr's recomd. practices.

Figure C-3(a)

ALARM SIGNAL - LOCALIZER RECEIVER - LO-1



DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQ. OF 90 & 150 cps SIGNALS

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.13 (a) (b)

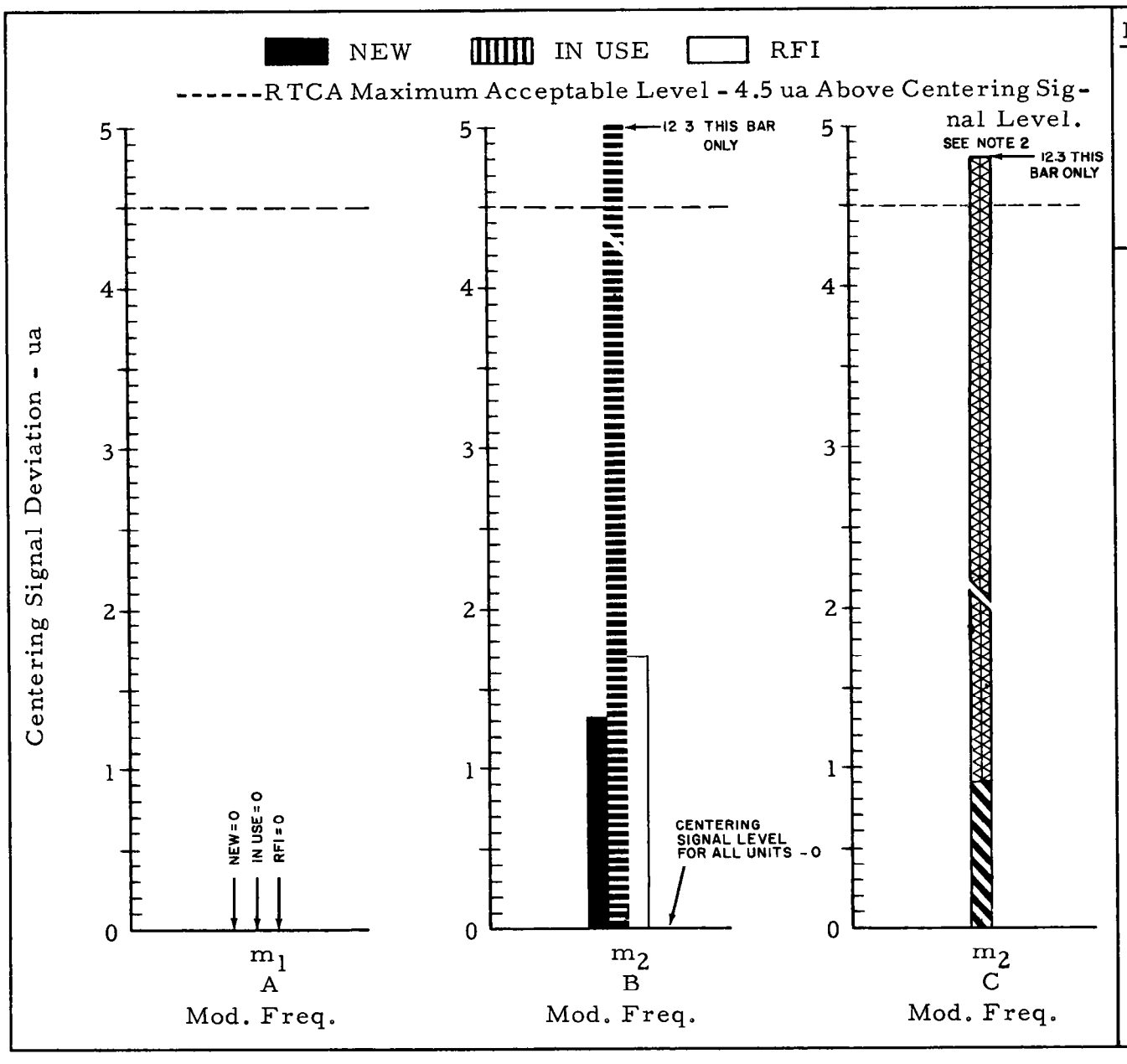
LEGEND
f1 - 90 & 150 cps
f2 - 87.75 & 146 25 cps
f3 - 92.25 & 153 75 cps

	Test	Standard Deviation New	In Use Before	In Use After	RFI
A	f_1	0	7.8	0	0
	f_2	0.8	5.1	1.0	1.0
	f_3	0.6	6.8	0.3	0.4
B	f_1	1.0	14.4	4.0	2.3
	f_2	8.3	13.0	3.8	4.4
	f_3	8.7	9.6	4.0	6.1

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. "In Use" units after adjust.
   "In Use" units before adjust.
3. RTCA acceptable:
   Graph A: Centering signal - 9 ua maximum.
   Graph B: Deflection signal limits- 76.5 to 103.5 ua.
4. Graph A: f_1 after adjust. is zero.
5. Adjust's. were made in accord. with manufacturer's recommended practices.

DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQUENCY OF 90 & 150 cps SIGNALS
LOCALIZER RECEIVER - LO-1

Figure C-3(a)



PERCENTAGE MODULATION CHARACTERISTIC

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.18

LEGEND

m_1 - 20% of 90 and 150 cps
m_2 - 25% of 90 and 150 cps

Standard Deviation

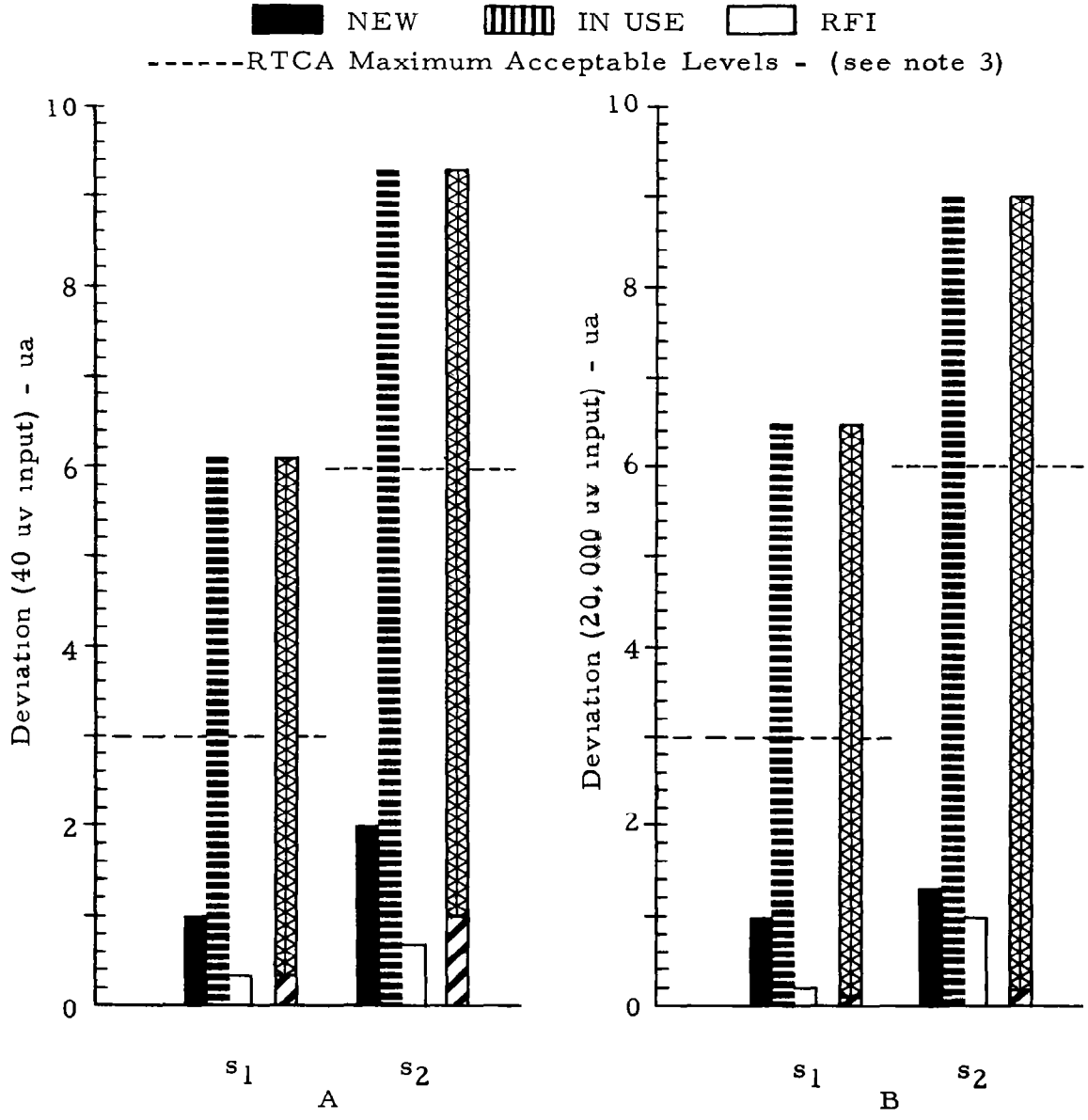
Test	New	In Use	RFI
A m_1	0	0	0
B m_2	1.5	12.80	2.0
C		12.80	
		0.04	

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Graph C:
   - "In Use" units before adjustments.
   - "In Use" units after adjustments.
3. RTCA maximum acceptable level - 4.5 ua above centering signal level.
4. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-3(a)

PERCENTAGE MODULATION CHARACTERISTIC - LOCALIZER RECEIVER - LO-1



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.14

LEGEND

Sensitivity Setting
s_1 - 0.4 of full scale
s_2 - 0.8 of full scale
Standard Deviation

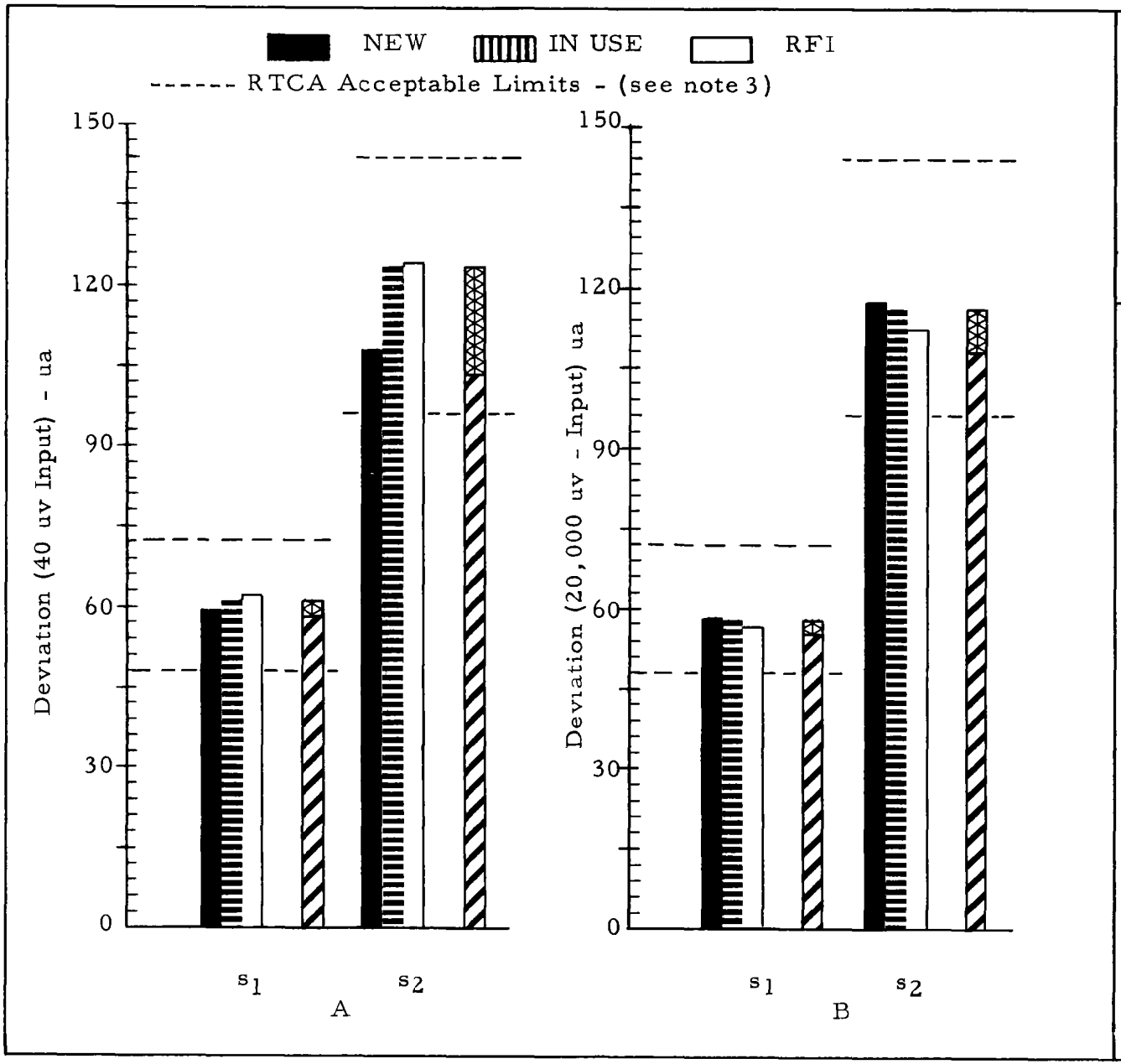
Test		New	In Use Before	In Use After	RFI
A	s_1	1.0	6.1	0.6	0.5
	s_2	2.6	9.3	1.0	1.1
B	s_1	1.0	8.2	0.1	0.3
	s_2	2.3	10.4	0.3	1.0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. ▩ "In Use" units before adjustments.
   ◪ "In Use" units after adjustments.
3. RTCA maximum acceptable levels: Graph A & B
   s_1 - 0.4 of full scale - 3 ua max.
   s_2 - 0.8 of full scale - 6 ua max.
4. Adjustments were made in accordance with mfgr's recommended practices.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-1
(Centering Characteristic)

Figure C-3(a)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Sensitivity & Deflection)
Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59
Para 2.14

LEGEND

Sensitivity Setting
s_1 - 0.4 of full scale
s_2 - 0.8 of full scale

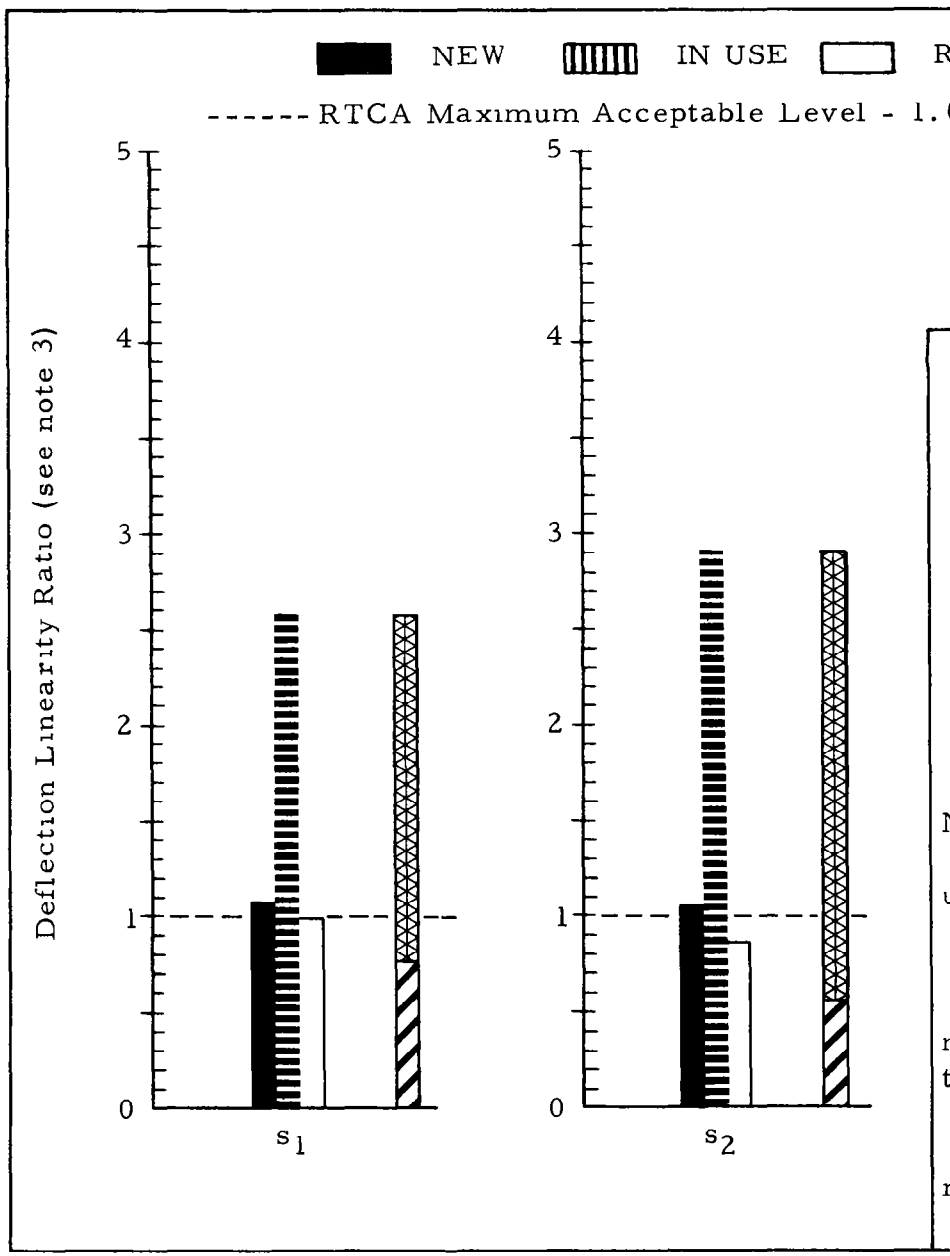
Standard Deviation

Test		New	In Use Before	In Use After	RFI
A	s_1	3.0	5.7	1.2	0.6
	s_2	4.0	10.0	1.7	1.0
B	s_1	1.5	4.5	3.0	4.0
	s_2	3.6	11.6	5.7	9.6

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. ▩ "In Use" units after adjustment.
▨ "In Use" units before adjustment.
3. RTCA acceptable limits: Graph A and B:
s_1 - 0.4 full scale, 48-72 ua
s_2 - 0.8 full scale, 96-144ua
4. Adjust. made in accord. mfgrs. recommended practice.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-1
(Sensitivity & Deflection)

Figure C-3(a)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Deflection Linearity)
Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.14

LEGEND

Sensitivity Setting
s_1 - 0.4 of Full Scale Adjustment
s_2 - 0.8 of Full Scale Adjustment

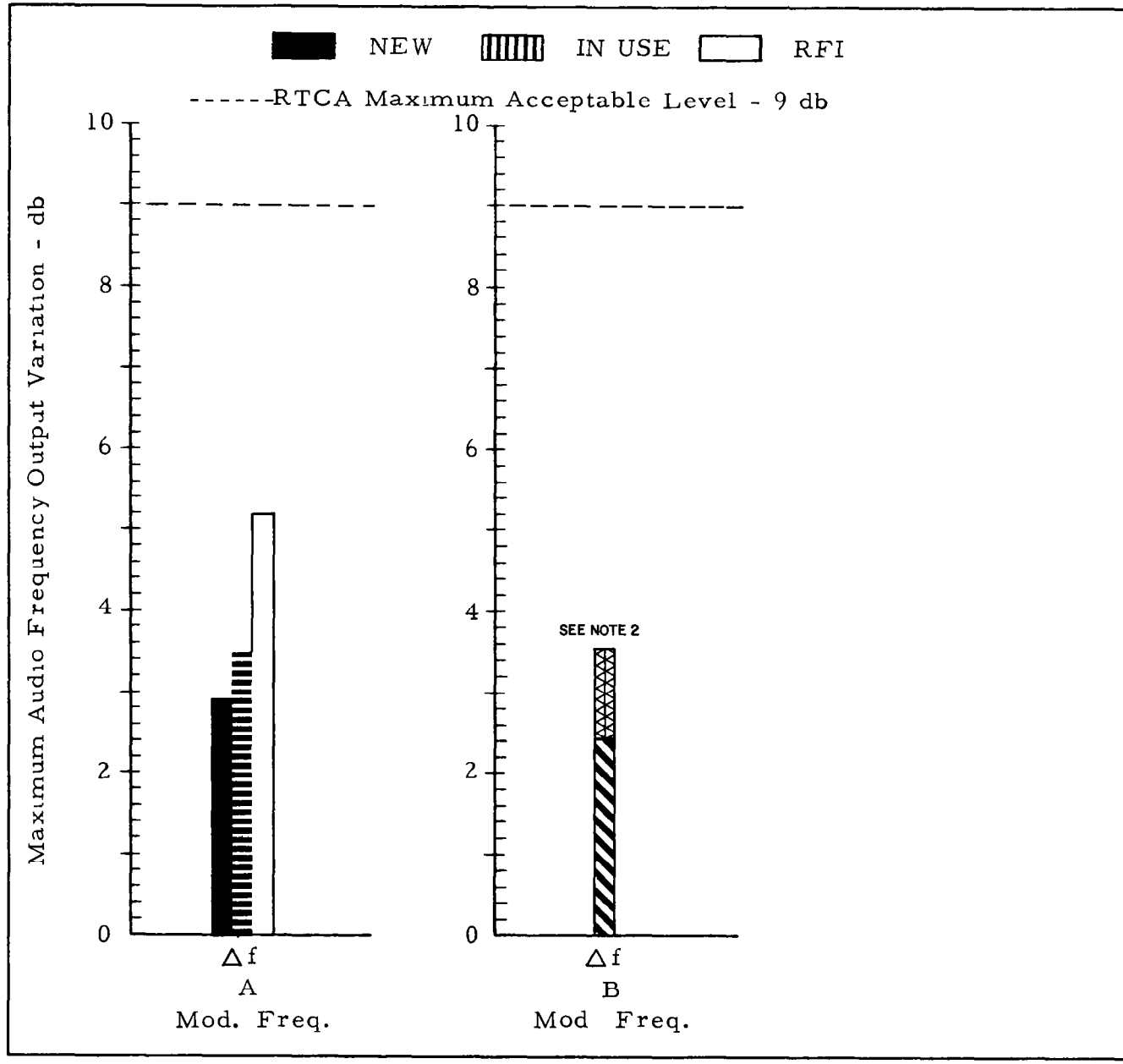
Standard Deviation

Test	New	In Use		RFI
		Before	After	
s_1	0.4	1.6	0.2	0.2
s_2	0.4	2.9	0.1	0.1

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. ⊠ "In Use" units before adjustment.
   ◪ "In Use" units after adjustment.
3. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.
4. RTCA maximum acceptable level - 1.0.
5. Adjustments were made in accordance with manufacturer's recommended practices.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-1
(Deflection Linearity)

Figure C-3(a)



AUDIO FREQ. RESPONSE

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.16

LEGEND

Δf - 350 - 2500 cps

Standard Deviation

Test	New	In Use	RFI
A	0.7	1.3	3.2
B		1.8 2.1	

Notes:

1. Each bar represents the arithmetic mean for 3 units in Graph A. Each bar in Graph B represents 2 units.
2. Graph B:
   - "In Use" units before adjustments.
   - "In Use" units after adjustments.
3. RTCA maximum acceptable level - 9 db
4. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-3(a)

AUDIO FREQUENCY RESPONSE - LOCALIZER RECEIVER - LO-1

INTERFERENCE TESTS

Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.7	.19 to 1500	110.9	Acceptable level excluding the band 107.8 to 112.2 mc. ≥60 db.	Actual Level: ≥60 db. All frequencies within performance standards.	Yes
Cross Modulation RTCA Para: 2.8	107 to 112	110.1	Acceptable level excluding the band within F_c ±200 kc: Alarm Device: ≥250 microamps. * Deviation Indication: ≤9 microamps.	Actual Level: ≥250 Microamps 0 Microamps. All frequencies within performance standards.	Yes
Cable Conducted Interference RTCA Para: 2.10a	.15 to 25	108.0	Acceptable Emission: ≤200 microvolts. * Acceptable levels were determined by using RTCA Papers as a guide.	Actual Emission on +28v. line: <200 microvolts except at 20.6 mc. All other frequencies within performance standards.	Partially

INTERFERENCE TESTS - LOCALIZER RECEIVER - LO-1

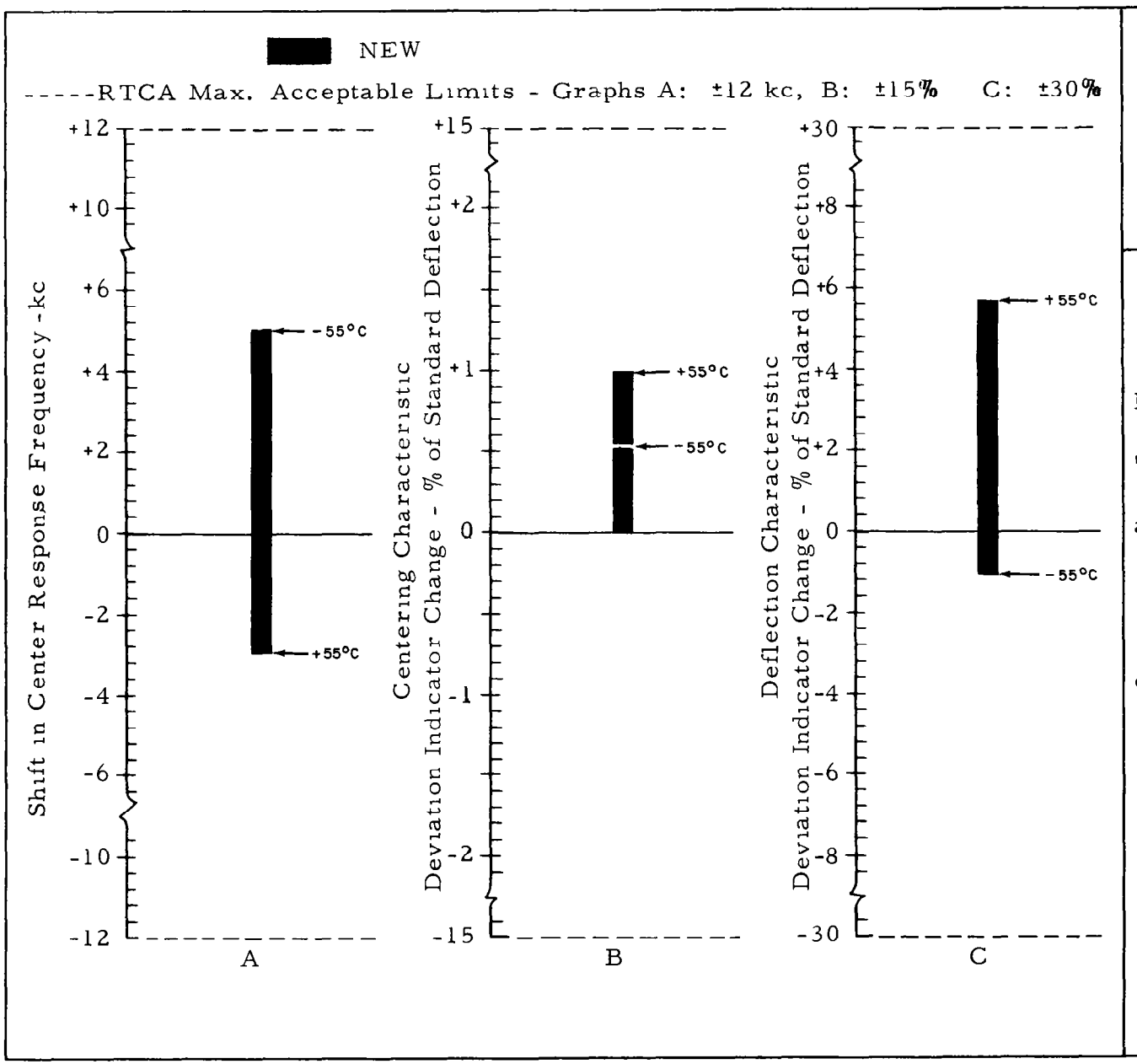
(continued on Page C-227)

Figure C-3(a)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Antenna Conducted Interference RTCA Para:2.10b	.09 to 1500	108.0	Acceptable Emission: ≤ 400 micro-microwatts.	Actual Emission on +28v line: <400 micro-microwatts. All frequencies within performance standards.	Yes
Operation of two receivers from same antenna. RTCA Para: 2.15	107 to 112	Varied over localizer band	Acceptable Operation: Deviation Indication ≤ 4.5 microamps.	Actual Operation: 0 microamps. All frequencies within performance standards.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relationship to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	110.1	None	(Not Applicable)

INTERFERENCE TESTS - LOCALIZER RECEIVER - LO-1



TEMPERATURE VARIATION TEST
Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 3.3(a)(b)(c)

LEGEND

fc - 110 mc

Notes:

1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits:
   - Graph A: ±12 kc
   - Graph B: ±15%
   - Graph C: ±30%
3. This unit is designed to operate above 15,000 feet.

Figure C-3(a)

TEMPERATURE VARIATION TEST - LOCALIZER RECEIVER - LO-1

Note: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

AUDIO OUTPUT
REGULATION & DISTORTION
Localizer Receiver: LO-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.17

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
New Unit No. 1	350	135	145	145	120	128	132	120	128	132
	500	250	250	255	225	228	230	220	225	230
	1000	300	310	313	255	260	265	280	280	285
	1800	280	288	298	235	245	250	260	270	278
	2500	220	232	243	185	195	215	200	215	225
New Unit No. 2	350	135	140	150	130	135	145	85	96	100
	500	220	240	250	200	210	250	130	135	150
	1000	310	290	320	215	235	275	150	140	160
	1800	285	280	350	225	215	280	110	140	135
	2500	230	260	280	185	200	225	105	115	125
New Unit No. 3	350	480	490	500	450	470	480	330	350	370
	500	620	670	680	540	580	590	500	520	530
	1000	690	710	740	520	560	580	600	670	690
	1800	650	700	720	500	515	550	590	650	680
	2500	590	650	690	460	500	500	510	600	630
In Use Unit No. 1	350	150	160	167	110	125	135	120	130	135
	500	265	285	290	220	230	238	260	270	290
	1000	295	300	335	232	250	270	300	315	380
	1800	242	270	295	205	240	250	229	240	260
	2500	200	235	250	172	188	200	170	190	210

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-1

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
In Use Unit No. 2	350	110	118	108	92	100	95	100	115	110
	500	240	265	245	220	245	230	270	300	285
	1000	260	300	275	250	280	260	210	250	235
	1800	192	220	198	162	200	185	240	275	255
	2500	190	215	200	165	190	180	190	210	200
In Use Unit No. 3	350	175	190	195	150	160	165	145	155	160
	500	280	195	300	230	250	255	250	270	292
	1000	280	300	325	230	250	260	275	300	320
	1800	232	250	265	185	200	215	210	235	260
	2500	200	240	260	142	165	172	190	225	250
RFI Unit No. 1	350	43	45	48	48	52	50	33	36	39
	500	90	100	110	90	100	110	75	82	86
	1000	230	250	260	220	240	250	182	200	210
	1800	300	325	350	290	315	330	290	315	340
	2500	285	320	345	290	320	340	280	310	330
RFI Unit No. 2	350	145	152	260	120	133	141	122	132	143
	500	270	293	300	225	240	245	220	235	245
	1000	279	300	330	250	270	285	250	280	300
	1800	230	265	280	200	235	200	240	250	278
	2500	187	222	230	162	183	195	200	230	250
RFI Unit No. 3	350	250	270	235	245	265	225	195	210	185
	500	470	500	440	400	435	375	410	440	380
	1000	580	610	520	425	460	400	580	615	510
	1800	590	650	580	425	485	420	590	670	575
	2500	510	590	510	395	440	380	500	600	505

Figure C-3(a)

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-1

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
New Unit No. 1	350	20.0	21.0	21.0	19.5	20.5	20.5	20.5	21.5	22.0
	500	14.0	14.5	14.0	13.5	14.0	14.0	13.0	13.0	13.5
	1000	14.5	15.0	15.0	13.5	14.0	14.5	14.0	14.0	14.5
	1800	10.0	11.0	11.5	10.5	11.0	11.5	10.0	11.0	11.0
	2500	8.0	8.0	8.0	8.0	8.0	8.5	6.5	7.0	7.0
New Unit No. 2	350	15.0	14.5	15.2	13.0	13.0	13.5	13.0	13.0	13.0
	500	11.5	12.0	12.5	10.5	11.5	12.0	11.5	11.5	12.0
	1000	7.5	6.8	7.3	8.0	8.0	8.6	9.5	9.2	9.2
	1800	6.0	5.4	5.8	7.5	6.6	7.6	8.2	8.4	8.2
	2500	5.8	5.0	5.2	6.8	6.5	6.8	8.2	8.0	8.0
New Unit No. 3	350	18.0	15.0	15.8	15.5	14.0	14.5	20.0	18.0	18.2
	500	13.5	11.8	12.0	13.5	12.0	12.0	13.5	12.0	12.2
	1000	11.2	8.0	8.5	12.0	10.5	10.8	10.0	6.5	7.0
	1800	9.8	6.5	6.8	12.0	10.3	10.0	8.7	4.9	5.2
	2500	10.0	6.1	6.3	11.5	9.6	9.8	10.0	4.6	4.6
In Use Unit No. 1	350	12.0	10.5	11.0	11.0	9.0	8.5	12.0	9.5	10.0
	500	10.0	9.0	9.2	9.2	9.0	9.2	3.2	9.0	10.0
	1000	7.5	6.0	6.5	8.2	7.2	7.6	6.8	5.5	6.0
	1800	7.0	4.8	4.8	7.6	6.3	6.5	6.4	3.9	4.0
	2500	7.5	4.5	4.5	7.9	5.4	5.4	8.0	4.2	4.0
In Use Unit No. 2	350	7.5	6.9	9.8	7.0	6.8	9.2	7.2	6.8	9.6
	500	6.0	6.2	6.9	7.3	7.7	8.0	6.5	7.4	7.6
	1000	4.5	4.5	5.2	6.3	6.5	6.6	4.0	3.7	4.3
	1800	4.2	3.8	4.0	4.7	4.7	4.8	3.5	3.1	3.4
	2500	4.1	3.7	3.7	4.7	4.7	4.6	3.7	3.2	3.2

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-1

Figure C-3(a)

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
In Use Unit No. 3	350	8.0	8.7	9.0	7.9	7.8	8.6	8.2	8.4	9.0
	500	7.0	7.8	7.8	8.4	8.0	8.4	7.0	7.4	8.0
	1000	4.6	4.3	4.6	5.8	5.8	6.0	4.0	3.7	3.7
	1800	4.3	4.0	4.0	5.1	4.8	5.1	4.0	3.5	3.4
	2500	4.6	4.0	3.9	5.4	4.9	5.0	4.3	3.6	3.4
RFI Unit No. 1	350	13.5	12.0	12.5	14.0	12.5	13.0	13.0	11.0	11.5
	500	9.1	8.2	8.2	9.6	8.6	9.0	8.7	7.6	7.8
	1000	5.7	5.2	5.2	6.6	5.4	5.6	5.5	4.7	4.9
	1800	4.6	4.2	4.2	5.3	5.0	5.3	4.2	3.6	3.6
	2500	4.6	4.1	4.1	5.4	5.0	5.2	4.1	3.6	3.6
RFI Unit No. 2	350	11.0	11.0	11.5	10.5	10.0	10.0	11.0	10.5	11.5
	500	10.0	10.3	11.0	10.0	10.0	10.5	14.0	13.5	14.0
	1000	6.0	5.3	5.8	7.2	7.0	7.1	5.6	4.5	4.6
	1800	5.8	4.4	4.8	6.4	5.5	5.6	5.6	4.1	4.0
	2500	6.6	4.8	4.7	6.6	5.4	5.3	6.2	4.4	4.3
RFI Unit No. 3	350	9.0	9.8	8.2	9.6	11.0	8.9	10.0	10.5	9.5
	500	9.6	9.6	8.7	10.0	10.5	10.5	9.5	10.5	8.5
	1000	6.6	8.0	6.8	9.0	9.5	9.0	4.4	4.8	5.1
	1800	6.0	6.6	6.0	9.5	10.0	9.0	2.8	3.3	3.2
	2500	5.0	6.4	5.2	9.0	10.0	9.0	2.2	2.3	2.2

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-1

Figure C-3(a)

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SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

4. Laboratory and Field Test Data

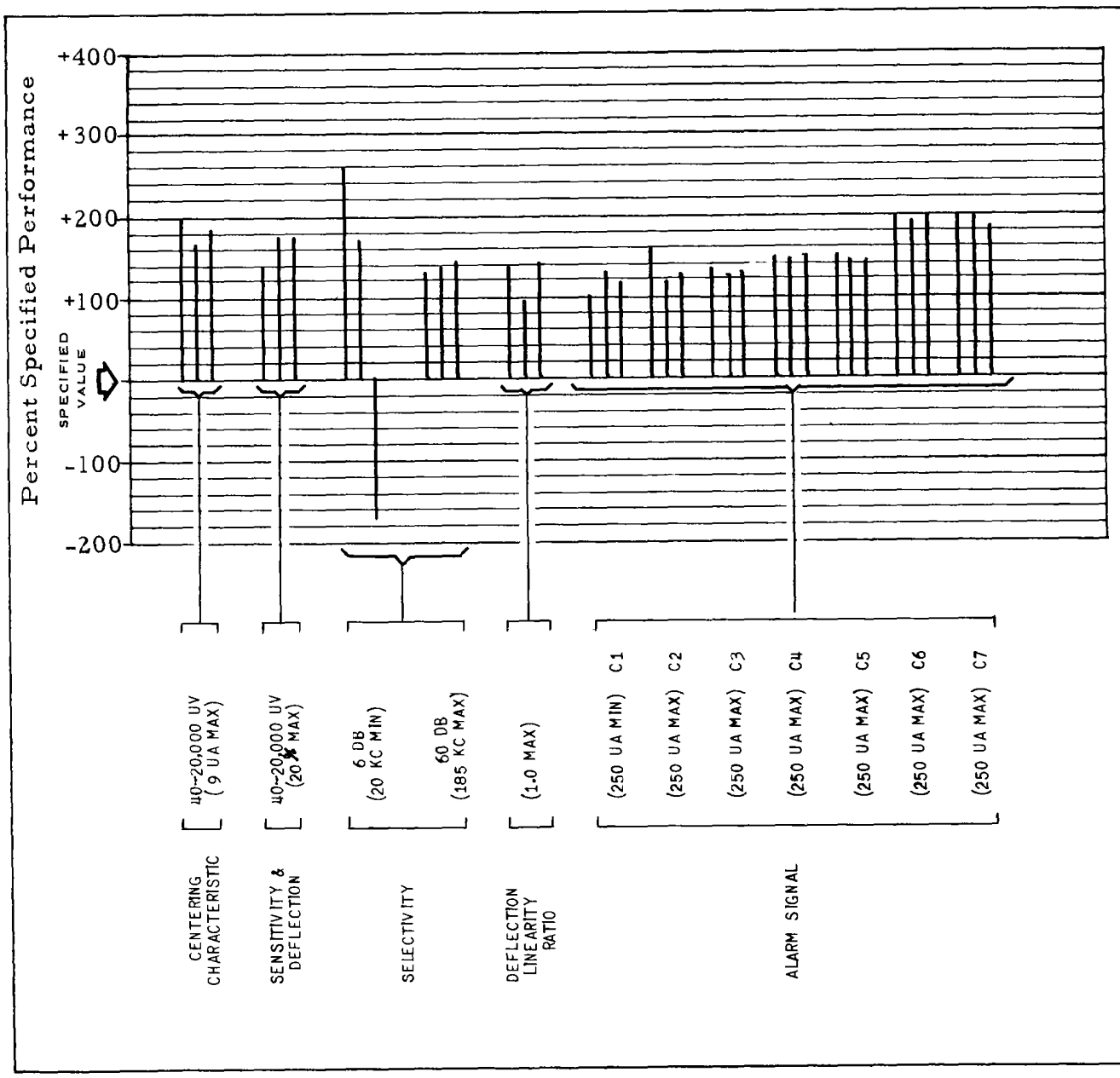
b. LO-2, Localizer Receiver

General:

Frequency Range:	108.0 - 135.9 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	280
Number of Channels Available at Operator's Position:	280
Means of Frequency Selection:	Rotary Switch

Technical:

	Page(s)
Percent Specified Performance	C-232
Weighted Performance	C-233
Centering Characteristic	C-234
Selectivity	C-235
Sensitivity and Deflection Characteristic	C-236
Deflection Linearity	C-237
Alarm Signal	C-238
Deviation Indicator Stability	C-239
Percentage Modulation Characteristic	C-240
Deviation Indicator Sensitivity Adjustment Range - Centering Characteristic	C-241
Deviation Indicator Sensitivity Adjustment Range - Sensitivity & Deflection Characteristic	C-242
Deviation Indicator Sensitivity Adjustment Range - Deflection Linearity	C-243
Audio Frequency Response	C-244
Interference Tests	C-245-246
Temperature Variation Test	C-247
Audio Output Regulation & Distortion	C-248



PERCENT
SPECIFIED PERFORMANCE
Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

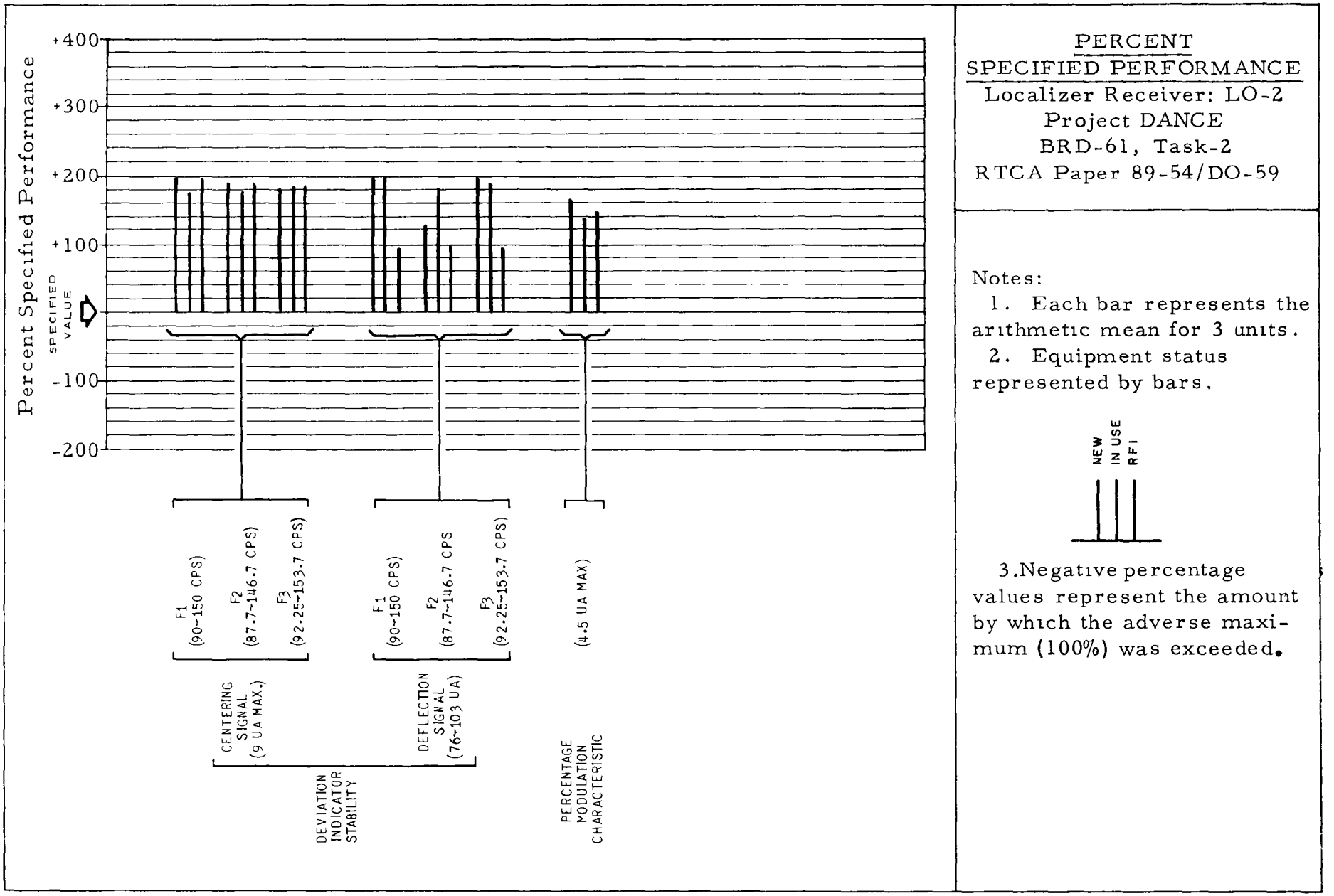


3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - LOCALIZER RECEIVER - LO-2

(continued on Page C-232a)

Figure C-3(b)



PERCENT
SPECIFIED PERFORMANCE
Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59

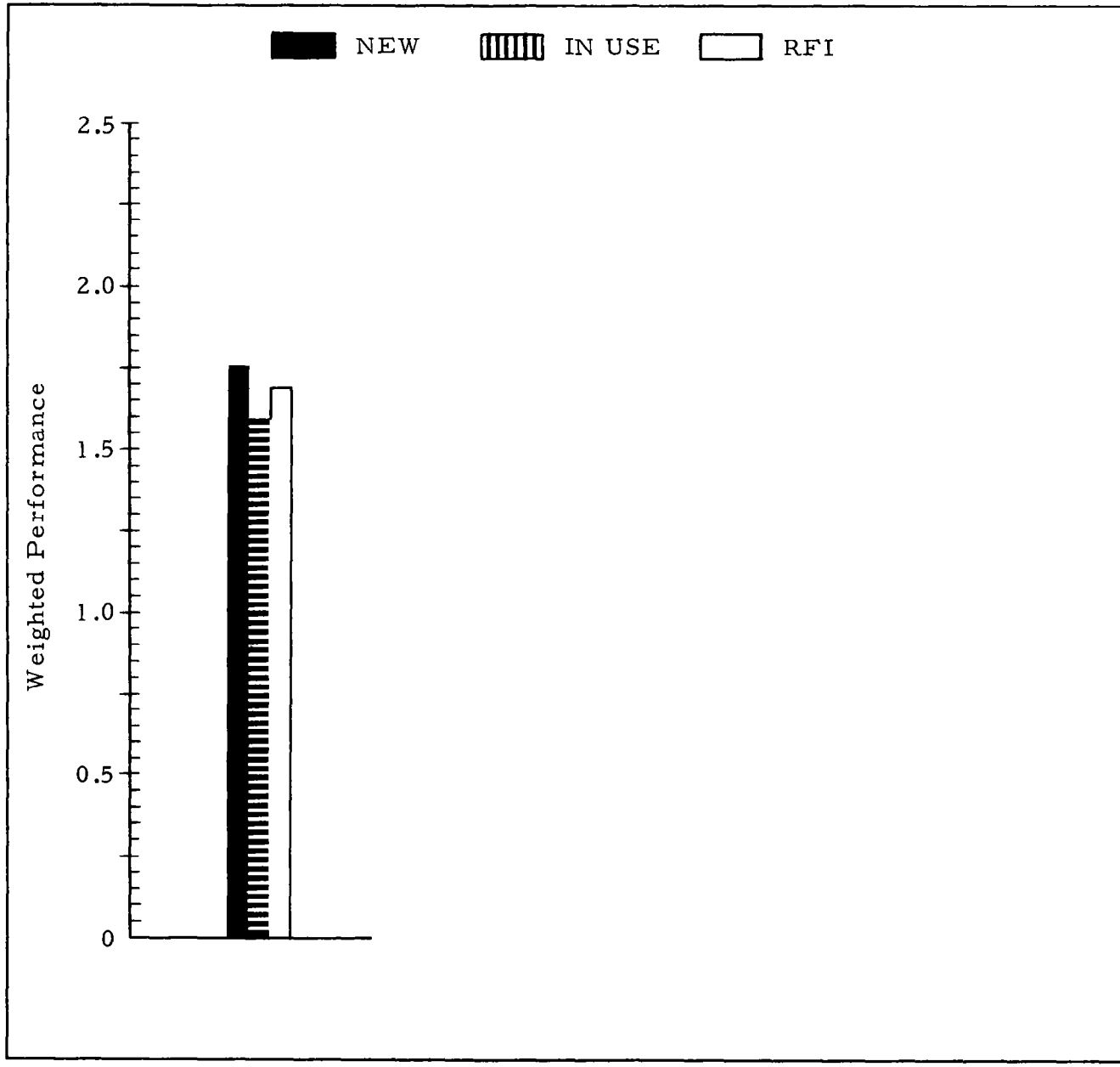
Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - LOCALIZER RECEIVER - LO-2

Figure C-3(b)



WEIGHTED PERFORMANCE

Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2

WEIGHTING FACTORS

Centering Characteristics: 1/4

Sensitivity & Deflection: 3/20

Selectivity:
b_1, b_2 1/8 ea.

Deflection Linearity: 1/10

Alarm Signal:
c_1, c_2, c_3, c_4, c_5, c_6, c_7 1/70 ea.

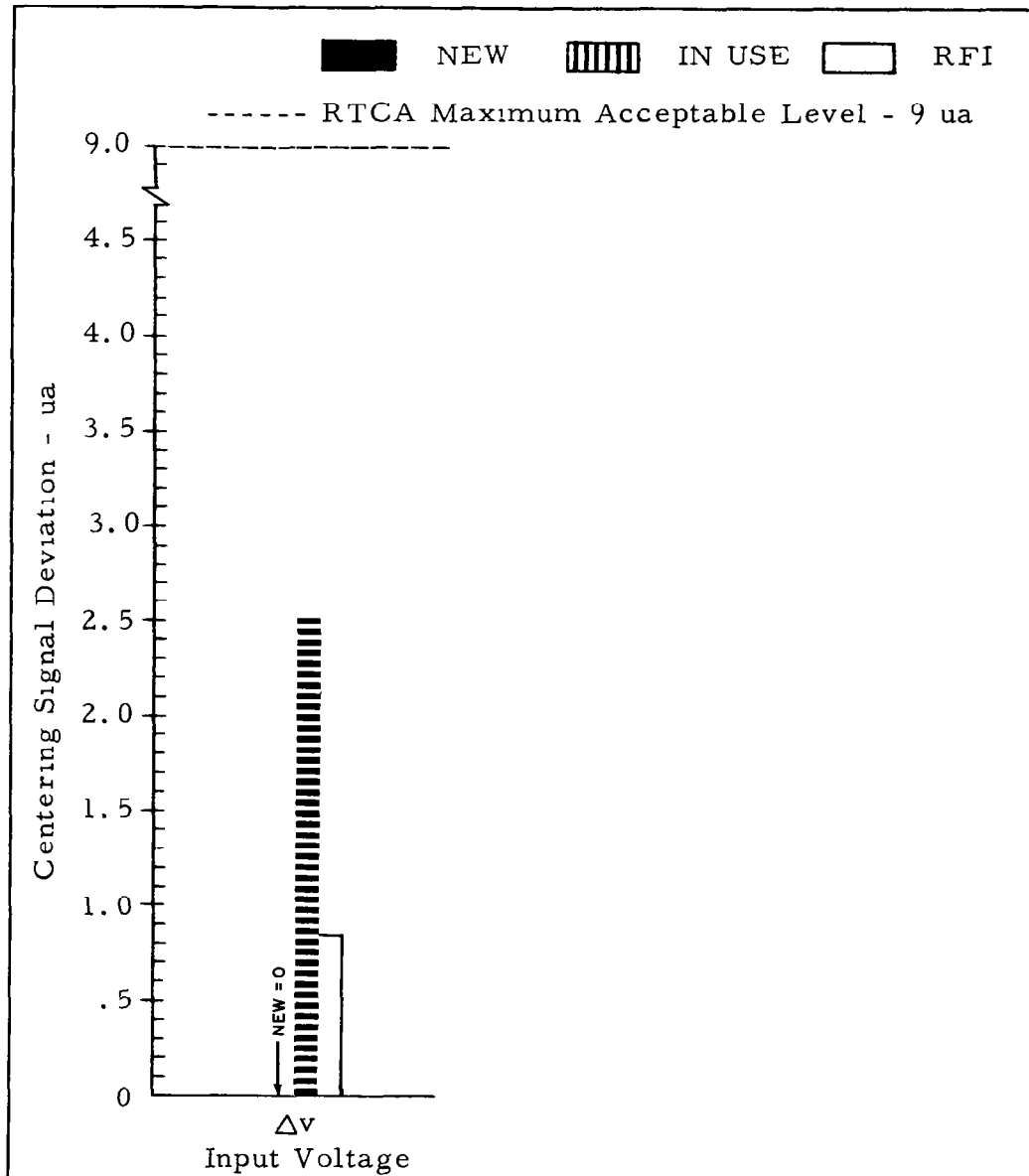
Deviation Indicator Stability:
(I) f_1, f_2, f_3 1/60 ea.
(II) f_1, f_2, f_3 1/60 ea.

Percentage Modulation Characteristic: 1/20

Note:
1. Graph based on arithmetic mean for above characteristics.

Figure C-3(b)

WEIGHTED PERFORMANCE - LOCALIZER RECEIVER - LO-2



CENTERING CHARACTERISTIC

Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.3

LEGEND

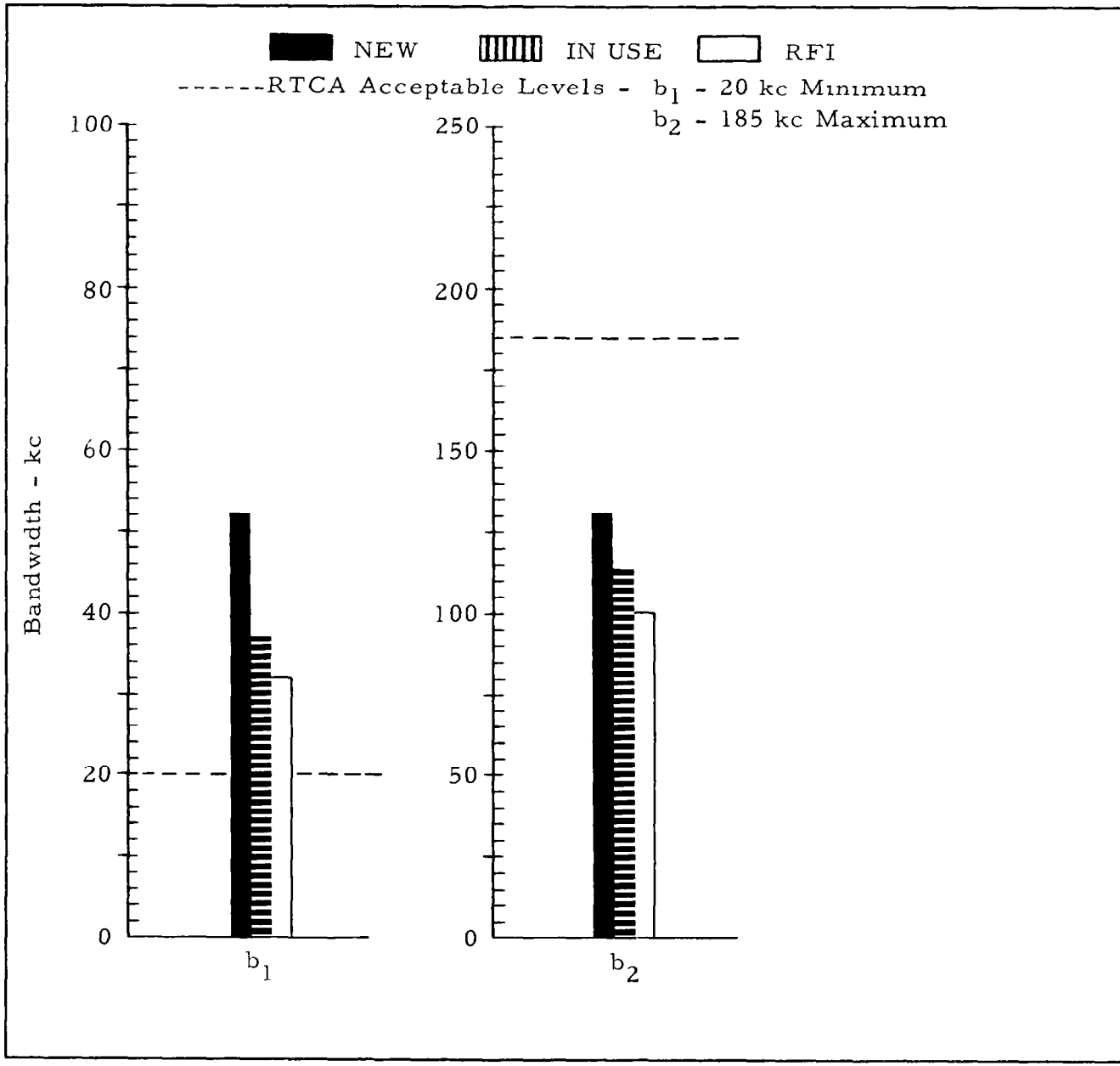
Δv - 40 - 20,000 uv
Standard Deflection - 90 ua
Standard Deviation

New	In Use	RFI
0	2.2	1.0

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 ua.

CENTERING CHARACTERISTIC - LOCALIZER RECEIVER - LO-2

Figure C-3(b)



SELECTIVITY

Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.6

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 110.1 mc

Standard Deviation

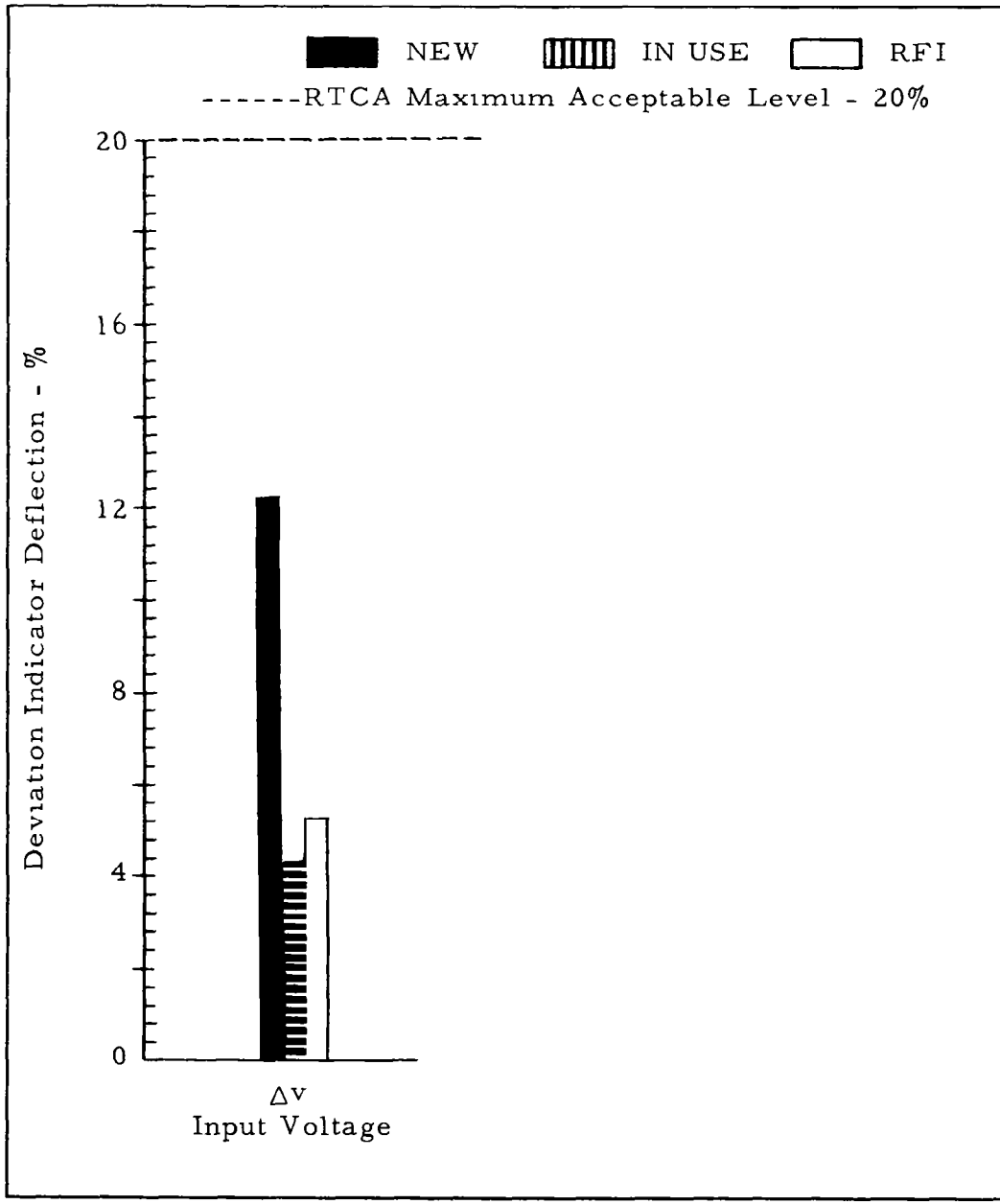
Test	New	In Use	RFI
b_1	10.4	4.1	1.5
b_2	8.3	59.2	48.5

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable levels:
b_1 - 20 kc minimum
b_2 - 185 kc maximum
3. This receiver is tuned in discrete steps.

SELECTIVITY - LOCALIZER RECEIVER - LO-2

Figure C-3(b)



SENSITIVITY & DEFLECTION CHARACTERISTIC
Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.4

LEGEND

Δv - 40 - 20,000 uv

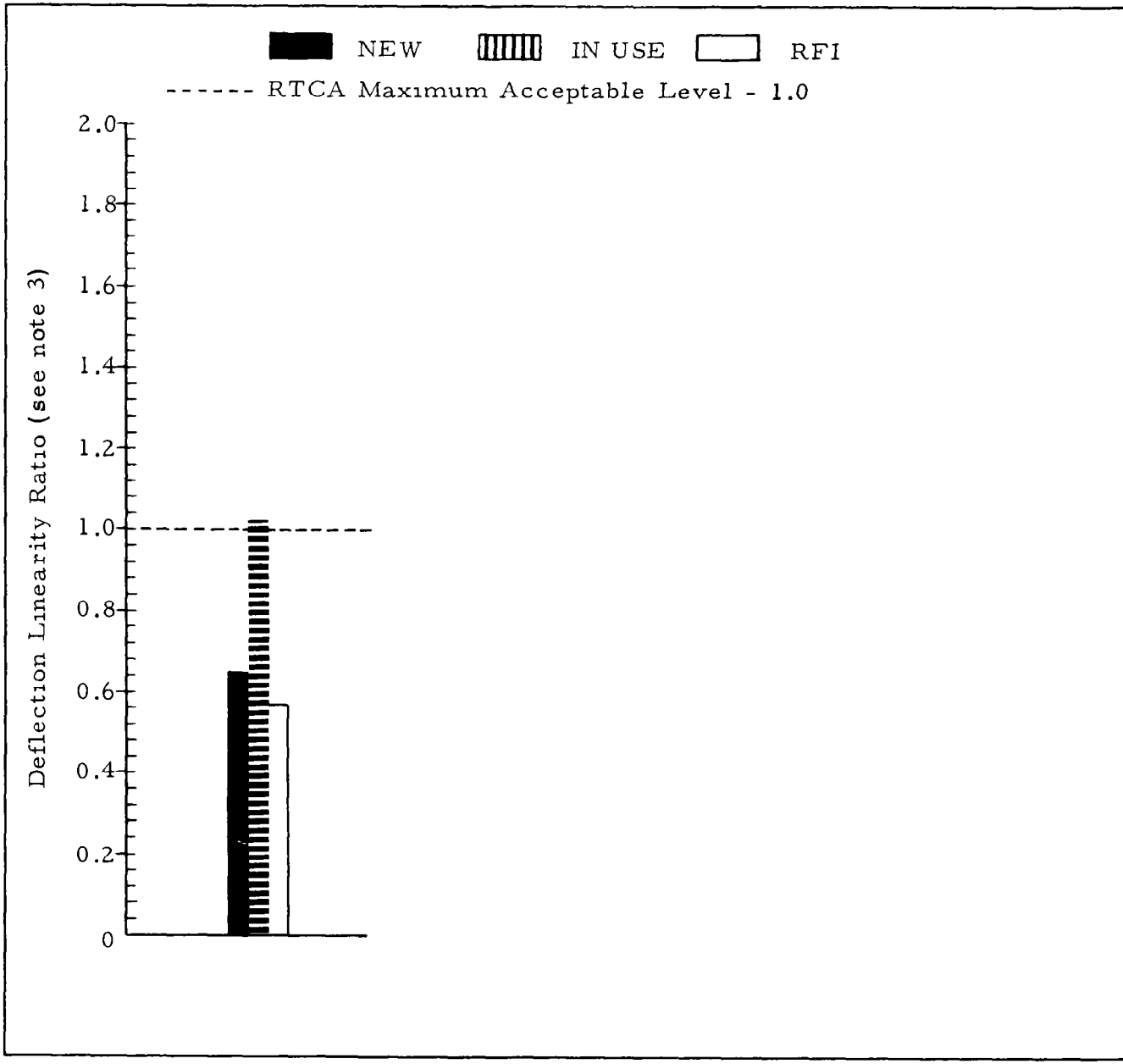
Standard Deviation

New	In Use	RFI
1.1	1.18	.74

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 20%.

Figure C-3(b)

SENSITIVITY & DEFLECTION CHARACTERISTIC - LOCALIZER RECEIVER - LO-2



DEFLECTION LINEARITY

Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.5

Standard Deviation

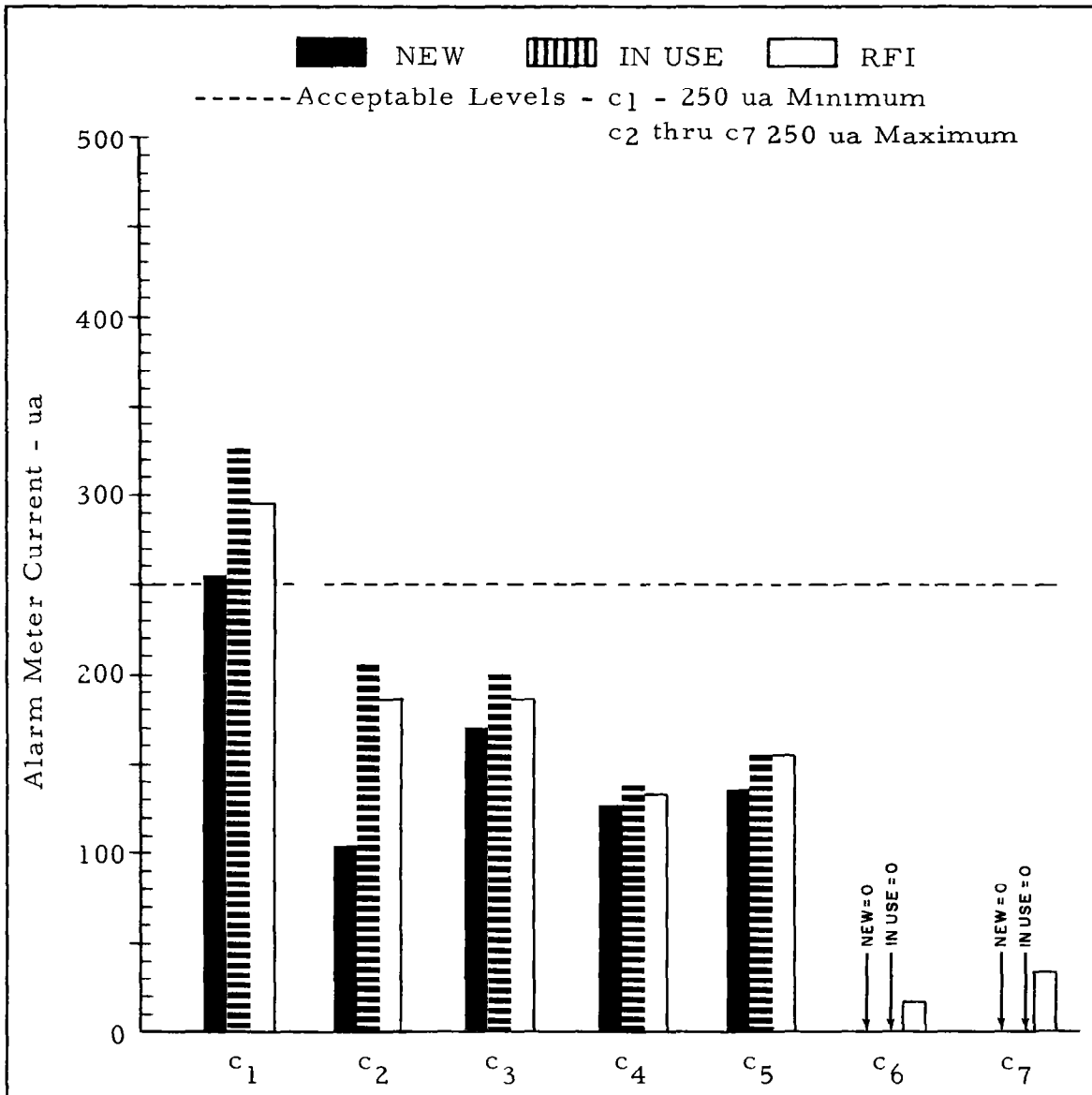
New	In Use	RFI
.10	.31	.15

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 1.0.
3. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.

Figure C-3(b)

DEFLECTION LINEARITY - LOCALIZER RECEIVER - LO-2



ALARM SIGNAL

Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.9

LEGEND

c_1 - std. test sig. - 40 uv
c_2 - mod. 0% - 150 cps & 20% - 90 cps
c_3 - mod. 0% - 90 cps & 20% - 150 cps
c_4 - mod. 10% - 90 cps & 10% - 150 cps
c_5 - std. dev. sig. @ 50% deflection
c_6 - absence of mod. - 1000 uv
c_7 - absence of R.F.

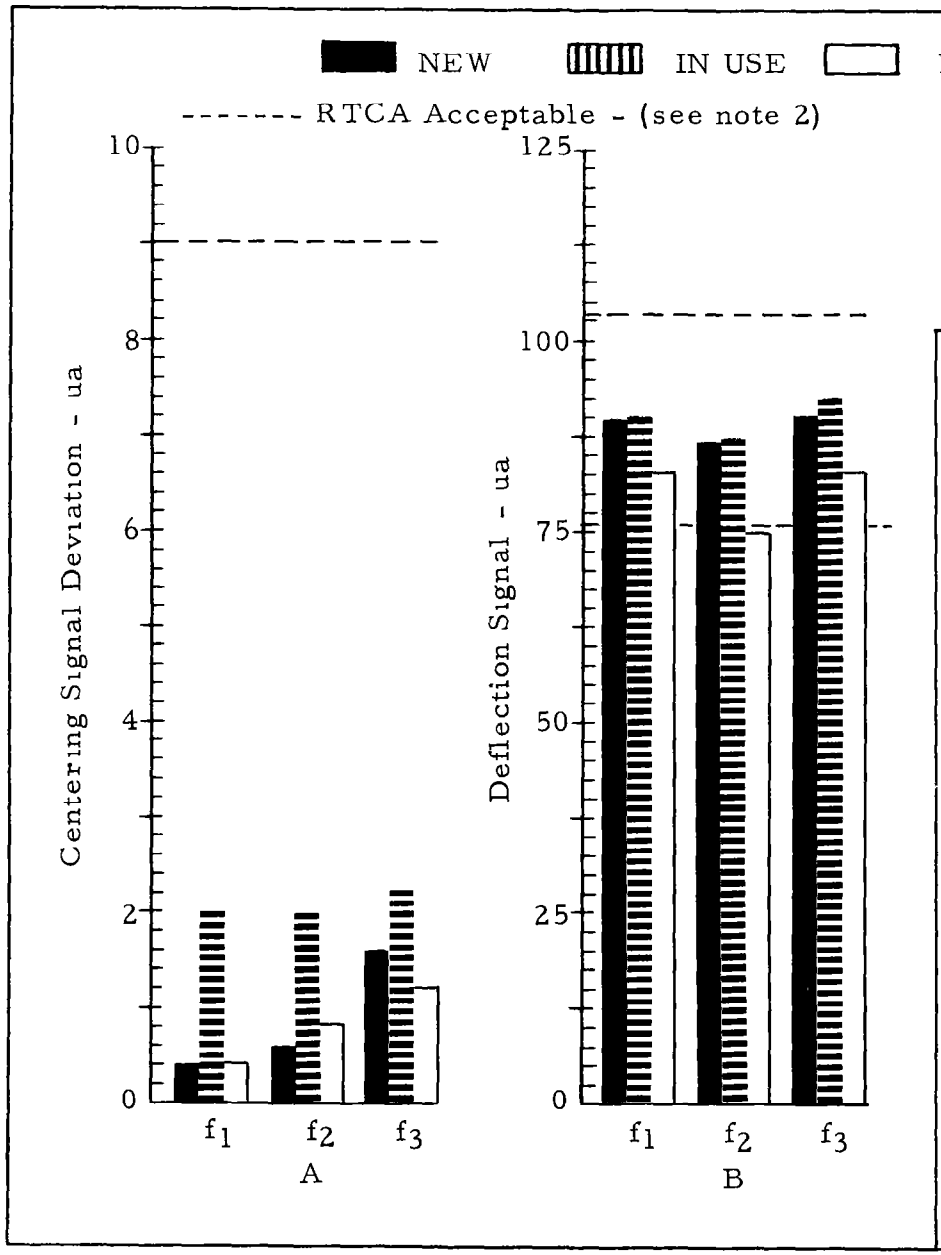
Standard Deviation

Test	New	In Use	RFI
c_1	8.7	36.1	31.4
c_2	11.0	30.4	13.5
c_3	10.0	25.3	11.5
c_4	15.1	22.6	5.8
c_5	4.5	20.8	20.8
c_6	0	0	29.2
c_7	0	0	28.9

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA paper as a guide.

Figure C-3(b)

ALARM SIGNAL - LOCALIZER RECEIVER - LO-2



DEVIATION INDICATOR STABILITY WITH CHANGES IN FREQ. OF 90 & 150 cps SIGNALS

Localizer Receiver: LO-2

Project DANCE

BRD-61, Task-2

RTCA Paper 89-54/DO-59, Para 2.13 (a) (b)

LEGEND

f_1 - 90 & 150 cps

f_2 - 87.75 & 146.25 cps

f_3 - 92.25 & 153.75 cps

Standard Deviation

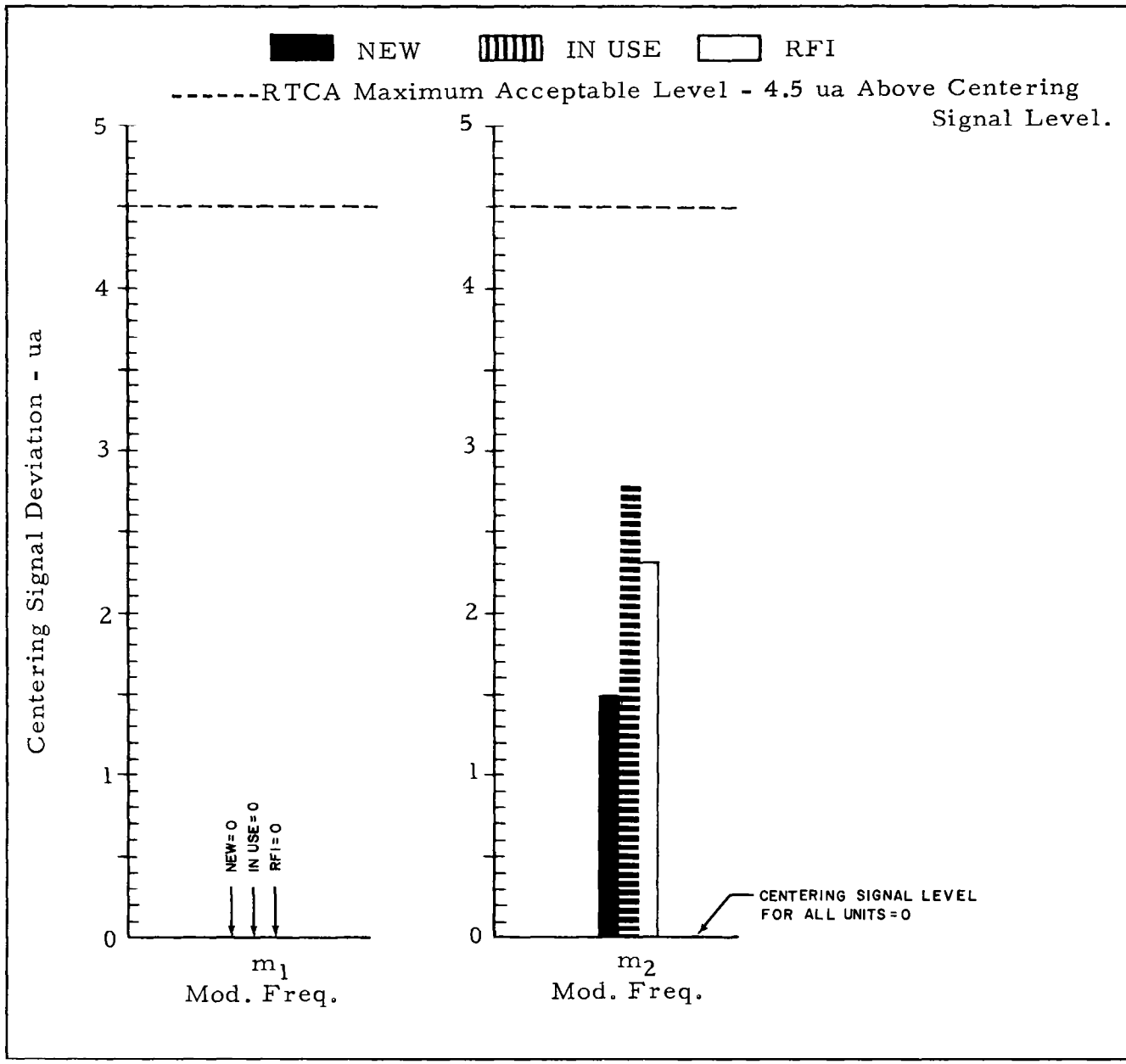
	Test	New	In Use	RFI
A	f_1	.58	1.0	58
	f_2	1.2	2.0	1 0
	f_3	.58	2.1	.28
B	f_1	0	9.8	0
	f_2	1.2	9.9	4.1
	f_3	1.2	10.6	.58

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable:
   Graph A: Centering Signal - 9 ua maximum
   Graph B: Deflection Signal Limits - 76.5 to 103.5 ua.

DEVIATION INDICATOR STABILITY WITH CHANGES IN FREQUENCY OF 90 & 150 cps SIGNALS
LOCALIZER RECEIVER - LO-2

Figure C-3(b)



PERCENTAGE MODULATION CHARACTERISTIC

Localizer Receiver: LO-2
Project DANCE
BRD-61. Task-2
RTCA Paper 89-54/DO-59, Para 2.18

LEGEND

m_1 - 20% of 90 and 150 cps
m_2 - 25% of 90 and 150 cps

Standard Deviation

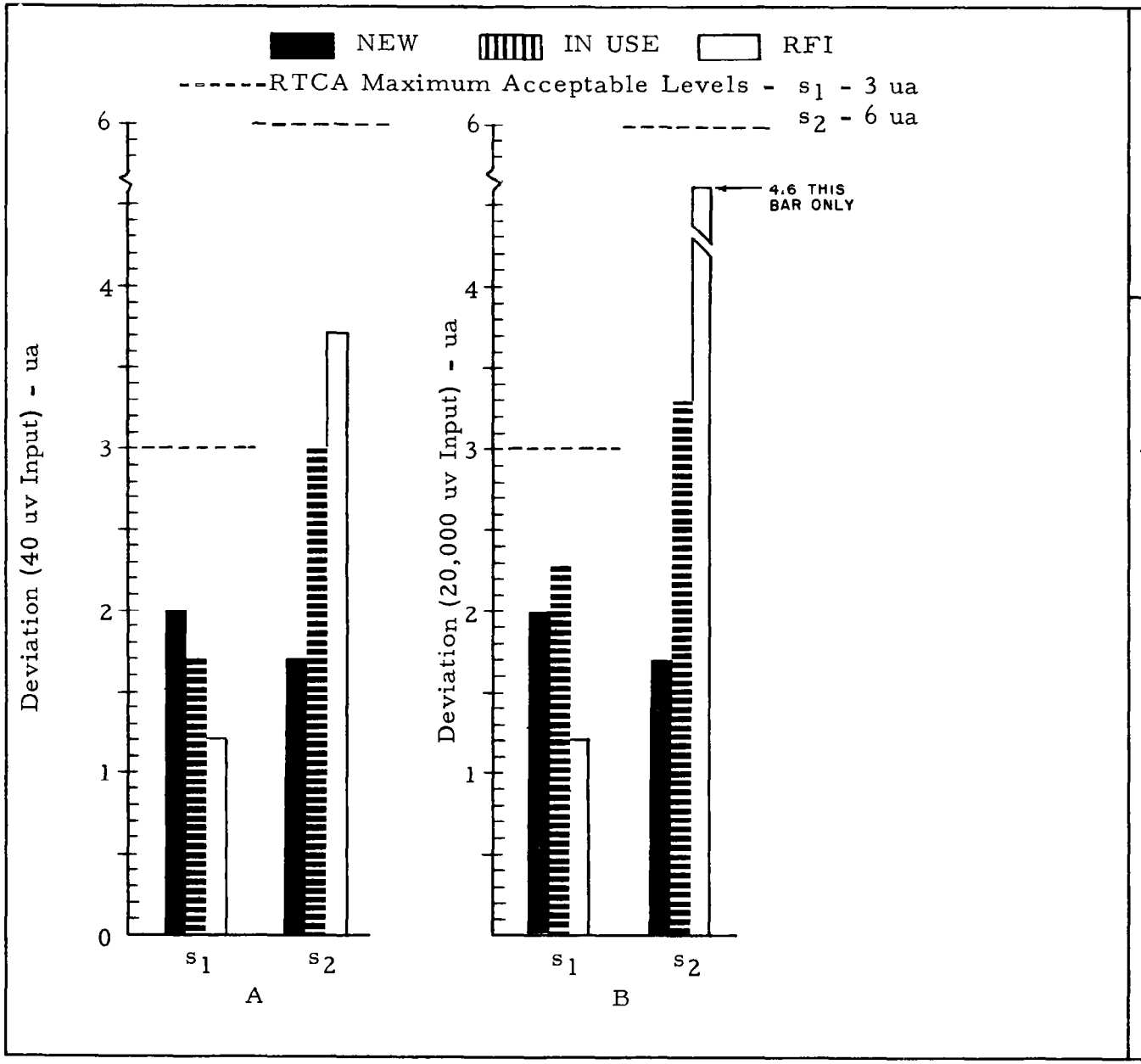
Test	New	In Use	RFI
m_1	0	0	0
m_2	1.3	1.6	.58

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 4.5 ua above centering signal level.

Figure C-3(b)

PERCENTAGE MODULATION CHARACTERISTIC - LOCALIZER RECEIVER - LO-2



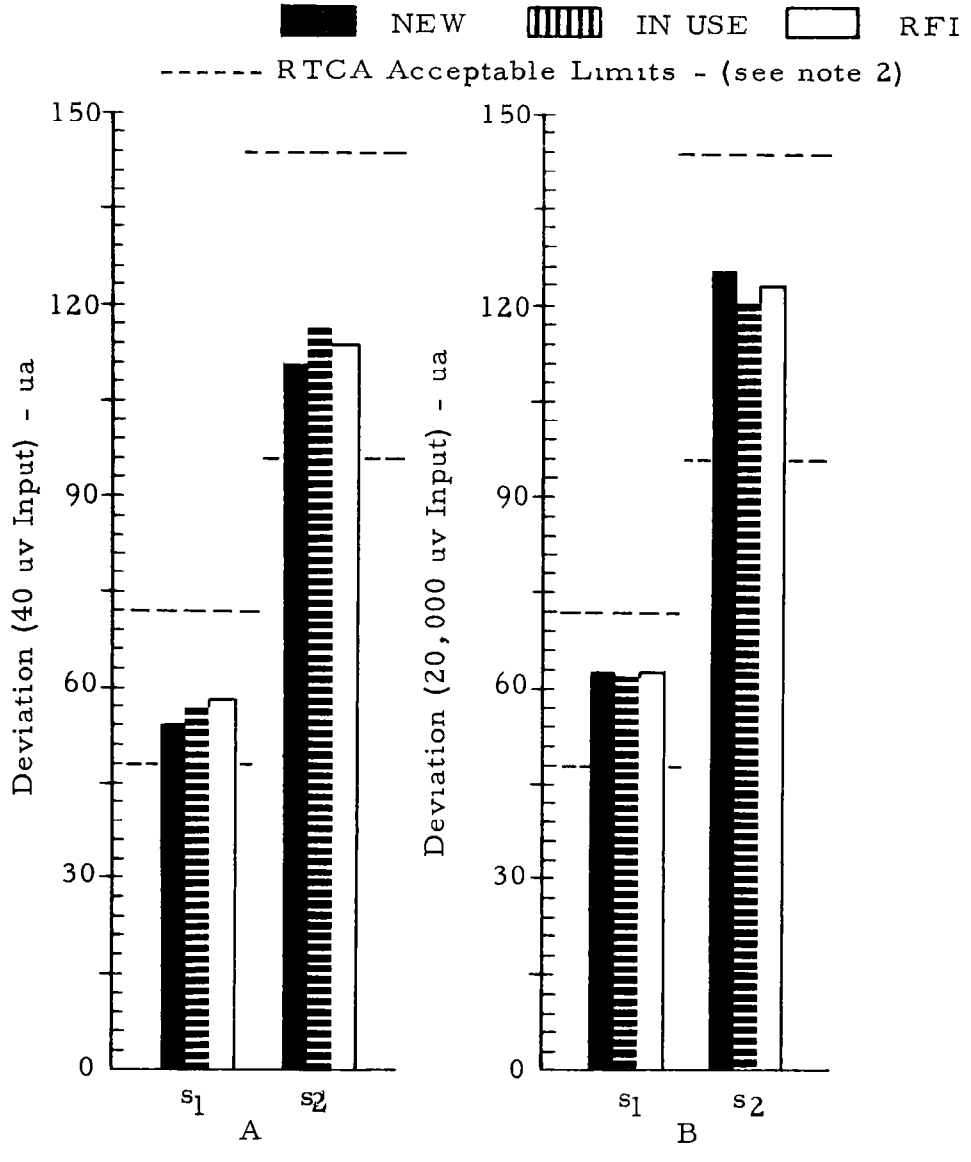
DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Centering Characteristic)
Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.14

LEGEND
Sensitivity Setting
s_1 - 0.4 of full scale
s_2 - 0.8 of full scale
Standard Deviation

Test		New	In Use	RFI
A	s_1	0	0.58	0.72
	s_2	1.5	3.60	1.10
B	s_1	0	1.10	0.47
	s_2	1.5	2.30	1.00

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable levels: Graph A & B
s_1 - 0.4 of full scale, 3 ua max.
s_2 - 0.8 of full scale, 6 ua max.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-2
(Centering Characteristic)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Sensitivity & Deflection)
Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.14

LEGEND

Sensitivity Setting

s_1 - 0.4 of full scale

s_2 - 0.8 of full scale

Standard Deviation

	Test	New	In Use	RFI
A	s_1	.58	0	1.2
	s_2	2.1	1.0	7.4
B	s_1	1.0	1.0	.58
	s_2	1.5	2.1	0

Notes:

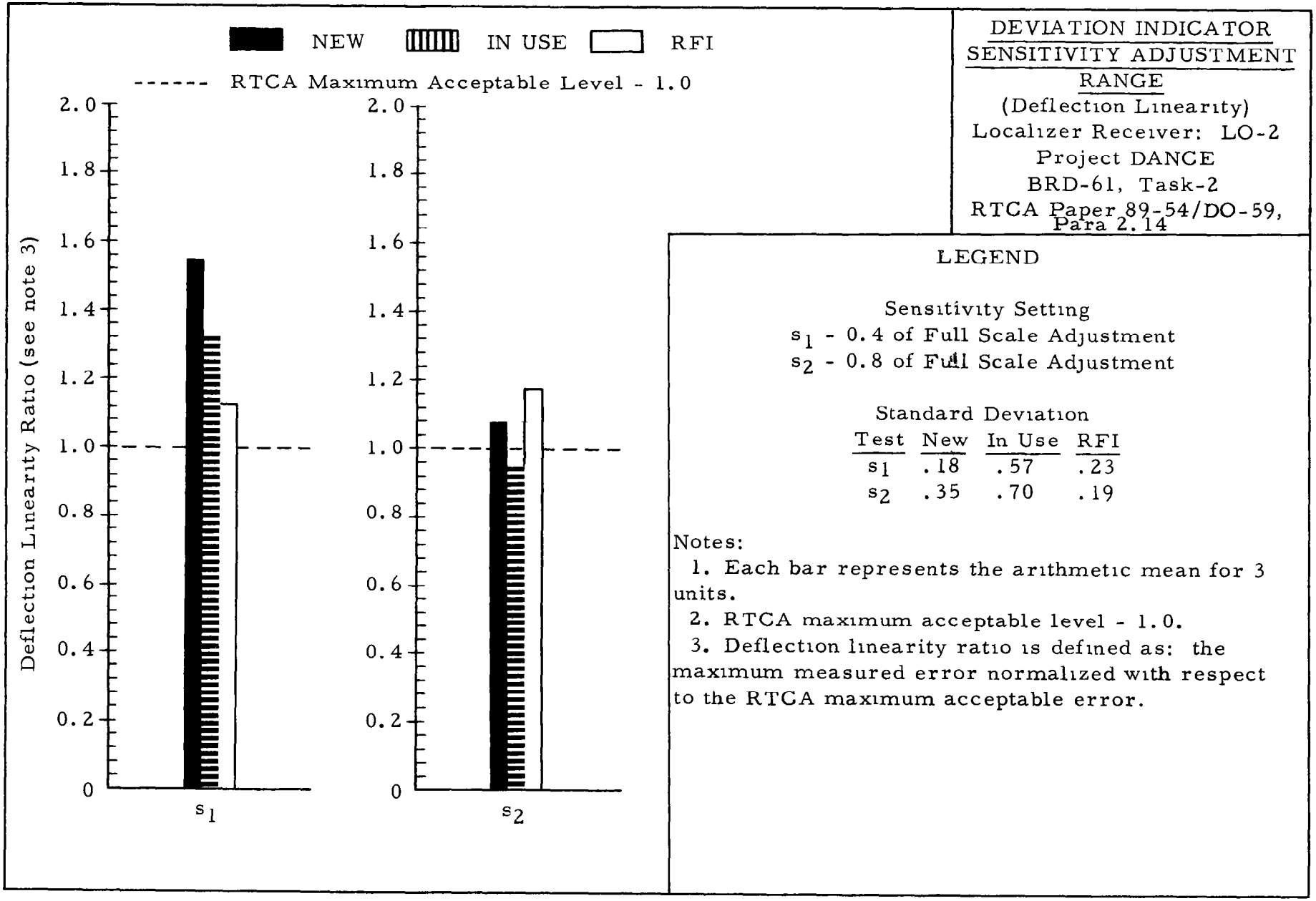
1. Each bar represents the arithmetic mean for 3 units
2. RTCA acceptable limits: Graph A and B;

s_1 - 0.4 of full scale, 48-72 ua

s_2 - 0.8 of full scale, 96-144 ua

Figure C-3(b)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-2
(Sensitivity & Deflection)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Deflection Linearity)
Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.14

LEGEND

Sensitivity Setting
s_1 - 0.4 of Full Scale Adjustment
s_2 - 0.8 of Full Scale Adjustment

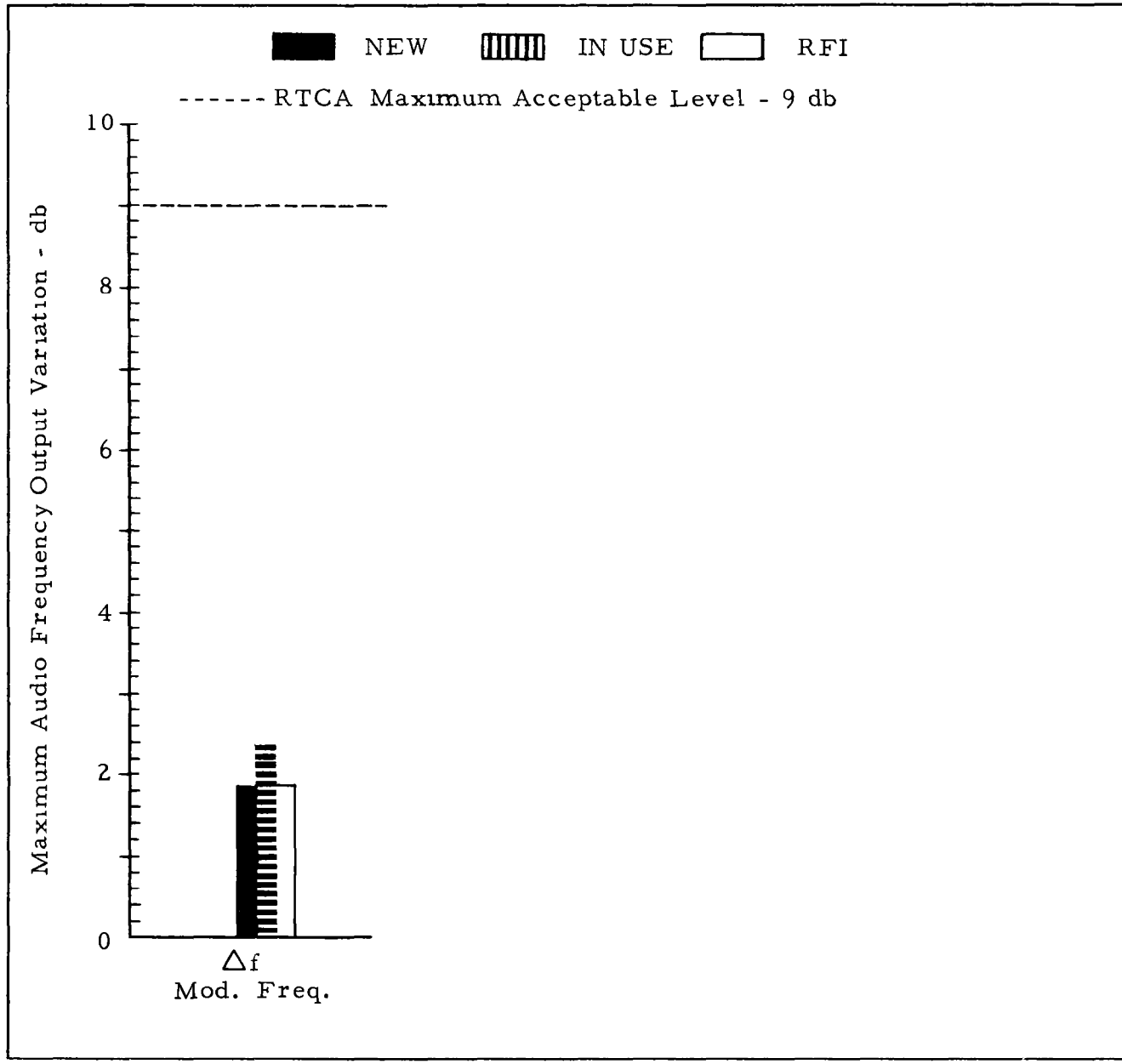
Standard Deviation

Test	New	In Use	RFI
s_1	.18	.57	.23
s_2	.35	.70	.19

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 1.0.
3. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.

Figure C-3(b)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-2
(Deflection Linearity)



AUDIO FREQ. RESPONSE

Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.16

LEGEND

Δf - 350 - 2500 cps

Standard Deviation

New	In Use	RFI
.12	.54	.43

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 db.

Figure C-3(b)

AUDIO FREQUENCY RESPONSE - LOCALIZER RECEIVER - LO-2

INTERFERENCE TESTS

Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59

Test	Frequency (mc)	F_C (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.7	.19 to 1500	110.1	Acceptable level excluding the band 107.8 to 112.2 mc: ≥60 db	Actual Level: ≥ 60 db. All frequencies within performance standards.	Yes
Cross Modulation RTCA Para: 2.8	107 to 112	110.1	Acceptable level excluding band $F_C \pm 200$ kc: Alarm Device: ≥250 microamps. * Deviation Indication: ≤ 9 microamps.	Actual Level: ≥250 microamps. 0 microamps. All frequencies within performance standards.	Yes
Cable Conducted Interference RTCA Para: 2.10a	.15 to 25	110.1	Actual Emission: ≤200 microvolts. * Acceptable levels were determined by using RTCA Papers as a guide.	Actual Emission: < 200 microvolts. All frequencies within performance standards.	Yes

INTERFERENCE TESTS - LOCALIZER RECEIVER - LO-2

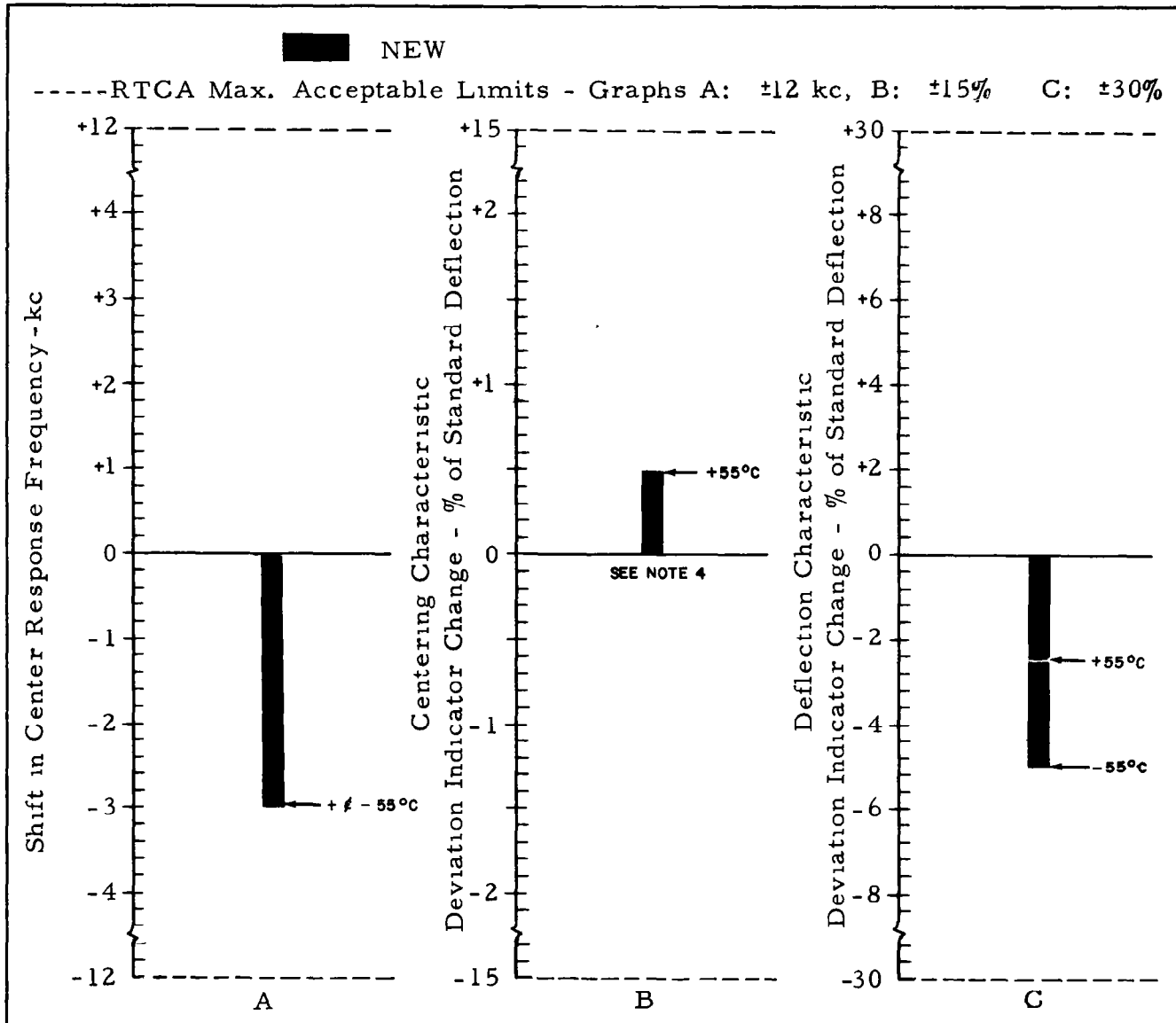
(continued on Page C-246)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Antenna Conducted Interference RTCA Para: 2.10b	.09 to 1500	110.1	Required Emission over frequency range. ≤400 micro-microwatts.	Actual Emission on +28v line < 400 micro-microwatts. All frequencies within performance standards.	Yes
Operation of two receivers from same antenna. RTCA Para: 2.15	107 to 112	Varied over localizer band	Acceptable Operation: Deviation Indication: ≤4.5 microamps.	Actual Operation: 0 microamps.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relationship to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	110.1	655, 1900, & 1800 mc	None

Figure C-3(b)

INTERFERENCE TESTS - LOCALIZER RECEIVER - LO-2



TEMPERATURE VARIATION TEST
Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 3.3(a)(b)(c)

LEGEND

fc - 110 mc

Notes:

1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits:
   Graph A: ±12 kc
   Graph B: ±15%
   Graph C: ±30%
3. This unit is designed to operate above 15,000 feet.
4. -55°C standard deflection - 0. %.

Figure C-3(b)

TEMPERATURE VARIATION TEST - LOCALIZER RECEIVER - LO-2

Note: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

AUDIO OUTPUT
REGULATION & DISTORTION
Localizer Receiver: LO-2
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.17

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
New Unit No. 1	350	245	300	335	225	281	312	210	253	276
	500	310	365	395	302	360	388	248	287	310
	1000	372	435	460	395	445	470	275	325	350
	1800	320	377	408	360	416	445	228	268	286
	2500	268	291	320	322	380	400	185	215	234
New Unit No. 2	350	289	352	391	278	350	375	240	290	320
	500	345	400	430	350	405	430	270	318	340
	1000	389	450	480	420	480	500	289	330	360
	1800	320	368	400	375	435	460	220	260	280
	2500	230	275	290	290	342	368	158	183	200
New Unit No. 3	350	231	278	300	230	241	268	185	228	245
	500	260	340	369	255	328	350	200	262	280
	1000	330	415	441	350	430	450	235	300	321
	1800	280	370	385	330	400	421	195	250	268
	2500	225	290	310	270	340	360	170	200	210
In Use Unit No. 1	350	187	168	162	130	150	160	108	128	140
	500	200	230	250	197	220	235	175	196	203
	1000	270	300	322	270	305	325	200	232	248
	1800	215	250	270	247	280	297	168	188	198
	2500	168	192	203	190	220	240	110	135	150

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-2

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
In Use Unit No. 2	350	225	248	260	197	212	230	200	215	230
	500	242	262	271	216	232	245	210	225	235
	1000	280	300	317	260	280	290	230	250	260
	1800	230	250	260	222	242	250	180	191	200
	2500	160	178	185	170	181	190	122	136	145
In Use Unit No. 3	350	182	195	205	170	180	190	170	178	188
	500	230	245	253	210	255	235	200	210	223
	1000	285	300	315	271	290	300	240	255	265
	1800	258	270	280	256	262	280	200	210	225
	2500	192	210	217	200	210	221	158	162	171
RFI Unit No. 1	350	202	222	235	188	220	210	180	195	200
	500	250	270	277	225	242	250	210	225	235
	1000	300	325	336	295	310	320	250	270	280
	1800	265	290	300	272	290	300	215	232	240
	2500	205	220	235	220	240	245	165	175	180
RFI Unit No. 2	350	220	240	250	198	215	223	190	200	211
	500	254	270	280	232	250	258	212	230	240
	1000	281	300	310	277	290	300	235	250	260
	1800	230	242	252	230	248	252	180	190	195
	2500	266	175	180	173	185	190	121	131	140
RFI Unit No. 3	350	220	240	250	198	218	230	192	210	220
	500	260	280	290	242	260	268	220	240	250
	1000	300	330	340	297	313	325	260	275	285
	1800	260	280	290	275	290	300	212	230	240
	2500	200	220	230	222	240	250	170	179	182

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-2

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
New Unit No. 1	350	11.5	9.8	10.5	14.0	12.0	12.0	9.8	9.1	10.5
	500	10.0	10.0	10.8	11.8	10.8	11.0	10.0	10.8	12.5
	1000	9.8	10.8	12.0	10.0	10.8	12.0	10.0	12.0	13.0
	1800	8.2	9.0	10.0	8.2	8.6	9.6	8.4	9.5	11.0
	2500	7.0	7.2	9.5	7.7	7.7	8.3	8.3	8.9	10.0
New Unit No. 2	350	10.0	11.5	11.5	11.2	11.0	11.8	9.5	10.9	12.0
	500	9.5	11.2	12.0	9.5	10.7	11.0	10.5	12.9	14.0
	1000	10.5	12.0	12.8	9.8	11.0	12.0	11.0	13.0	14.0
	1800	8.0	10.0	10.7	8.0	9.1	10.0	8.7	10.0	11.5
	2500	7.0	8.0	8.5	6.0	7.0	7.8	7.5	8.5	9.0
New Unit No. 3	350	16.0	9.2	9.3	20.0	11.8	12.0	13.5	8.0	8.2
	500	16.0	8.5	9.2	19.0	11.0	10.5	14.0	8.3	9.0
	1000	12.5	9.0	9.7	13.0	9.0	9.6	13.0	9.6	10.8
	1800	10.0	7.3	8.0	10.0	7.2	7.9	11.0	7.4	8.4
	2500	11.0	6.0	6.6	9.5	6.2	6.5	11.0	6.6	7.3
In Use Unit No. 1	350	21.0	20.0	19.5	20.5	19.3	19.5	21.0	20.0	19.0
	500	16.0	14.0	13.3	17.5	15.7	15.0	14.5	12.8	12.0
	1000	9.0	8.0	8.3	10.0	9.0	9.0	9.0	8.6	8.5
	1800	6.5	6.0	6.0	7.0	7.0	7.0	6.5	6.0	6.5
	2500	6.0	5.8	5.8	6.2	6.0	6.0	6.0	5.4	5.6
In Use Unit No. 2	350	11.0	11.0	11.0	11.5	11.0	11.5	10.5	11.0	11.0
	500	12.5	12.0	12.5	12.5	12.0	12.2	12.8	13.0	14.0
	1000	13.5	14.0	14.0	12.5	13.0	13.5	14.0	14.0	15.0
	1800	10.7	11.0	11.5	10.0	10.7	11.0	11.0	11.5	12.0
	2500	8.2	8.2	8.6	8.2	8.0	8.4	8.5	8.5	9.0

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-2

Figure C-4(b)

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
In Use Unit No. 3	350	10.0	9.5	9.5	11.5	10.5	10.5	9.0	9.0	9.1
	500	9.2	9.3	9.6	9.3	9.2	9.3	9.7	9.8	10.5
	1000	11.5	12.0	12.5	11.0	11.0	11.5	12.5	13.0	13.2
	1800	10.0	11.0	11.5	10.0	10.5	11.0	11.0	11.5	12.0
	2500	7.7	8.2	8.7	7.5	8.0	8.3	8.0	8.6	9.0
RFI Unit No. 1	350	12.5	11.7	12.0	13.5	12.6	13.0	11.5	11.0	11.6
	500	12.0	12.3	12.8	12.3	12.0	12.5	12.0	12.3	12.8
	1000	13.5	14.0	14.5	12.5	13.0	13.5	14.0	15.0	15.5
	1800	11.5	12.0	13.0	11.5	12.0	12.6	12.0	12.6	13.4
	2500	9.5	10.0	10.5	9.0	9.8	10.0	10.0	10.3	11.0
RFI Unit No. 2	350	11.5	11.7	12.0	12.0	12.0	12.5	10.9	11.0	11.5
	500	11.5	11.8	12.0	12.0	12.0	12.5	11.5	12.0	12.4
	1000	12.0	13.0	13.4	11.7	12.3	13.0	12.7	13.3	14.0
	1800	10.0	10.5	11.0	10.0	10.5	11.0	10.5	11.0	11.7
	2500	8.5	8.8	9.0	8.3	8.5	9.0	8.5	9.0	9.3
RFI Unit No. 3	350	11.0	11.0	11.3	11.7	11.9	12.0	10.0	10.5	11.0
	500	11.6	12.2	12.4	11.5	12.0	12.4	11.5	12.0	12.8
	1000	13.0	13.7	14.0	12.0	12.7	13.4	13.3	14.4	15.0
	1800	11.0	12.0	13.0	10.5	11.6	12.0	11.4	12.3	13.0
	2500	9.0	9.4	10.0	8.8	9.5	10.0	9.5	10.2	11.0

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-2

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

4. Laboratory and Field Test Data

c. LO-3, Localizer Receiver

General:

Frequency Range:	108.0 - 135.0 mc
Means of Frequency Control:	Master Oscillator
Total Number of Channels:	Continuously Tunable
Number of Channels Available at Operator's Position:	Continuously Tunable
Means of Frequency Selection:	Continuously Tunable

Technical:

	Page(s)
Percent Specified Performance	C-250
Weighted Performance	C-251
Centering Characteristic	C-252
Selectivity	C-253
Sensitivity and Deflection Characteristic	C-254
Deflection Linearity	C-255
Alarm Signal	C-256
Deviation Indicator Stability	C-257
Percentage Modulation Characteristic	C-258
Deviation Indicator Sensitivity Adjustment Range - Centering Characteristic	C-259
Deviation Indicator Sensitivity Adjustment Range - Sensitivity & Deflection Characteristic	C-260
Deviation Indicator Sensitivity Adjustment Range - Deflection Linearity	C-261
Audio Frequency Response	C-262
Interference Tests	C-263-264
Temperature Variation Test	C-265
Audio Output Regulation & Distortion	C-266

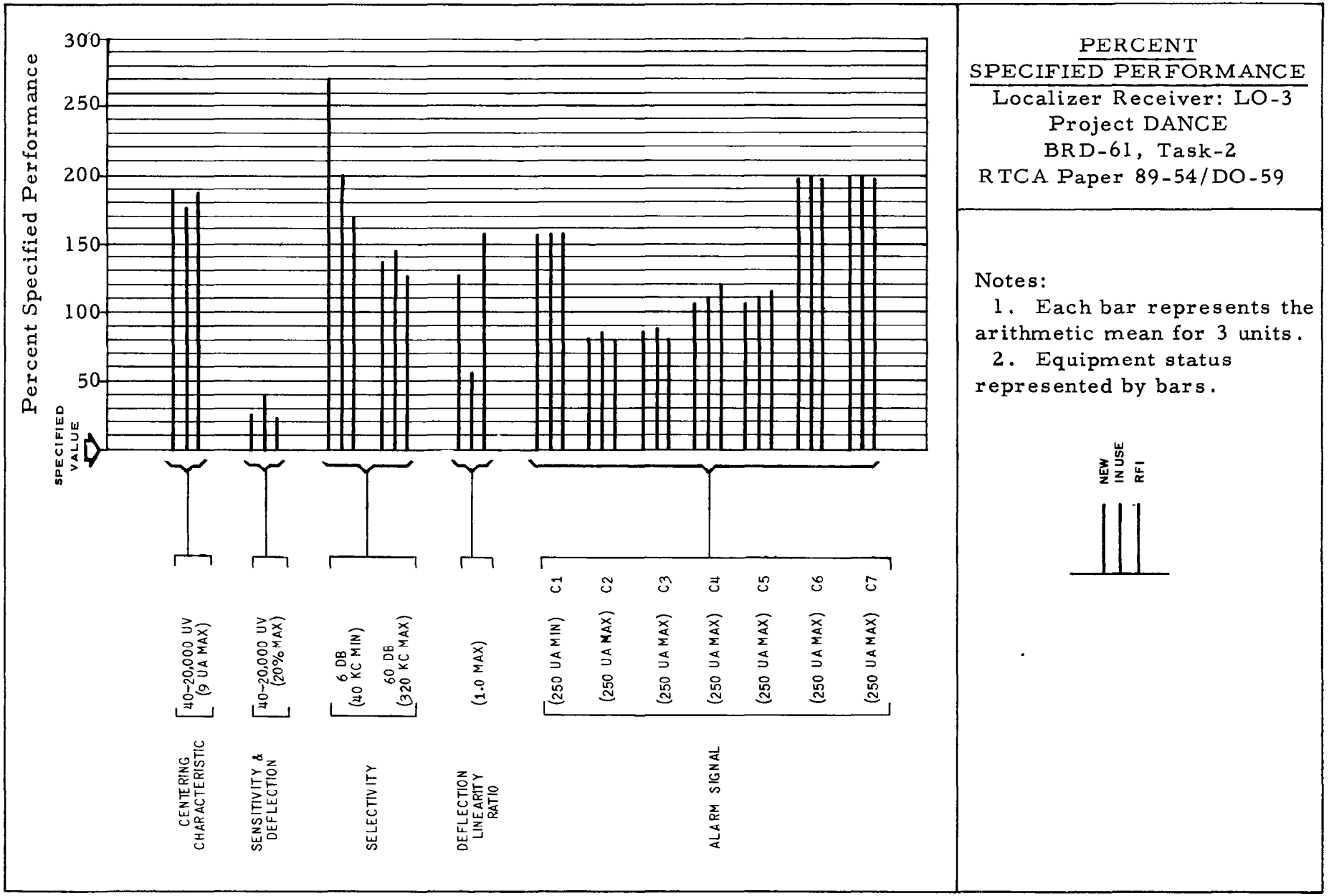
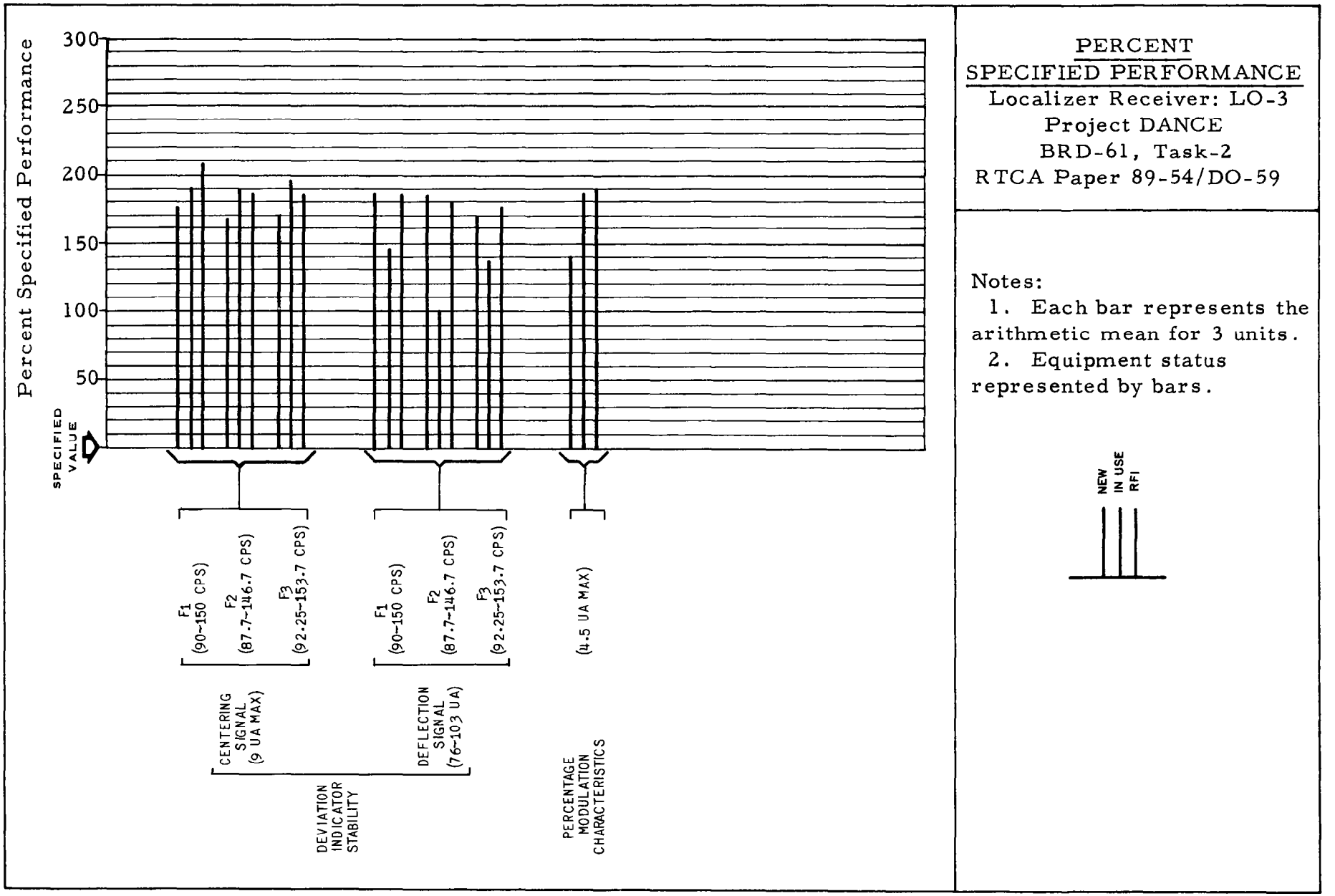


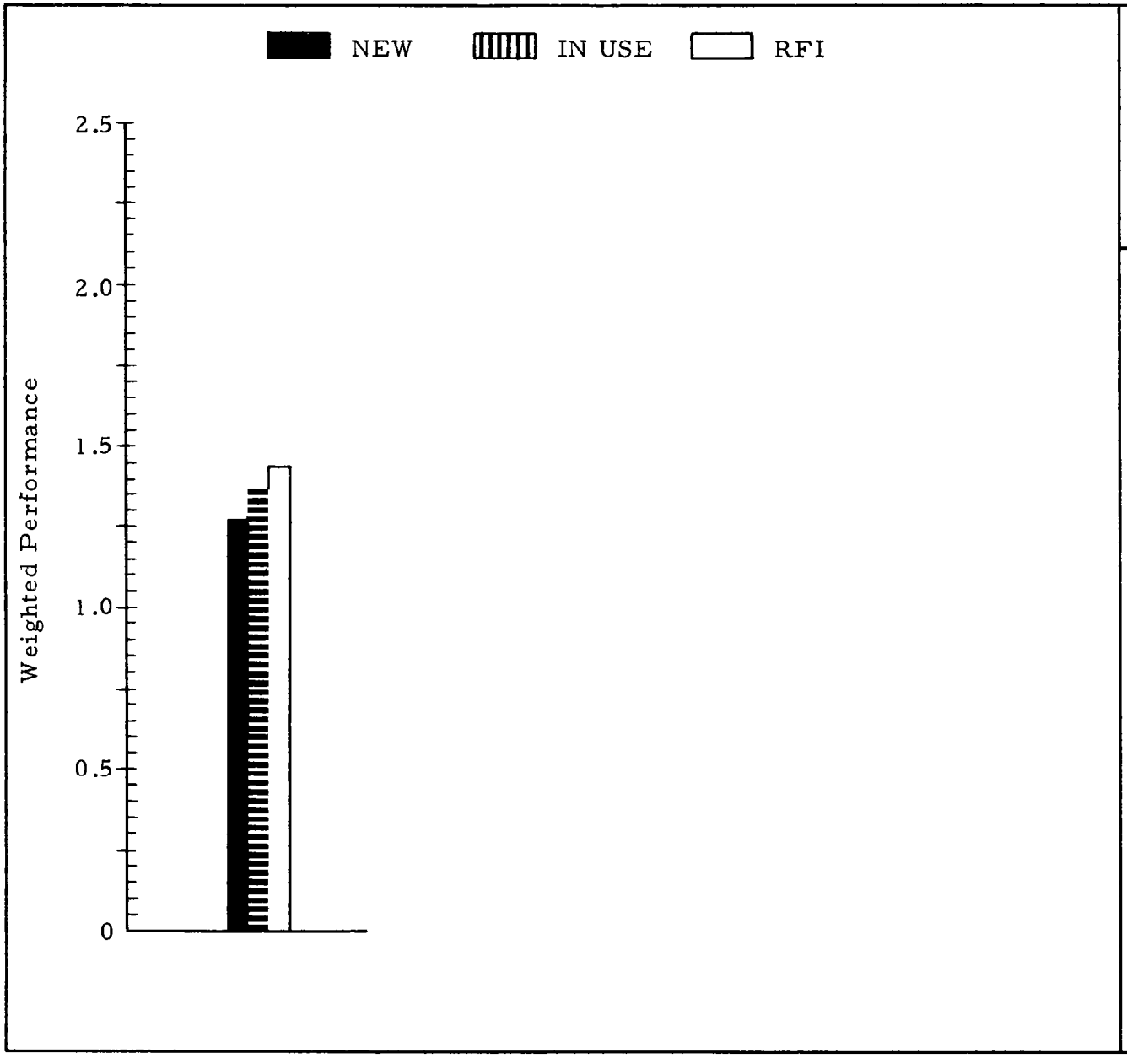
Figure C-3(c)

PERCENT SPECIFIED PERFORMANCE - LOCALIZER RECEIVER - LO-3

(continued on Page C-250a)



PERCENT SPECIFIED PERFORMANCE - LOCALIZER RECEIVER - LO-3



WEIGHTED PERFORMANCE

Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2

WEIGHTING FACTORS

Centering Characteristic 1/4

Sensitivity & Deflection: 3/20

Selectivity:
b_1, b_2 1/8 ea.

Deflection Linearity: 1/10

Alarm Signal:
c_1, c_2, c_3, c_4, c_5, c_6, c_7 1/70 ea.

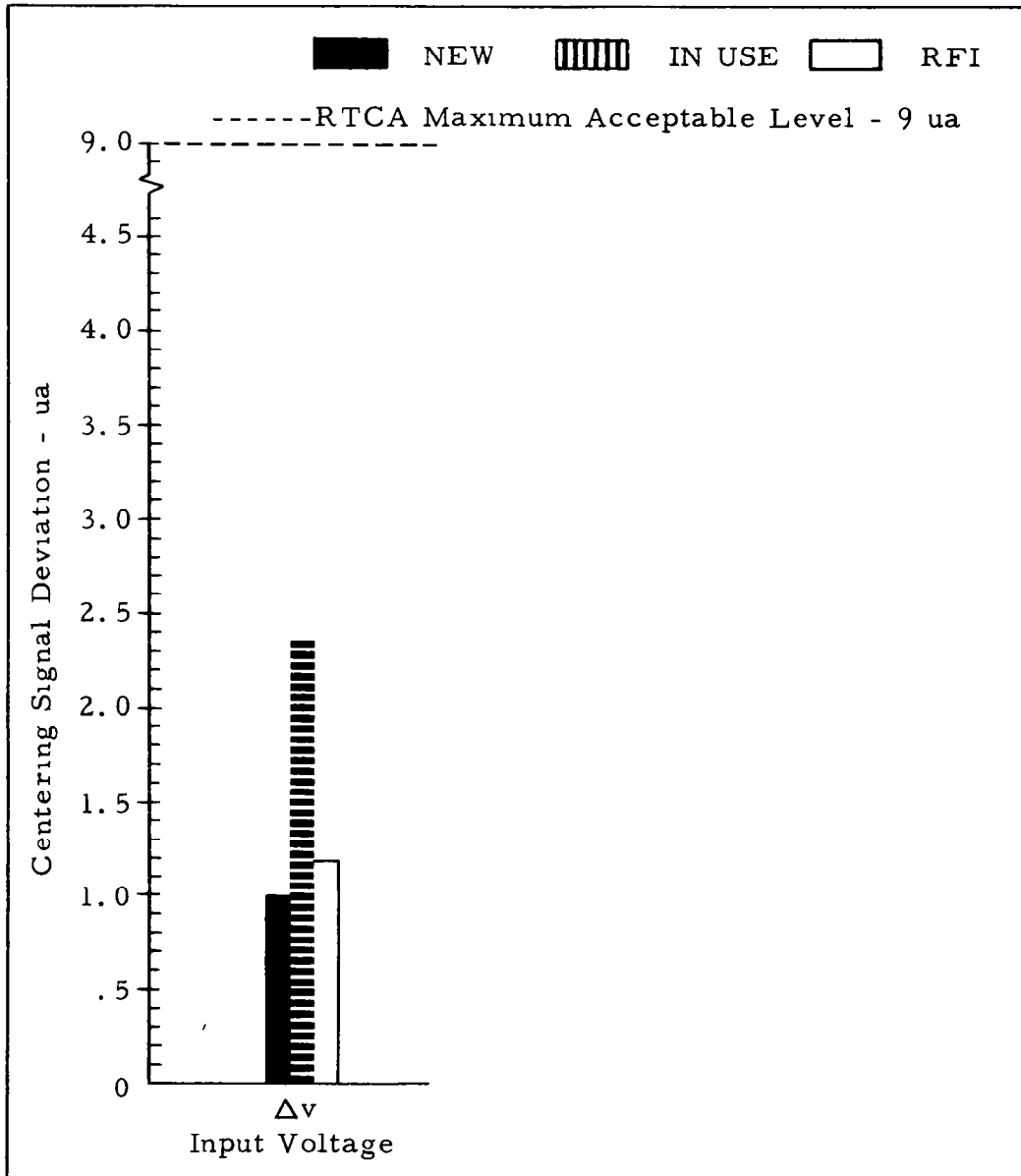
Deviation Indicator Stability:
(I) f_1, f_2, f_3 1/60 ea.
(II) f_1, f_2, f_3 1/60 ea.

Percentage Modulation Characteristic: 1/20

Note:
1. Graph based on arithmetic mean for above characteristics.

Figure C-3(c)

WEIGHTED PERFORMANCE - LOCALIZER RECEIVER - LO-3



CENTERING CHARACTERISTIC
Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.3

LEGEND

Δv - 40 - 20,000 uv
Standard Deflection - 90 ua

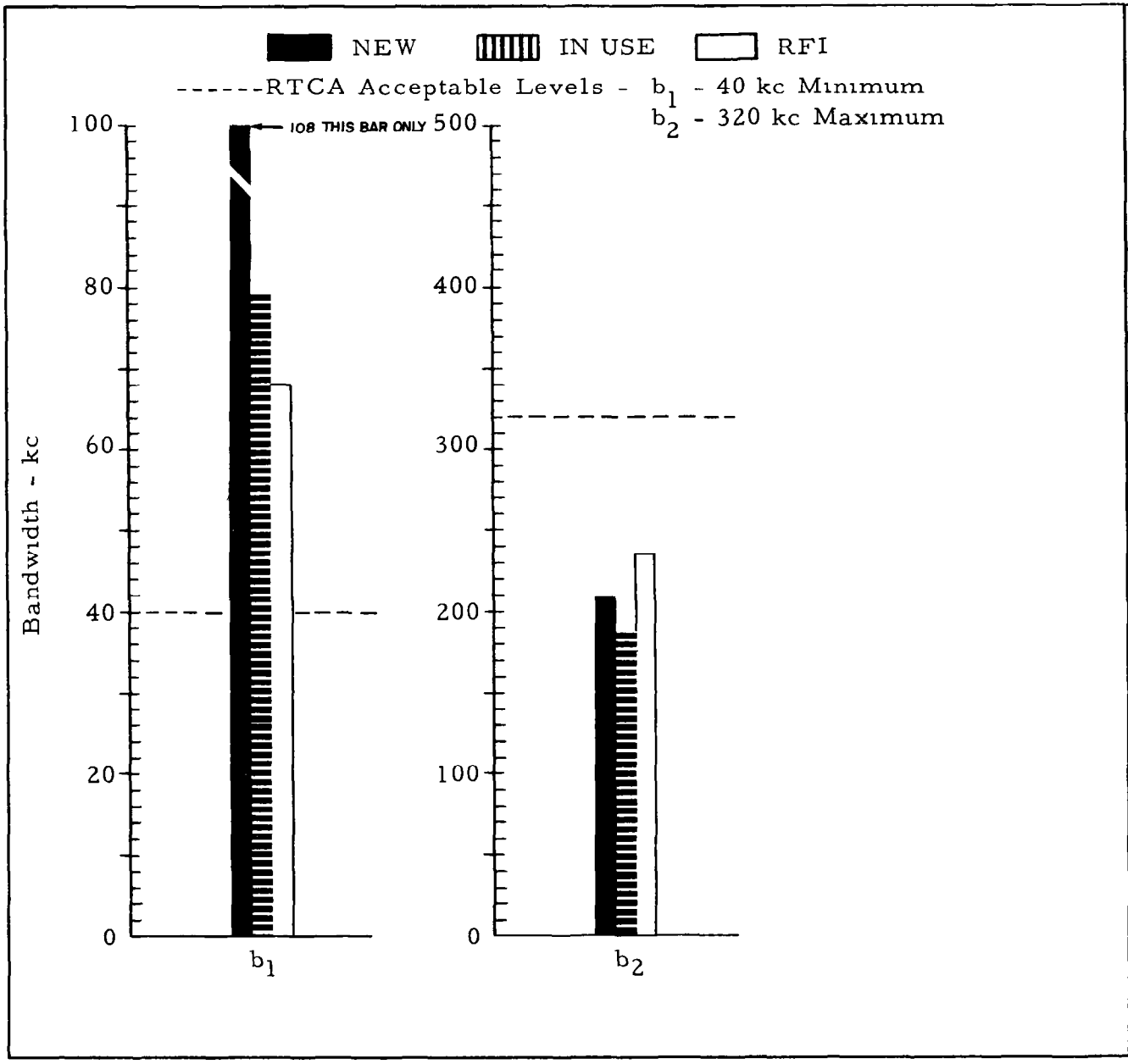
Standard Deviation

New	In Use	RFI
.709	1.15	.768

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 ua.

Figure C-3(c)

CENTERING CHARACTERISTIC - LOCALIZER RECEIVER - LO-3



SELECTIVITY

Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.6

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 110.1 mc

Standard Deviation

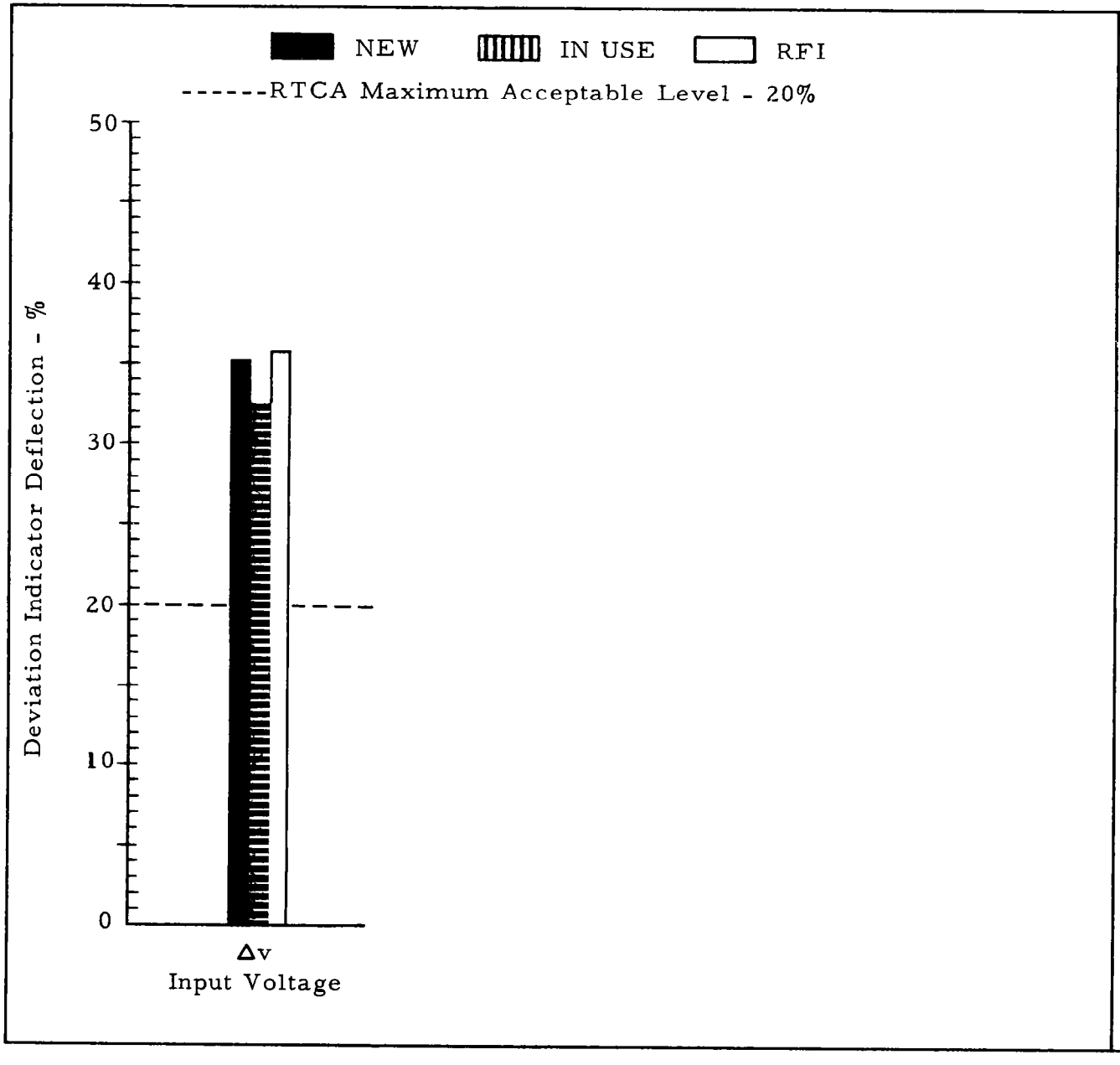
Test	New	In Use	RFI
b_1	13.7	81.4	10.3
b_2	23.7	28.6	182.6

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable levels:
b_1 - 40 kc minimum
b_2 - 320 kc maximum
3. This receiver is continuously tunable.

Figure C-3(c)

SELECTIVITY - LOCALIZER RECEIVER - LO-3



SENSITIVITY & DEFLECTION CHARACTERISTIC

Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.4

LEGEND

Δv - 40 - 20,000 uv

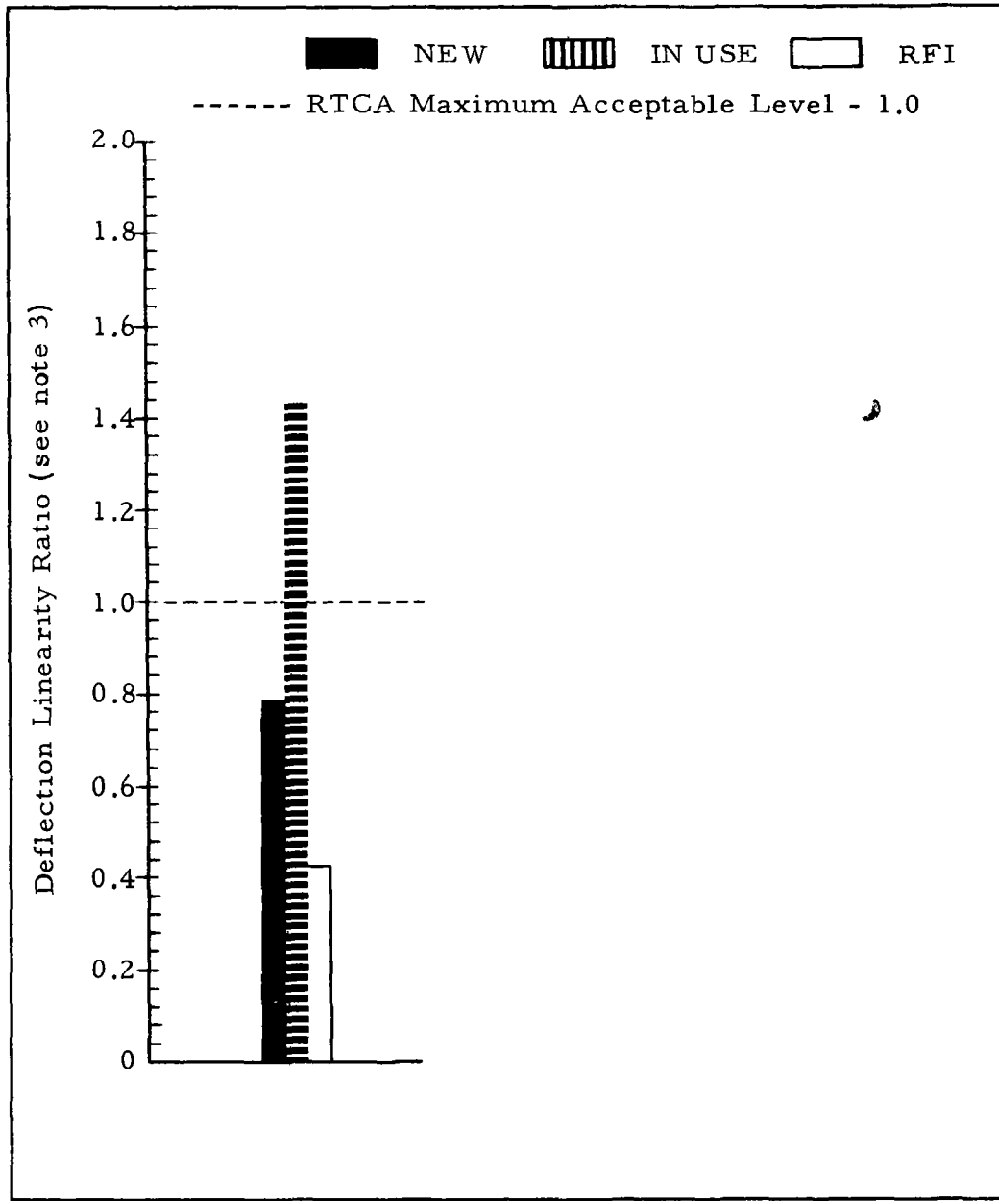
Standard Deviation

New	In Use	RFI
9.0	1.8	4.5

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 20%.

Figure C-3(c) SENSITIVITY & DEFLECTION CHARACTERISTIC - LOCALIZER RECEIVER - LO-3



DEFLECTION LINEARITY

Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.5

Standard Deviation

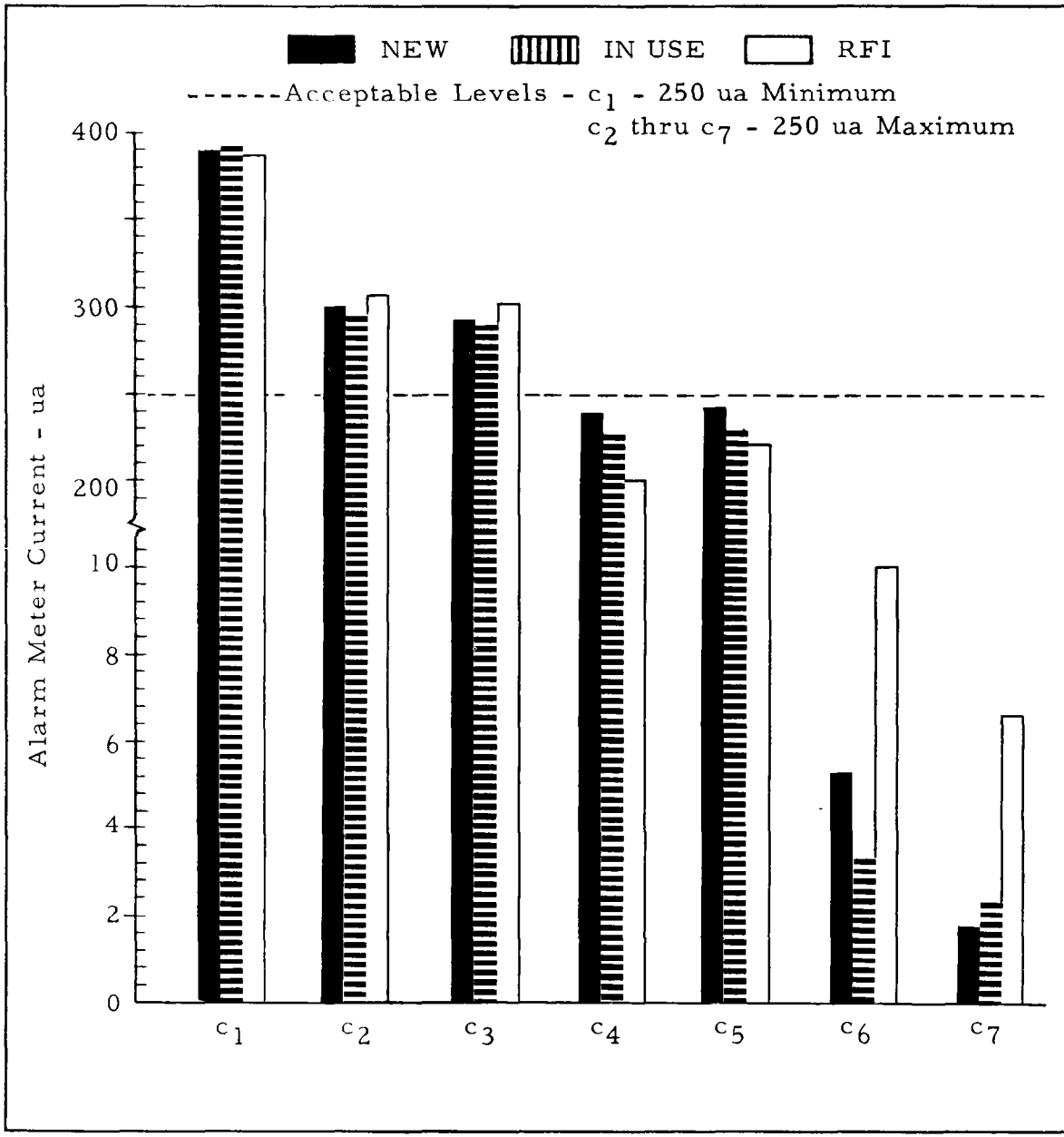
New	In Use	RFI
0.2	0.5	0.3

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 1.0.
3. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.

DEFLECTION LINEARITY - LOCALIZER RECEIVER - LO-3

Figure C-3(c)



ALARM SIGNAL

Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.9

LEGEND

c_1 - std. test sig. - 40 uv
c_2 - mod. 0% - 150 cps & 20% - 90 cps
c_3 - mod. 0% - 90 cps & 20% - 150 cps
c_4 - mod. 10% - 90 cps & 10% - 150 cps
c_5 - std. dev. sig. @ 50% deflection
c_6 - absence of mod. - 1000 uv
c_7 - absence of R.F.

Standard Deviation

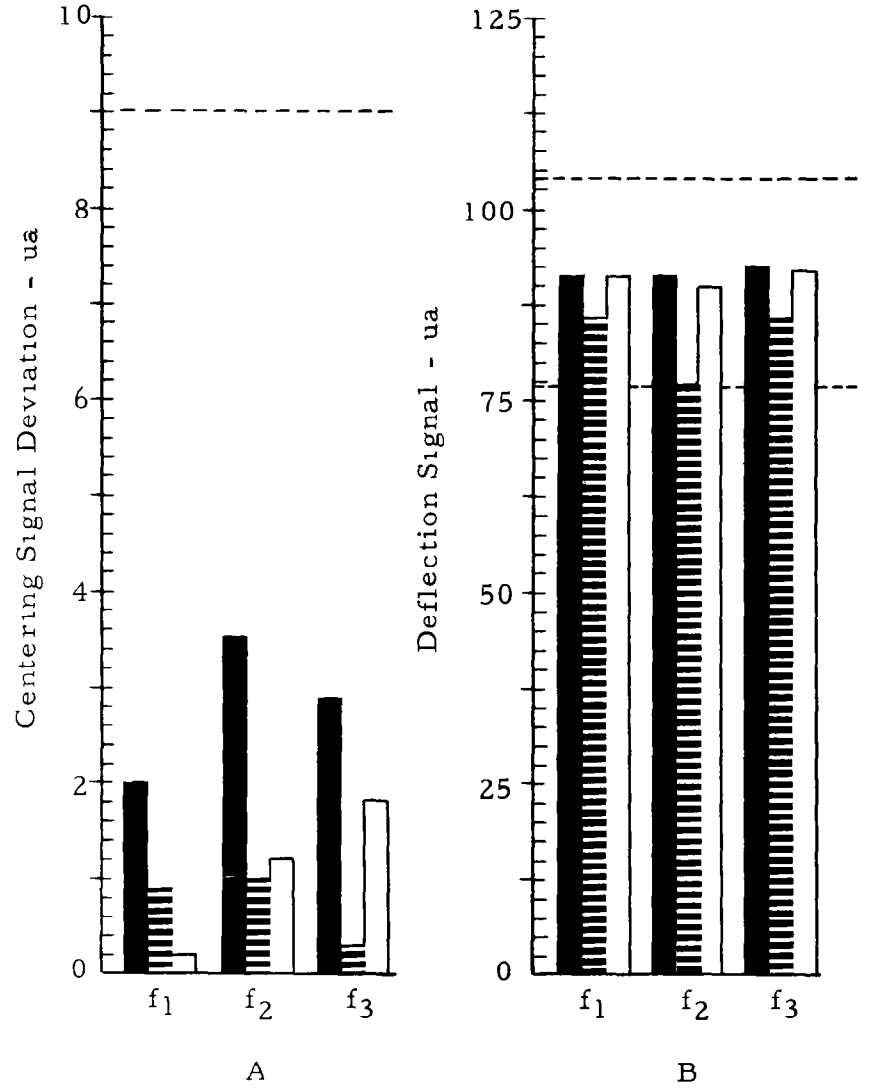
Test	New	In Use	RFI
c_1	21.8	10.4	23.0
c_2	13.2	10.0	17.3
c_3	12.6	2.9	16.7
c_4	10.4	4.6	63.2
c_5	18.9	1.2	11.5
c_6	4.0	3.3	0
c_7	2.9	2.5	2.9

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA paper as a guide.

Figure C-3(c)

ALARM SIGNAL - LOCALIZER RECEIVER - LO-3



DEVIATION INDICATOR STABILITY WITH CHANGES IN FREQ. OF 90 & 150 cps SIGNALS

Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.13 (a) (b)

LEGEND

f_1 - 90 & 150 cps
f_2 - 87.75 & 146.25 cps
f_3 - 92.25 & 153.75 cps

Standard Deviation

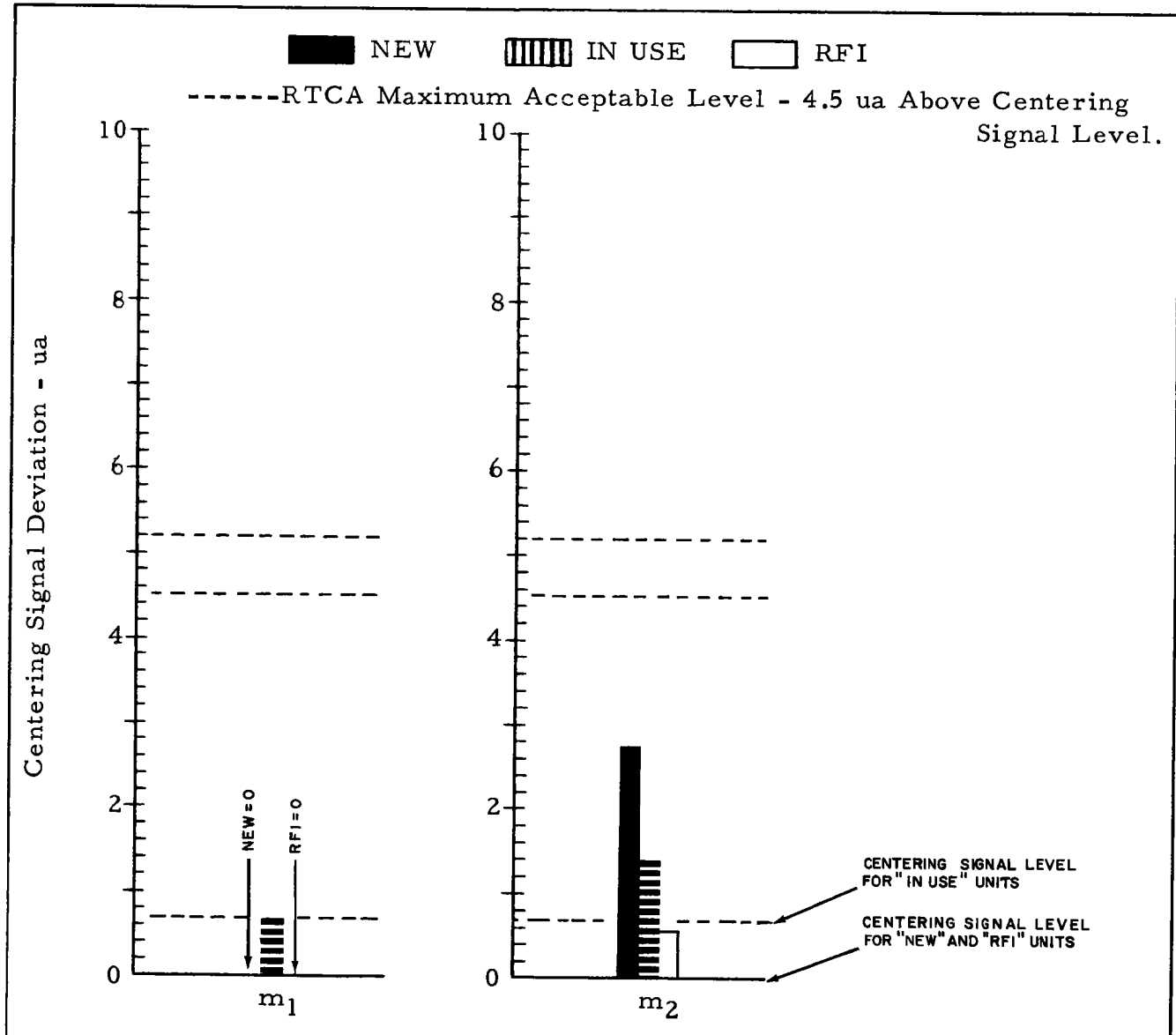
	Test	New	In Use	RFI
A	f_1	1.0	1.3	0.3
	f_2	0.5	1.0	1.1
	f_3	1.6	0.5	1.6
B	f_1	5.0	5.2	6.1
	f_2	2.8	2.1	3.5
	f_3	2.9	4.2	3.8

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable:
   Graph A: Centering Signal - 9 ua maximum.
   Graph B: Deflection Signal Limits - 76.5 to 103.5 ua.

DEVIATION INDICATOR STABILITY WITH CHANGES IN FREQUENCY OF 90 & 150 cps SIGNALS
LOCALIZER RECEIVER - LO-3

Figure C-3(c)



PERCENTAGE MODULATION CHARACTERISTIC

Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.18

LEGEND

m_1 - 20% of 90 and 150 cps
m_2 - 25% of 90 and 150 cps

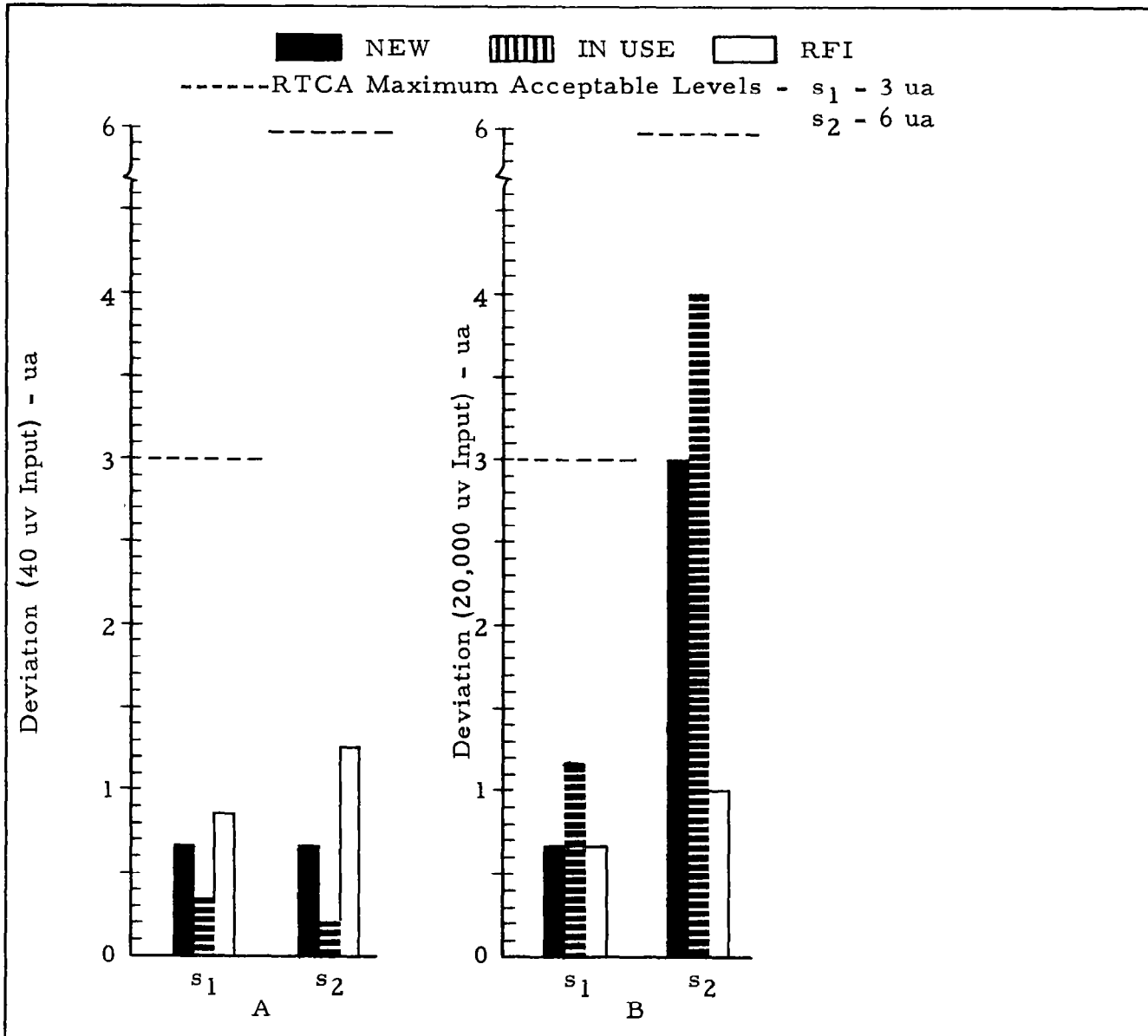
Standard Deviation

Test	New	In Use	RFI
m_1	0	1.1	0
m_2	2.3	2.2	0.5

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 4.5 ua above centering signal level.

PERCENTAGE MODULATION CHARACTERISTIC - LOCALIZER RECEIVER - LO-3

Figure C-3(c)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Centering Characteristic)
Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.14

LEGEND

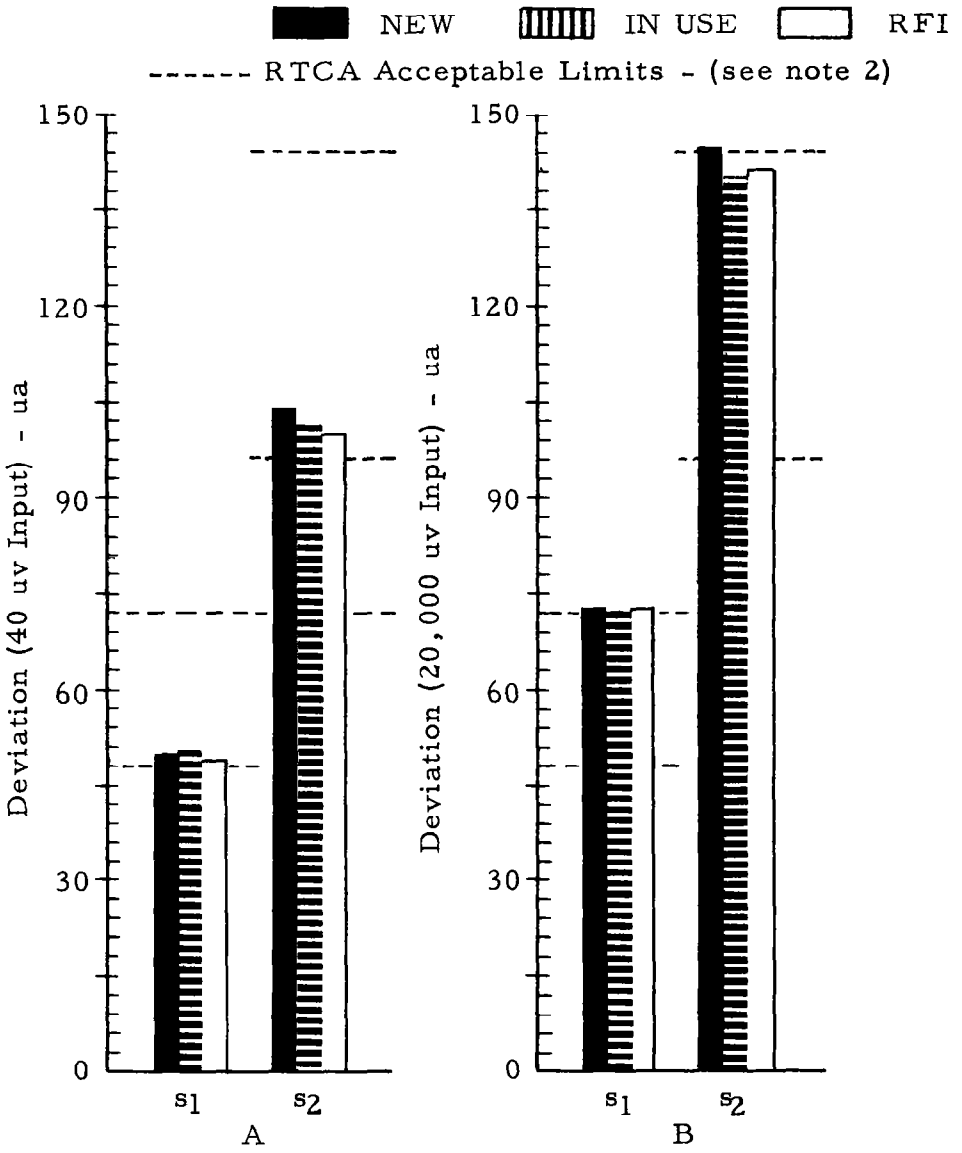
Sensitivity Setting
s_1 - 0.4 of full scale
s_2 - 0.8 of full scale
Standard Deviation

Test		New	In Use	RFI
A	s_1	1.2	0.6	0.3
	s_2	0.6	2.0	1.1
B	s_1	0.6	0.8	1.2
	s_2	0	1.0	1.7

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable levels: Graph A & B
s_1 - 0.4 of full scale, 3 ua max.
s_2 - 0.8 of full scale, 6 ua max.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-3
(Centering Characteristic)

Figure C-3(c)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Sensitivity & Deflection)
Localizer Receiver - LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.14

LEGEND

Sensitivity Setting

s_1 - 0.4 of full scale

s_2 - 0.8 of full scale

Standard Deviation

	Test	New	In Use	RFI
A	s_1	0	2.2	1.6
	s_2	2.0	2.5	2.5
B	s_1	1.0	2.1	1.0
	s_2	6.1	4.0	3.1

Notes:

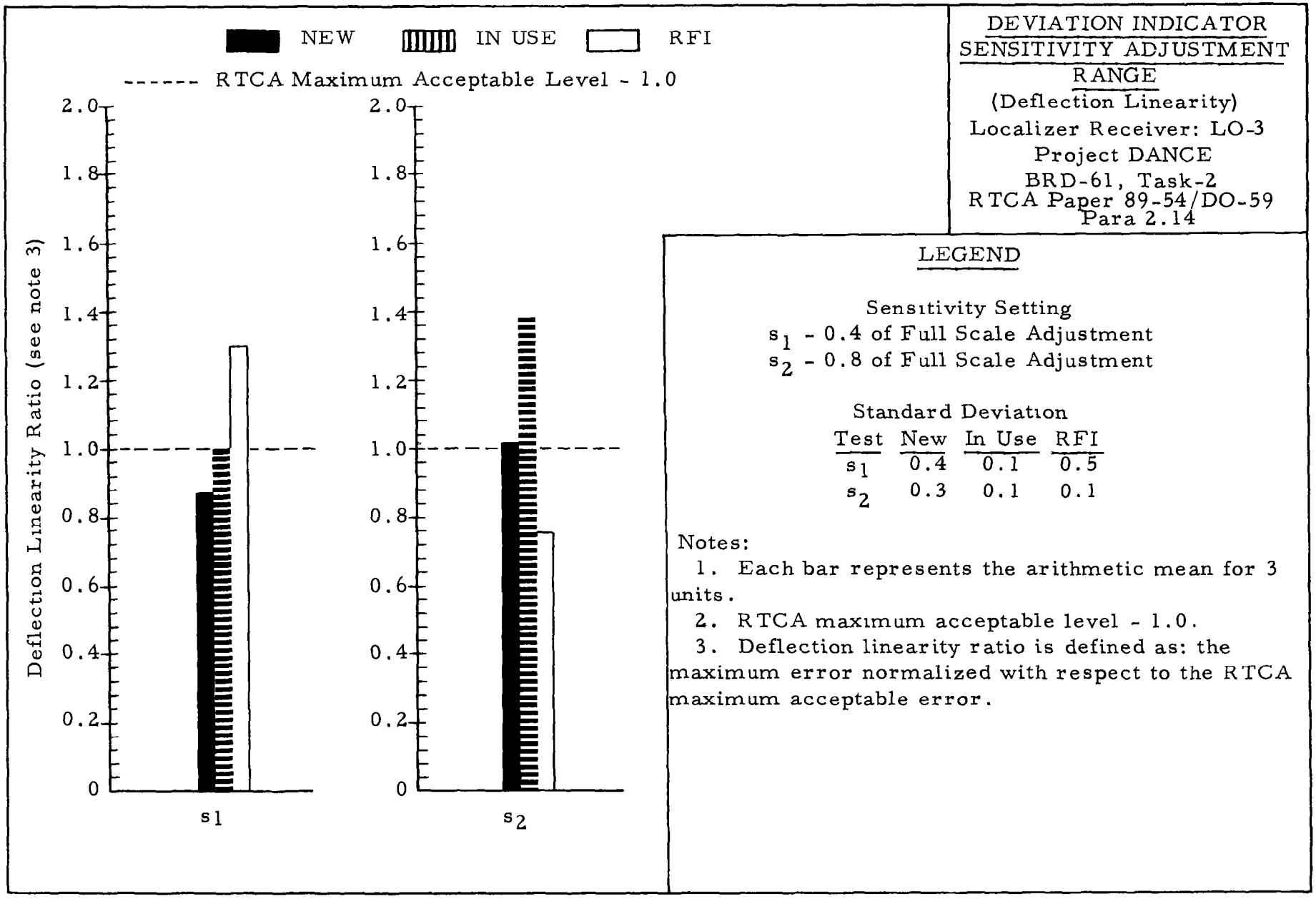
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable limits: Graph A and B:

s_1-0.4 full scale, 48-72 ua.

s_2-0.8 full scale, 98-144 ua.

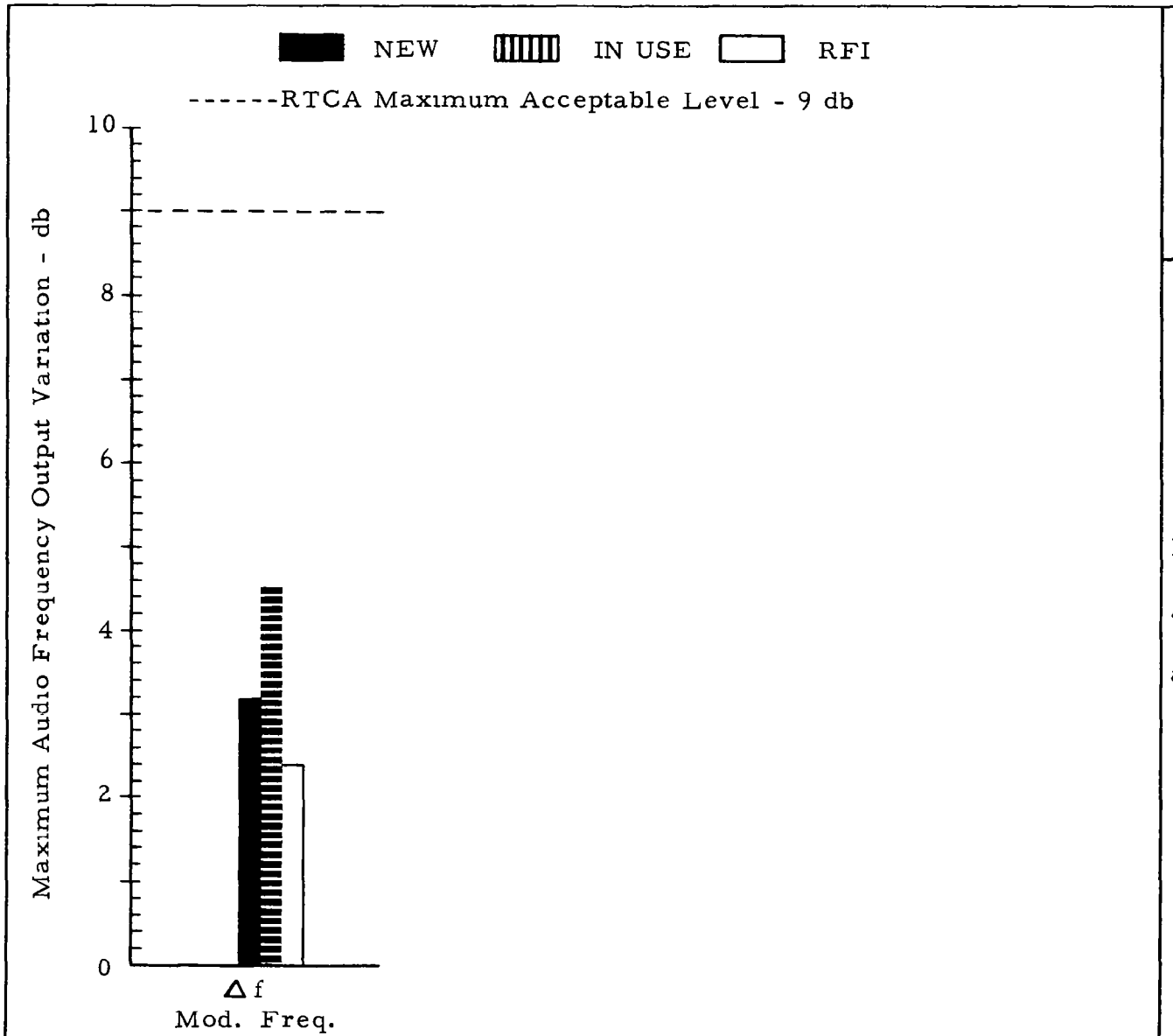
Figure C-3(c)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-3
(Sensitivity & Deflection)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - LOCALIZER RECEIVER - LO-3
(Deflection Linearity)

Figure C-3(c)



AUDIO FREQ. RESPONSE

Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.16

LEGEND

Δf - 350 - 2500 cps

Standard Deviation

New	In Use	RFI
0.3	2.4	0.6

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 db.

Figure C-3(c)

AUDIO FREQUENCY RESPONSE - LOCALIZER RECEIVER - LO-3

INTERFERENCE TESTS

Localizer Receiver: LO-3
Project DANCE
BRD-60, Task-2
RTCA Paper 89-54/DO-59

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.7	.19 to 1500	110.1	Acceptable level excluding the band 107.8 to 112.2 mc: ≥60 db.	Actual Level: ≥60 db. All frequencies within performance standards.	Yes
Cross Modulation RTCA Para: 2.8	107 to 112	110.1	Acceptable level excluding the band within F_c ± 200 kc: Alarm Device: ≥250 microamps. * Deviation Indication: ≤9 microamps.	Actual Level: >250 microamps. 0 microamps. All frequencies within performance standards.	Yes
Cable Conducted Interference RTCA Para: 2.10a	.15 to 25	108.0	Acceptable Emission: ≤200 microvolts. * Acceptable levels were determined by using RTCA Papers as a guide.	Actual Emission: <200 microvolts. All frequencies within performance standards.	Yes

INTERFERENCE TESTS - LOCALIZER RECEIVER - LO-3

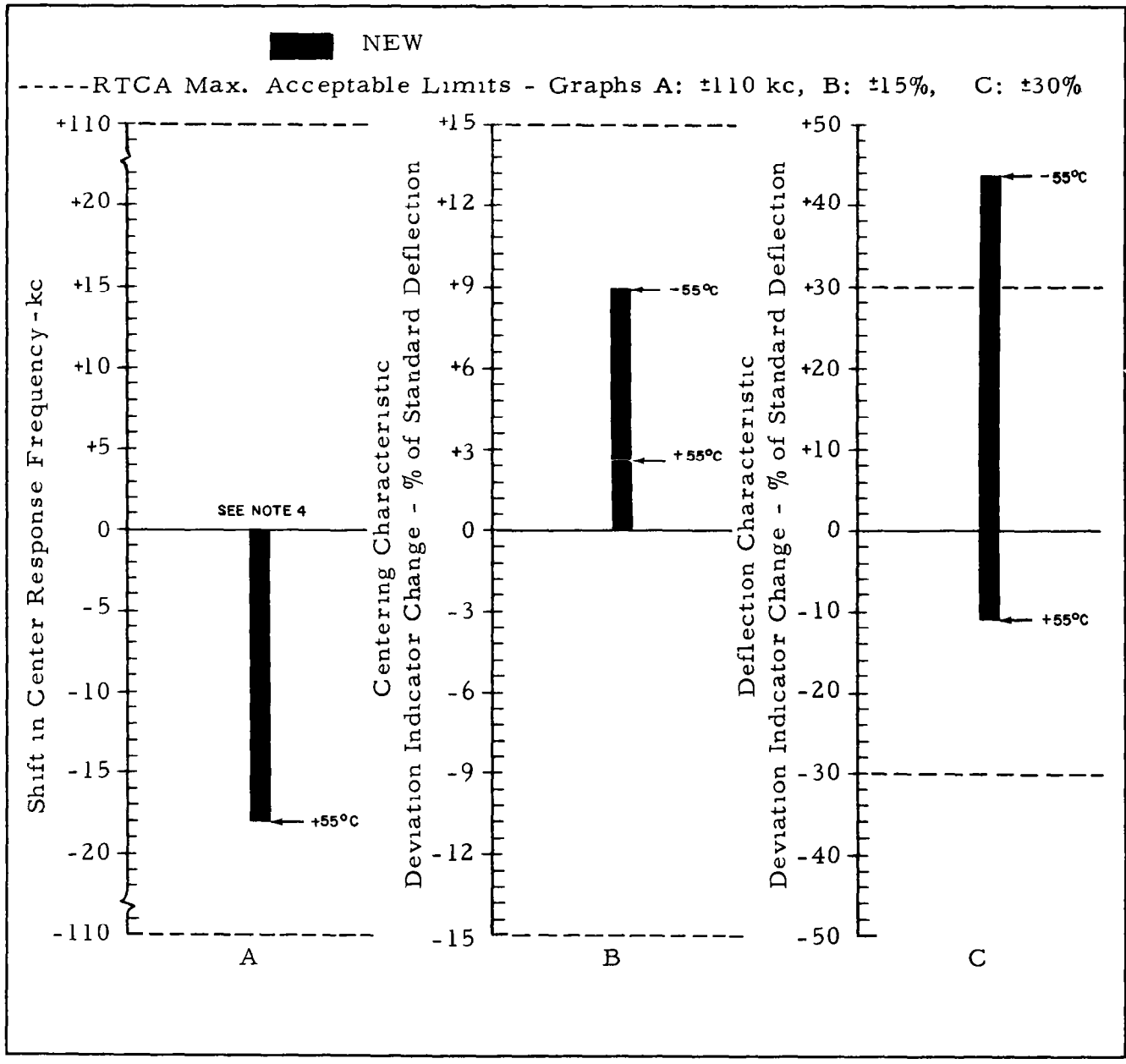
(continued on Page C-264)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.15	107 to 112	Varied over localizer band	Acceptable Operation: Deviation Indication: ≤4.5 microamps.	Actual Operation: 0 microamps. All frequencies within performance standards.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	110.1	None	(Not Applicable)

Figure C-3(c)

INTERFERENCE TESTS - LOCALIZER RECEIVER - LO-3



TEMPERATURE VARIATION TEST
Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 3.3(a)(b)(c)

LEGEND

fc - 110 mc

Notes:

1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits:
   - Graph A: ±110 kc
   - Graph B: ±15%
   - Graph C: ±30%
3. This unit is designed to operate above 15,000 feet.
4. -55°C frequency shift - 0. kc.

Figure C-3(c)

TEMPERATURE VARIATION TEST - LOCALIZER RECEIVER - LO-3

Note: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

AUDIO OUTPUT
REGULATION & DISTORTION
Localizer Receiver: LO-3
Project DANCE
BRD-61, Task-2,
RTCA Paper 89-54/DO-59,
Para 2.17

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
New Unit No. 1	350	82	90	130	62	81	111	81	108	149
	500	120	140	180	81	110	150	125	158	192
	1000	160	180	230	110	150	190	160	190	235
	1800	129	150	177	110	139	161	132	160	185
	2500	88	100	121	79	91	115	85	102	130
New Unit No. 2	350	80	110	150	55	75	100	70	90	125
	500	105	145	175	75	100	70	100	130	170
	1000	150	180	280	100	135	180	155	180	230
	1800	165	190	240	110	140	175	140	165	200
	2500	95	120	150	80	95	120	100	120	150
New Unit No. 3	350	220	268	332	170	215	280	200	250	290
	500	285	350	405	240	300	370	260	305	360
	1000	335	380	430	270	330	385	310	360	395
	1800	350	290	325	210	250	280	165	180	210
	2500	170	190	215	135	155	170	175	195	220
In Use Unit No. 1	350	78	100	140	60	78	105	82	112	148
	500	122	160	200	185	118	150	132	160	200
	1000	170	200	250	112	148	185	162	190	235
	1800	130	158	185	100	122	155	130	160	190
	2500	82	100	127	68	80	100	185	105	132

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-3

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
In Use Unit No. 2	350	62	85	120	50	70	91	55	76	108
	500	110	150	190	82	115	158	109	150	185
	1000	165	200	250	150	185	230	170	200	245
	1800	140	168	192	106	132	160	150	172	198
	2500	86	105	130	69	85	95	92	118	142
In Use Unit No. 3	350	100	135	168	60	28	100	110	142	170
	500	130	162	200	90	125	158	150	180	210
	1000	150	180	220	110	142	172	170	200	240
	1800	148	172	200	118	150	170	138	162	190
	2500	95	115	140	82	100	115	88	110	130
RFI Unit No. 1	350	60	82	103	45	60	79	70	90	120
	500	88	122	145	61	81	105	100	130	160
	1000	108	140	170	70	93	120	120	150	175
	1800	80	100	127	60	73	90	87	110	138
	2500	56	70	80	40	50	62	60	75	90
RFI Unit No. 2	350	100	140	172	70	98	130	100	140	172
	500	132	172	210	90	130	165	145	180	210
	1000	160	195	240	110	150	185	160	190	230
	1800	138	170	192	110	140	162	130	160	180
	2500	88	110	132	175	90	105	82	100	128
RFI Unit No. 3	350	95	130	170	70	95	130	90	130	160
	500	130	175	215	90	125	165	135	175	220
	1000	155	200	250	110	155	190	150	190	240
	1800	130	170	200	110	140	175	120	160	190
	2500	70	105	135	75	90	119	78	100	130

Figure C-3(c)

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-3

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
New Unit No. 1	350	22.5	25.0	26.0	32.0	32.0	32.0	22.0	23.0	23.5
	500	23.0	22.5	23.0	27.5	27.5	27.5	19.0	19.5	20.0
	1000	19.5	19.2	19.0	23.8	24.0	24.5	16.0	17.0	17.5
	1800	19.5	19.5	20.5	22.0	22.0	22.5	17.5	18.0	19.0
	2500	23.0	24.0	25.5	26.0	26.5	27.5	21.0	22.0	23.0
New Unit No. 2	350	29.0	28.5	28.5	34.0	34.0	34.0	28.0	28.0	28.0
	500	29.0	29.0	26.5	32.0	30.0	32.0	22.5	22.5	22.5
	1000	24.0	24.0	21.5	27.0	27.0	27.5	18.0	19.0	20.0
	1800	20.5	21.5	22.0	25.0	26.0	26.5	18.0	19.0	20.0
	2500	25.0	26.5	28.0	28.0	30.0	32.0	20.5	21.5	23.0
New Unit No. 3	350	15.5	16.5	18.0	16.0	17.5	19.0	15.0	16.0	18.0
	500	14.0	16.0	17.5	15.0	16.5	19.0	14.0	16.0	17.5
	1000	12.0	13.0	15.5	12.5	14.0	15.5	13.0	14.5	16.0
	1800	9.0	10.0	11.0	9.5	10.0	11.0	12.5	13.0	13.5
	2500	10.5	11.0	12.0	11.5	12.0	12.5	9.5	11.0	11.5
In Use Unit No. 1	350	27.0	27.0	27.0	28.0	28.0	28.0	25.0	26.0	25.0
	500	21.0	21.0	21.0	23.0	22.0	22.0	19.0	20.0	21.0
	1000	17.0	17.0	17.5	19.0	19.5	19.0	16.0	17.0	17.0
	1800	19.0	19.5	20.0	20.0	20.0	20.5	17.0	17.5	17.5
	2500	23.0	24.0	24.0	25.0	25.0	26.0	21.0	21.0	22.0
In Use Unit No. 2	350	22.0	22.0	23.0	23.0	22.5	22.5	22.0	22.0	23.0
	500	16.0	16.5	17.5	19.5	19.5	20.0	18.0	16.0	17.5
	1000	13.0	13.0	14.0	12.5	13.0	14.0	13.0	13.5	14.0
	1800	13.0	13.5	14.0	14.0	14.5	15.0	12.0	12.0	13.0
	2500	15.0	16.0	17.0	17.0	17.5	19.0	13.5	14.0	15.0

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-3

Figure C-3(c)

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
In Use Unit No. 3	350	28.0	28.0	28.0	27.0	37.0	36.0	26.0	26.0	26.0
	500	27.0	27.0	26.0	29.0	29.0	29.0	22.0	22.0	22.0
	1000	25.0	24.0	25.0	27.0	27.0	27.0	20.0	20.0	20.0
	1800	24.0	23.0	24.0	24.5	25.0	25.0	23.0	23.0	22.5
	2500	29.0	29.0	30.0	27.0	30.0	30.0	27.0	28.0	28.0
RFI Unit No. 1	350	5.6	6.0	7.2	5.5	6.0	7.5	6.0	7.0	9.0
	500	7.6	2.0	2.4	1.6	2.0	2.4	7.5	9.0	10.5
	1000	11.5	12.0	8.3	4.8	1.8	2.2	7.8	9.0	10.2
	1800	5.0	5.2	5.6	2.9	2.6	2.8	5.0	5.2	5.4
	2500	3.2	2.2	2.4	1.0	2.2	2.2	4.0	3.0	3.0
RFI Unit No. 2	350	30.0	29.0	29.0	34.0	33.0	31.5	26.0	26.0	26.0
	500	26.0	26.0	26.0	30.0	30.0	29.0	22.0	23.0	23.0
	1000	23.0	23.0	23.0	27.0	26.5	27.0	20.0	21.0	21.0
	1800	24.0	24.0	24.0	24.0	25.0	25.0	22.0	22.0	22.0
	2500	29.0	29.0	30.0	29.0	30.0	31.0	27.0	28.0	28.0
RFI Unit No. 3	350	30.0	29.0	29.0	33.0	33.0	33.0	27.0	26.5	26.0
	500	25.5	25.0	25.0	29.0	29.0	28.5	22.0	22.0	22.0
	1000	22.5	23.5	22.5	8.2	8.2	26.0	19.5	20.0	20.0
	1800	24.5	25.0	25.0	26.0	26.5	26.5	22.0	22.5	23.0
	2500	30.0	31.0	32.0	31.0	32.0	33.0	27.0	27.5	28.0

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-3

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

4. Laboratory and Field Test Data

d. LO-4, Localizer Receiver

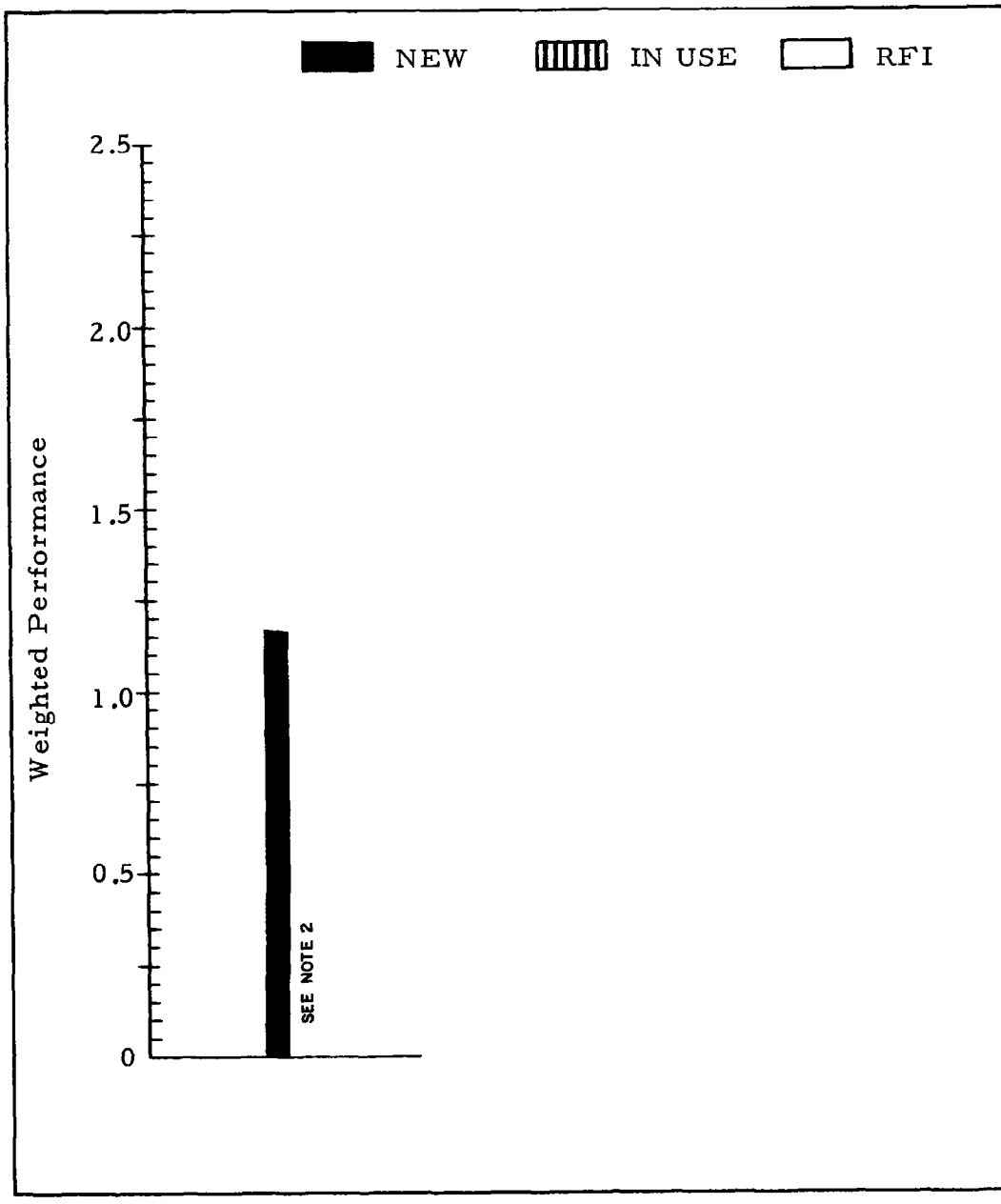
General:

Frequency Range:	108.0 - 126.7 mc
Means of Frequency Control:	Master Oscillator
Total Number of Channels:	Continuously Tunable
Number of Channels Available at Operator's Position:	Continuously Tunable
Means of Frequency Selection:	Continuously Tunable

Technical:

	Page(s)
Percent Specified Performance	C-268
Weighted Performance	C-269
Centering Characteristic	C-270
Selectivity	C-271
Sensitivity and Deflection Characteristic	C-272
Deflection Linearity	C-273
Deviation Indicator Stability	C-274
Percentage Modulation Characteristic	C-275
Audio Frequency Response	C-276
Interference Tests	C-277-278
Temperature Variation Test	C-279
Audio Output Regulation & Distortion	C-280

PERCENT SPECIFIED PERFORMANCE - LOCALIZER RECEIVER - LO-4



WEIGHTED PERFORMANCE

Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2

WEIGHTING FACTORS

Centering Characteristic: 3/10

Senstivity & Deflection: 3/20

Selectivity:
b_1, b_2 3/20 ea.

Deflection Linearity: 1/10

Deviation Indicator Stability:
(I) f_1, f_2, f_3 1/60 ea.
(II) f_1, f_2, f_3 1/60 ea.

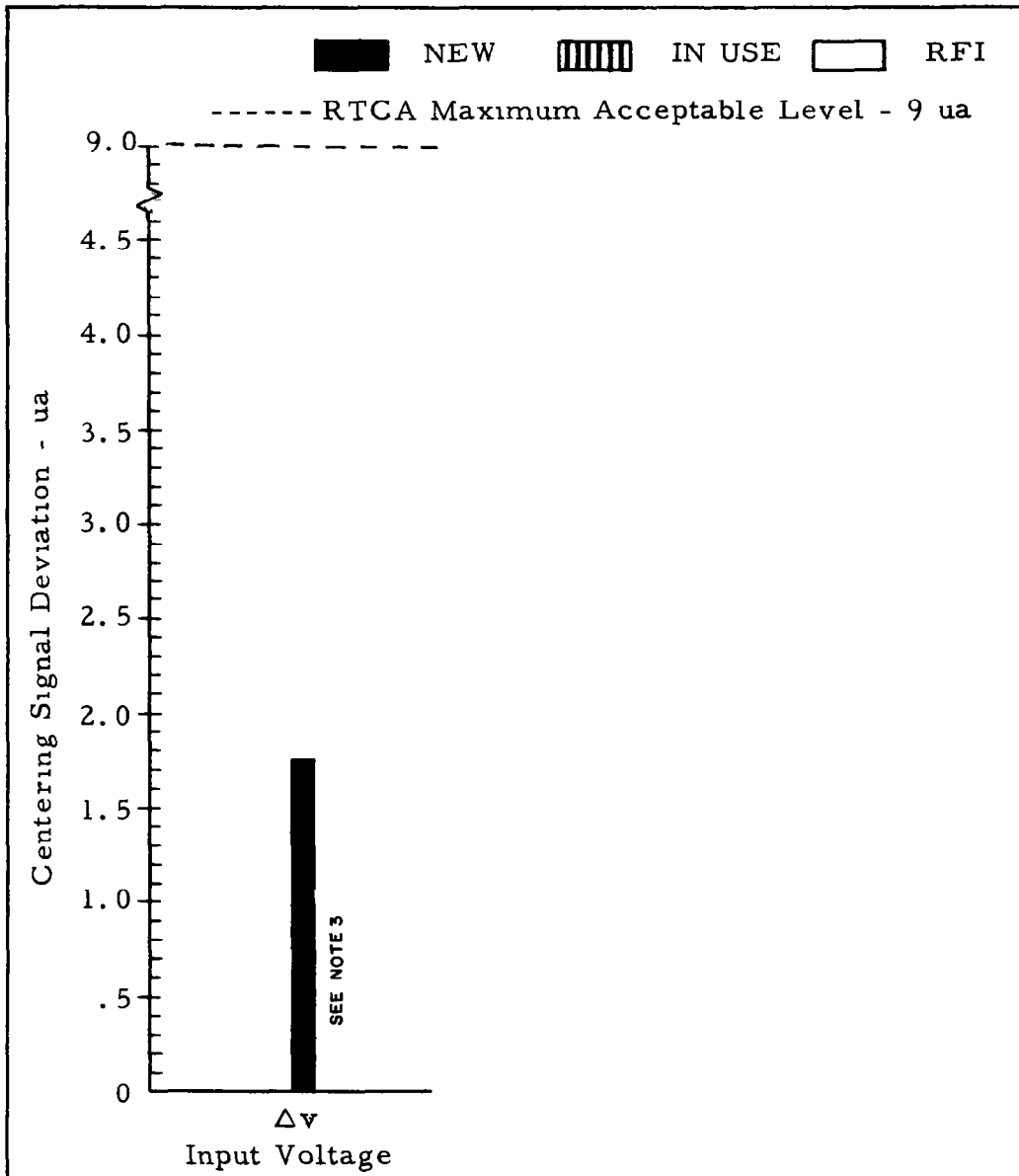
Percentage Modulation Characteristic: 1/20

Notes:

1. Graph based on arithmetic mean for above characteristics.
2. "RFI" and "In Use" equipment of the LO-4 were not available for test.

Figure C-3(d)

WEIGHTED PERFORMANCE - LOCALIZER RECEIVER - LO-4



CENTERING CHARACTERISTIC
Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.3

LEGEND

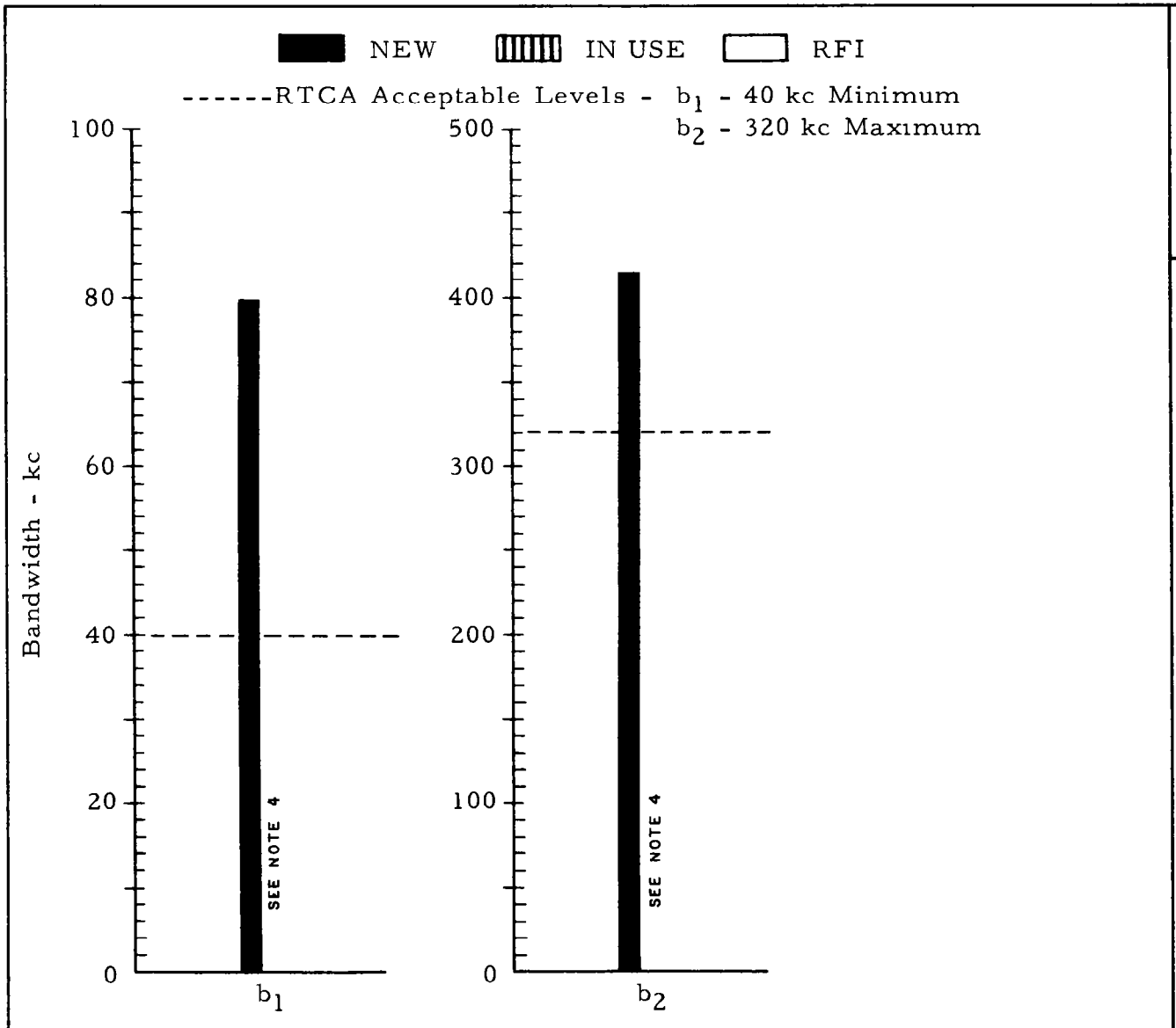
Δv - 40 - 20,000 uv
Standard Deflection - 90 ua

Standard Deviation		
New	In Use	RFI
3.1	———	———

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 ua.
3. "RFI" and "In Use" equipments of the LO-4 were not available for test.

Figure C-3(d)

CENTERING CHARACTERISTIC - LOCALIZER RECEIVER - LO-4



SELECTIVITY

Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.6

LEGEND

b_1 - Bandwidth @ 6 db down
b_2 - Bandwidth @ 60 db down
f_c - 110.1 mc

Standard Deviation

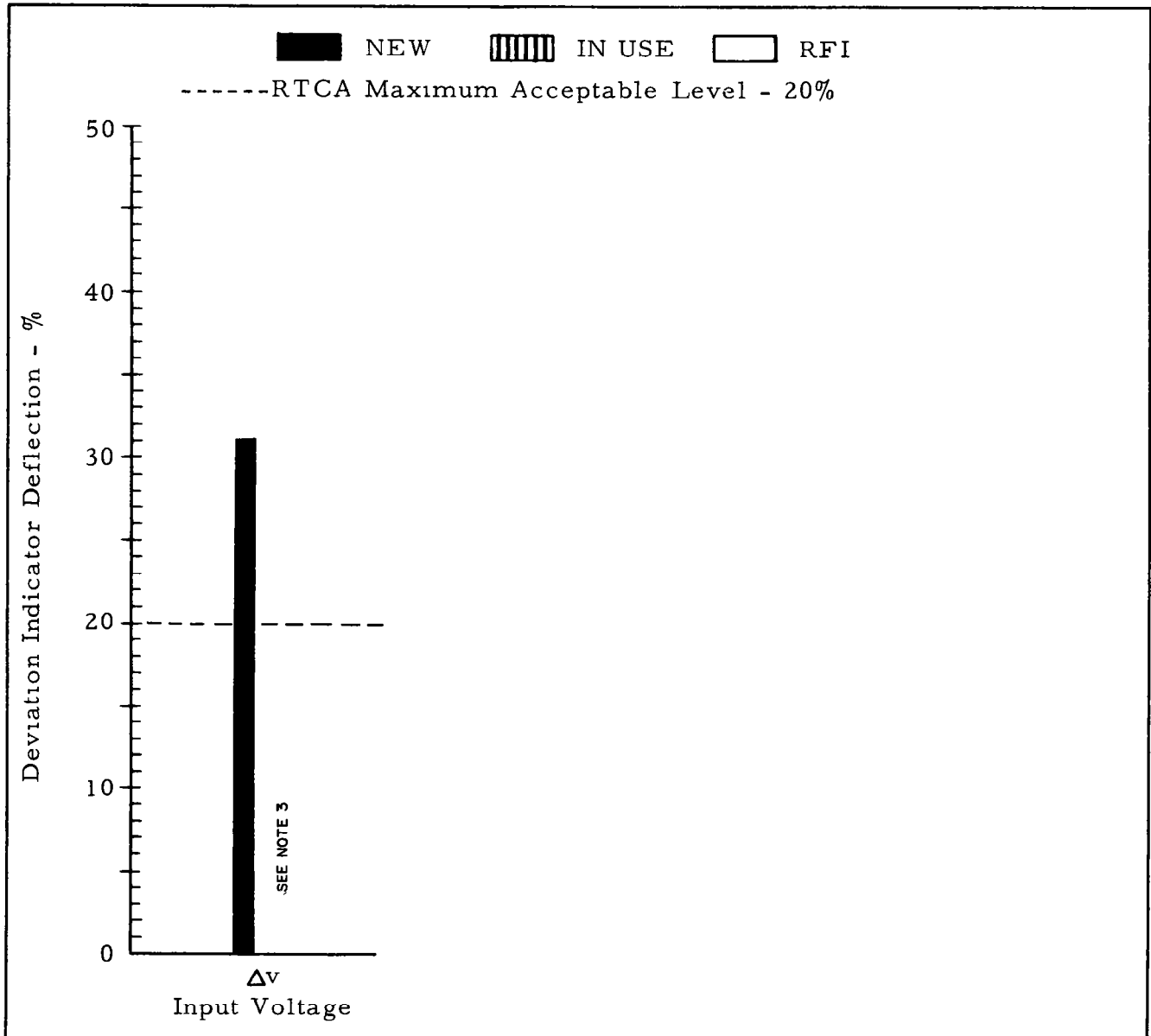
Test	New	In Use	RFI
b_1	11.7	—	—
b_2	23.8	—	—

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable levels:
   b_1 - 40 kc minimum
   b_2 - 320 kc maximum
3. This receiver is continuously tunable.
4. "RFI" and "In Use" equipments for the LO-4 were not available for test.

SELECTIVITY - LOCALIZER RECEIVER - LO-4

Figure C-3(d)



SENSITIVITY & DEFLECTION CHARACTERISTIC
Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.4

LEGEND

Δv - 40 - 20,000 uv

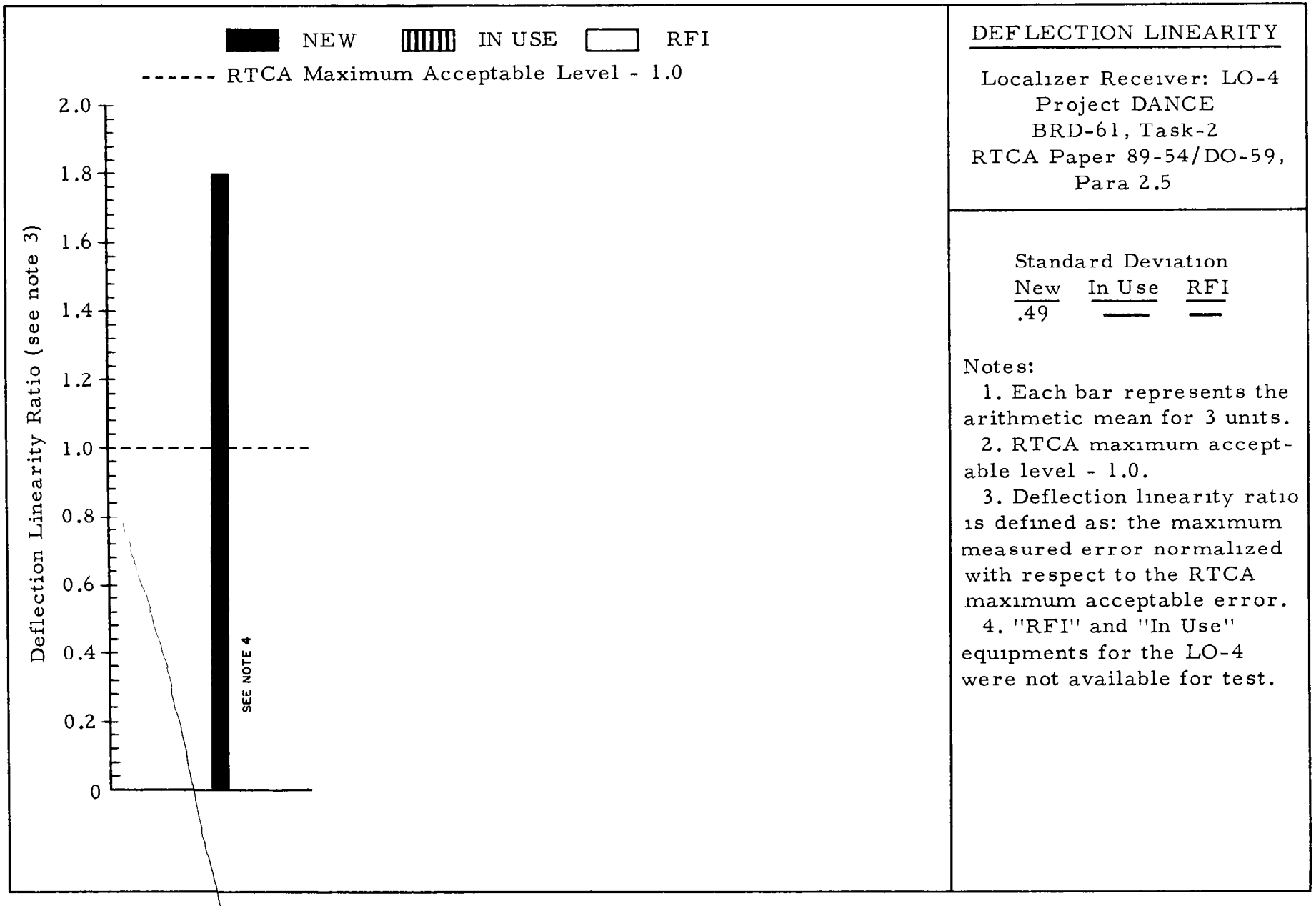
Standard Deviation

New	In Use	RFI
14.4	——	——

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 20%.
3. "RFI" and "In Use" equipments of the LO-4 were not available for test.

SENSITIVITY & DEFLECTION - LOCALIZER RECEIVER - LO-4

Figure C-3(d)



DEFLECTION LINEARITY

Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.5

Standard Deviation

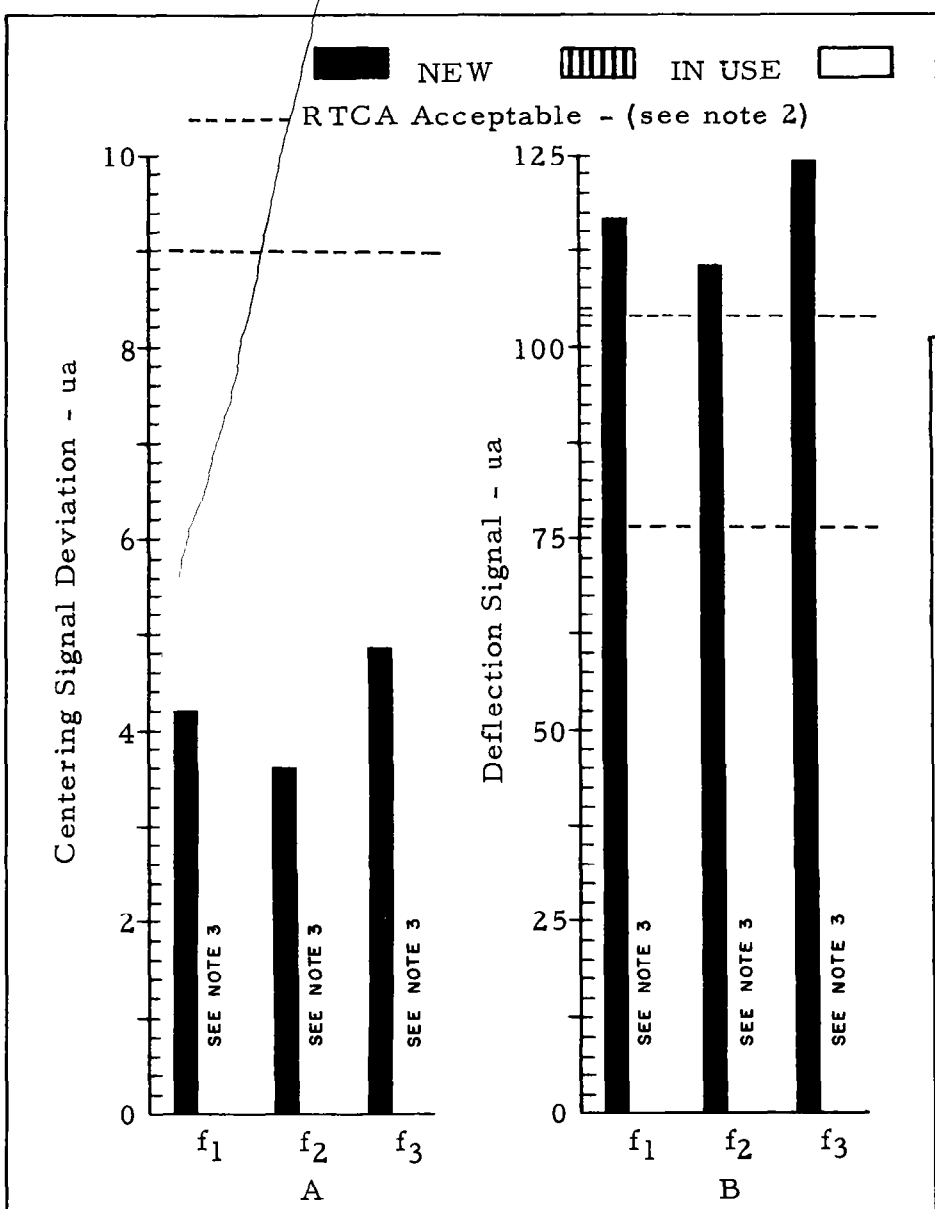
New	In Use	RFI
.49	——	——

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 1.0.
3. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.
4. "RFI" and "In Use" equipments for the LO-4 were not available for test.

DEFLECTION LINEARITY - LOCALIZER RECEIVER - LO-4

Figure C-3(d)



DEVIATION INDICATOR STABILITY WITH CHANGES IN FREQ. OF 90 & 150 cps SIGNALS

Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.13 (a) (b)

LEGEND

f_1 - 90 & 150 cps
f_2 - 87.75 & 146.25 cps
f_3 - 92.25 & 153.75 cps

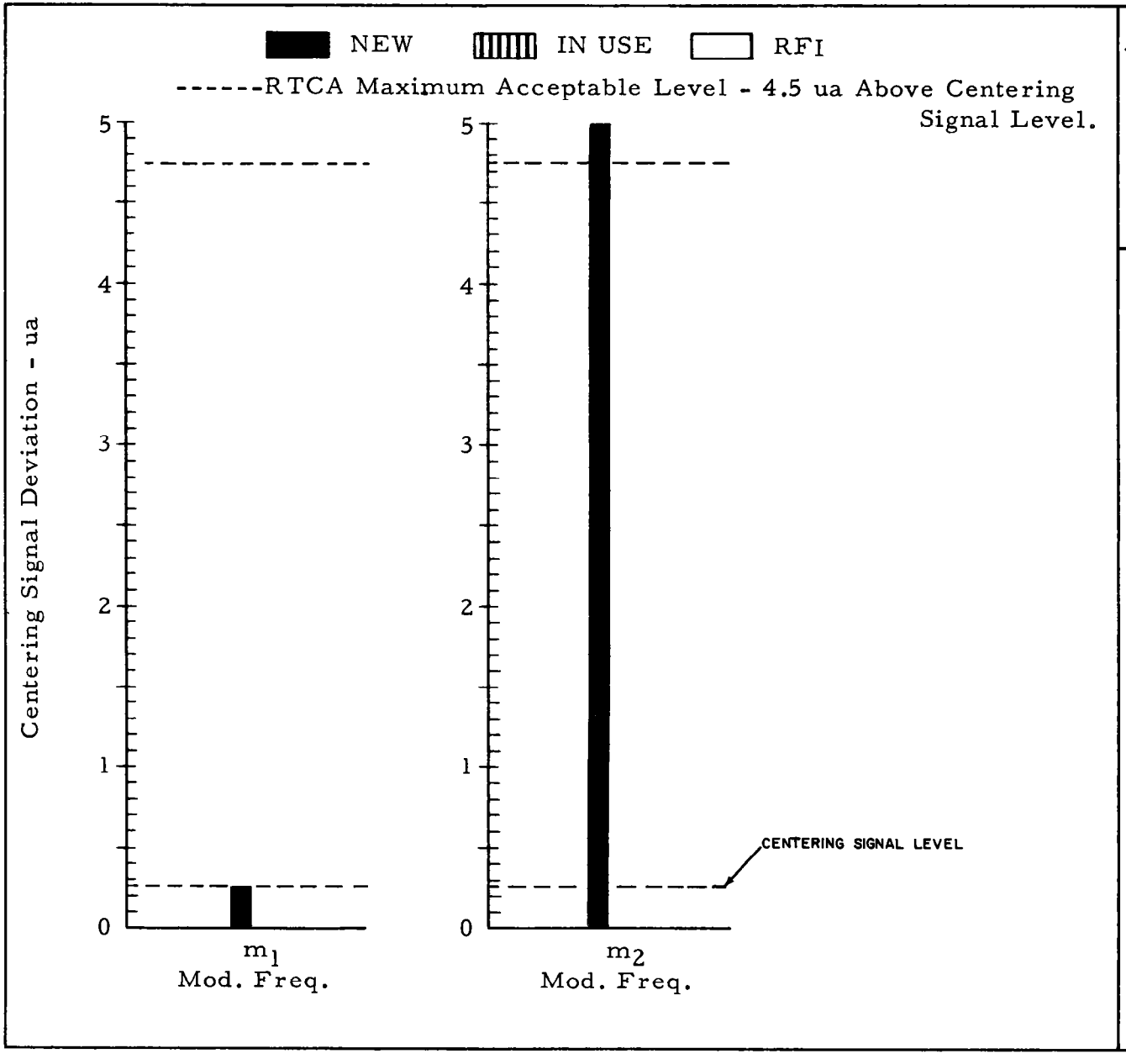
Standard Deviation

	Test	New	In Use	RFI
A	f_1	3.35	—	—
	f_2	3.58	—	—
	f_3	4.15	—	—
B	f_1	4.52	—	—
	f_2	8.52	—	—
	f_3	3.30	—	—

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable:
   Graph A: Centering Signal - 9 ua maximum.
   Graph B: Deflection Signal Limits - 76.5 to 103.5 ua.
3. "RFI" and "In Use" equipments for the LO-4 were not available for test.
4. Equipment has no sensitivity adjustment.

DEVIATION INDICATOR STABILITY WITH CHANGES IN FREQUENCY OF 90 & 150 cps SIGNALS
LOCALIZER RECEIVER - LO-4



PERCENTAGE MODULATION CHARACTERISTIC

Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59, Para 2.18

LEGEND

m_1 - 20% of 90 and 150 cps
m_2 - 25% of 90 and 150 cps

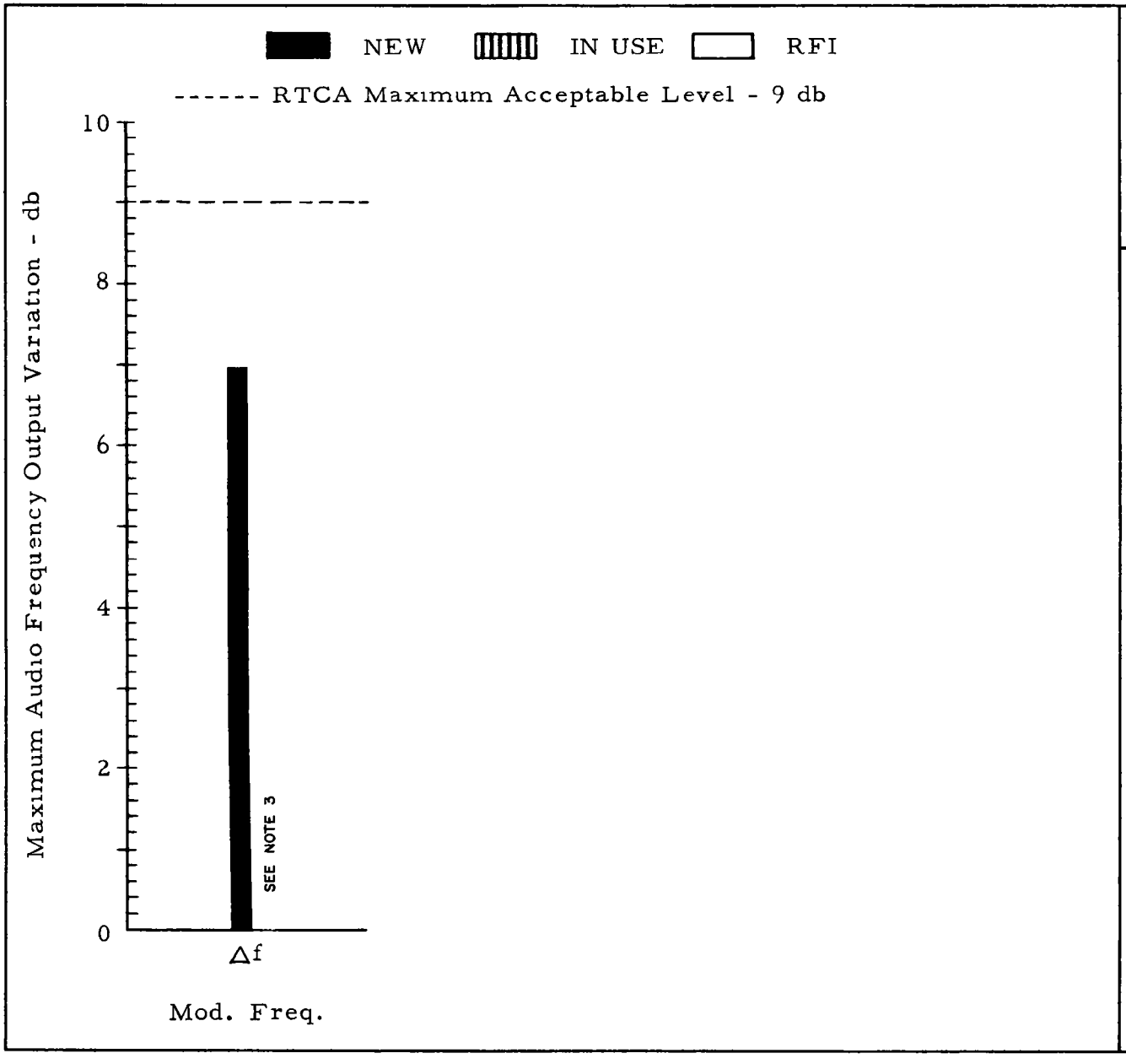
Standard Deviation

Test	New	In Use	RFI
m_1	0.57	—	—
m_2	8.60	—	—

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 4.5 ua above centering signal level.
3. "RFI" and "In Use" equipments of the LO-4 were not available for test.
4. Equipment does not have centering adjustment.

Figure C-3(d)

PERCENTAGE MODULATION CHARACTERISTIC - LOCALIZER RECEIVER - LO-4



AUDIO FREQ. RESPONSE

Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 2.16

LEGEND

Δf - 350 - 2500 cps

Standard Deviation

New	In Use	RFI
0.37	—	—

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 9 db.
3. "RFI" and "In Use" equipments of the LO-4 were not available for test.

Figure C-3(d)

AUDIO FREQUENCY RESPONSE - LOCALIZER RECEIVER - LO-4

INTERFERENCE TESTS

Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-59

Test	Frequency (mc)	F_C (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.7	.19 to 1500	110.1	Acceptable level excluding the band 107.8 to 112.2 mc. ≥ 60 db.	Actual Level: <60 db at 127 mc. All other frequencies within performance standards	Partially
Cross Modulation RTCA Para: 2.8	107 to 112	110.1	Acceptable level excluding the band within F_C ±200 kc. Deviation Indication: ≤ 9 microamps.	Actual Level: >9 microamps at 110.394 and 110.365 mc. All other frequencies within performance standards.	Yes
Cable Conducted Interference RTCA Para: 2.10a	.15 to 25	108.0	Acceptable Emission: ≤ 200 microvolts.	Actual Emission: <200 microvolts. All frequency within performance standards.	Yes
Antenna Conducted Interference RTCA Para: 2.10b	.09 to 1500	110.1	Acceptable Emission: ≤ 400 micro-microwatts.	Actual Emission: <400 micro-microwatts except at 119 and 480 mc. All other frequencies within performance standards.	Partially

INTERFERENCE TESTS - LOCALIZER RECEIVER - LO-4

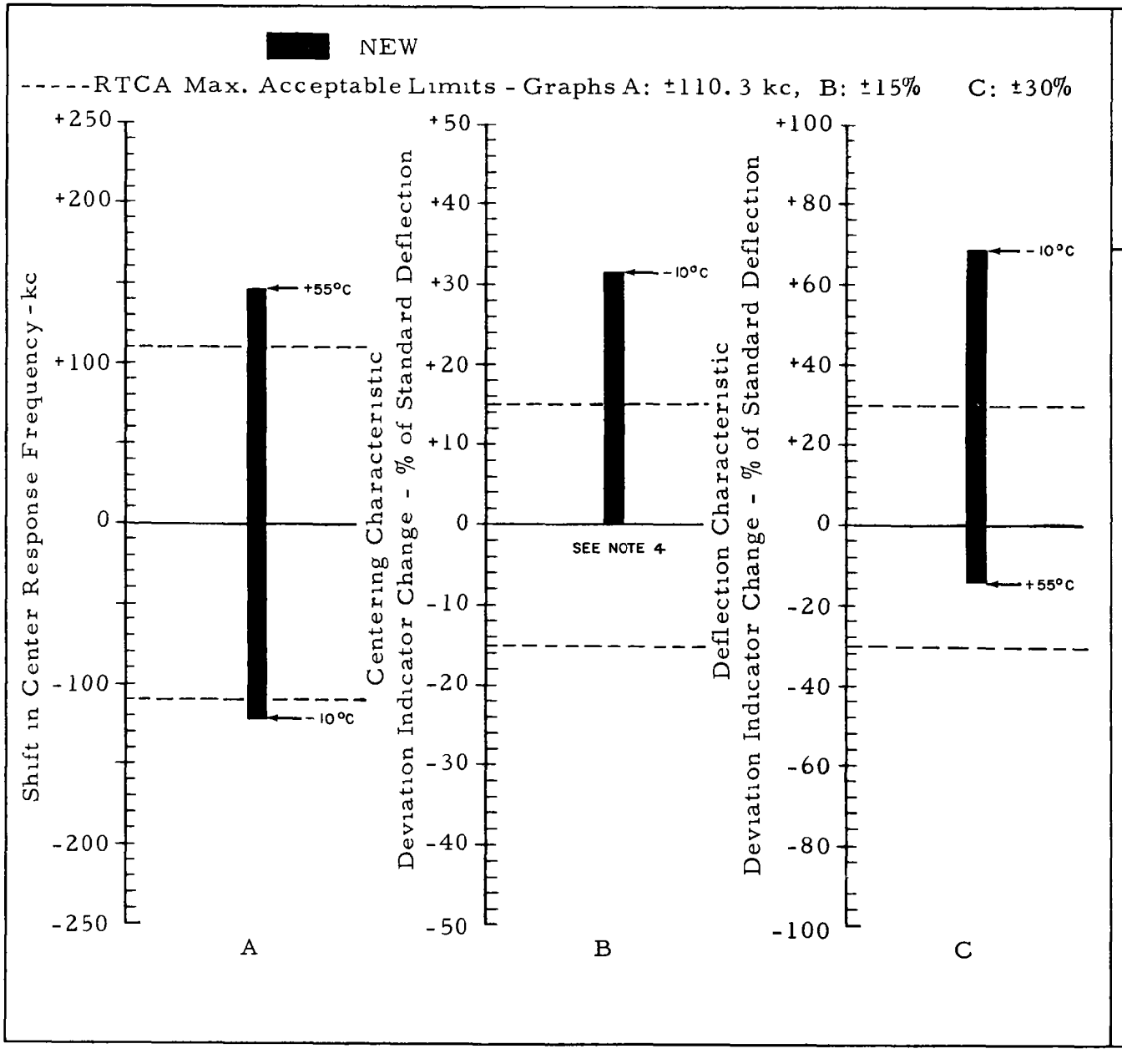
(continued on Page C-278)

Figure C-3(d)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna RTCA Para: 2.15	107 to 112	Varied over localizer band	Acceptable Operation: Deviation Indication: ≤4.5 microamps.	Actual Operation: 0 microamps. All frequencies within performance standards.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	110.1	102 to 144 mc.	None. (The receiver susceptibility from 102 to 144 mc occurs when receiver is tuned over the band from 108 to 126 mc.)

INTERFERENCE TESTS - LOCALIZER RECEIVER - LO-4



TEMPERATURE VARIATION TEST
Localizer Receiver: LO-4
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-59,
Para 3(a)(b)(c)

LEGEND

fc - 110.3 mc

Notes:

1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits:
   Graph A: ±110.3 kc
   Graph B: ±15%
   Graph C: ±30%
3. This unit is designed to operate below 15,000 feet.
4. +55°C standard deflection - 0. %.

Figure C-3(d)

TEMPERATURE VARIATION TEST - LOCALIZER RECEIVER - LO-4

Note: 1. RTCA acceptable limits - The output power level shall be within 2:1 of the level at design impedance. The combined distortion and noise in the receiver audio output shall not exceed 25% of the total receiver output.

AUDIO OUTPUT
REGULATION & DISTORTION
Localizer Receiver: LO-4
Project DANCE
BRD-60, Task-2
RTCA Paper 89-54/DO-59,
Para 2.17

Equipment Status	Mod. Freq. cps	Audio Output Power Regulation - Milliwatts								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
New Unit No. 1	350	1050	1100	1120	650	710	750	910	1080	1100
	500	1550	1600	1750	890	980	1000	1600	1690	1700
	1000	1870	1910	2000	1110	1200	1210	1800	1870	1900
	1800	1490	1600	1600	890	950	980	1320	1480	1500
	2500	1000	1200	1250	700	800	890	900	1050	1110
New Unit No. 2	350	520	600	610	460	500	480	500	550	580
	500	850	900	910	700	740	690	810	890	900
	1000	1410	1480	1500	1050	1120	1050	1310	1390	1400
	1800	1150	1200	1210	910	980	900	1000	1020	1080
	2500	890	950	910	700	710	710	700	780	790
New Unit No. 3	350	790	900	890	630	700	700	790	890	900
	500	1170	1350	1310	870	960	950	1250	1400	1480
	1000	1600	1700	1700	1190	1300	1320	1550	1690	1700
	1800	1250	1380	1370	930	1000	1050	1110	1300	1300
	2500	900	1000	1000	710	800	820	820	1000	980

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-4

Equipment Status	Mod. Freq. cps	Audio Output Distortion - Percent								
		100% Design Impedance			50% Design Impedance			200% Design Impedance		
		40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input	40 uv Input	1000 uv Input	20,000 uv Input
New Unit No. 1	350	46.0	56.0	59.0	42.0	52.0	54.0	52.0	63.0	66.0
	500	40.0	46.0	47.0	36.0	42.0	43.0	46.0	52.0	53.0
	1000	21.2	22.0	22.5	21.5	22.5	23.0	21.5	21.0	21.5
	1800	17.0	18.0	18.2	17.0	18.0	18.5	17.2	18.0	18.5
	2500	18.2	18.5	19.0	18.0	18.8	19.0	18.2	18.2	19.0
New Unit No. 2	350	56.0	59.0	61.0	52.0	54.0	56.0	62.0	66.0	66.0
	500	46.0	49.0	52.0	43.0	45.0	48.0	54.0	56.0	56.0
	1000	19.5	20.0	21.0	20.0	21.0	21.0	18.2	19.0	19.5
	1800	13.0	14.0	15.0	13.5	14.5	15.0	12.5	14.0	15.0
	2500	13.0	14.0	16.0	13.8	15.0	15.5	13.0	14.5	15.5
New Unit No. 3	350	52.0	61.0	63.0	49.0	56.0	58.0	58.0	66.0	67.0
	500	46.0	51.0	52.0	42.0	45.0	45.0	50.0	55.0	56.0
	1000	22.7	23.9	24.0	23.5	24.0	24.0	24.0	24.0	24.0
	1800	11.5	17.0	17.5	17.0	17.5	18.0	17.0	17.0	17.5
	2500	16.0	17.0	18.0	17.2	17.5	18.2	17.0	17.5	17.5

AUDIO OUTPUT REGULATION & DISTORTION - LOCALIZER RECEIVER - LO-4

Figure C-3(d)

SECTION C

AIRBORNE NAVIGATION EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

5. Laboratory and Field Test Data

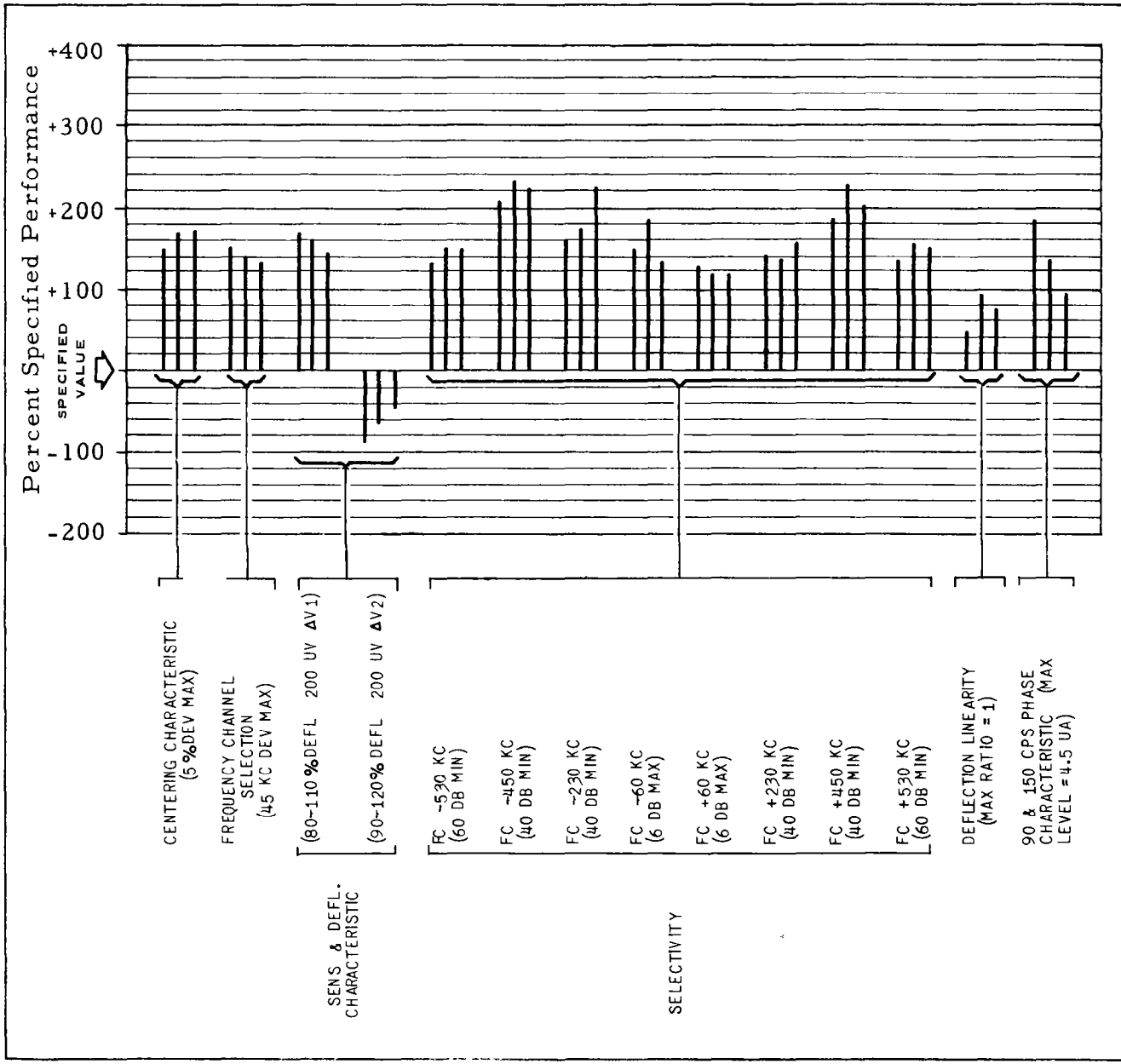
a. GS-1, Glide Slope Receiver

General:

Frequency Range:	329.3 - 335.0 mc
Means of Frequency Control	Crystal
Total Number of Channels:	20
Number of Channels Available at Operator's Position:	20
Means of Frequency Selection:	Rotary Switch

Technical:

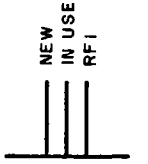
	Page(s)
Percent Specified Performance	C-282 - 283
Weighted Performance	C-284
Centering Characteristic	C-285
Frequency Channel Selection	C-286
Sensitivity and Deflection Characteristic	C-287 - 288
Selectivity.	C-289
Deflection Linearity	C-290
90 & 150 cps Phase Characteristic.	C-291
Alarm Signal	C-292 - 293
Indicator Stability	C-294 - 295
Deviation Indicator Stability with change in Frequency of 90 & 150 cps Signal	C-296 - 297
Deviation Indicator Sensitivity Adjustment Range	C-298 - 299
Deviation Indicator Sensitivity Adjustment Range - Centering Characteristic	C-300
Deviation Indicator Sensitivity Adjustment Range - Sensitivity & Deflection Characteristic	C-301 - 302
Deviation Indicator Sensitivity Adjustment Range - Deflection Linearity	C-303 - 304
Power Source Frequency Variation	C-305
Interference Tests	C-306 - 307
Temperature Variation Test	C-308



PERCENT
SPECIFIED PERFORMANCE
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

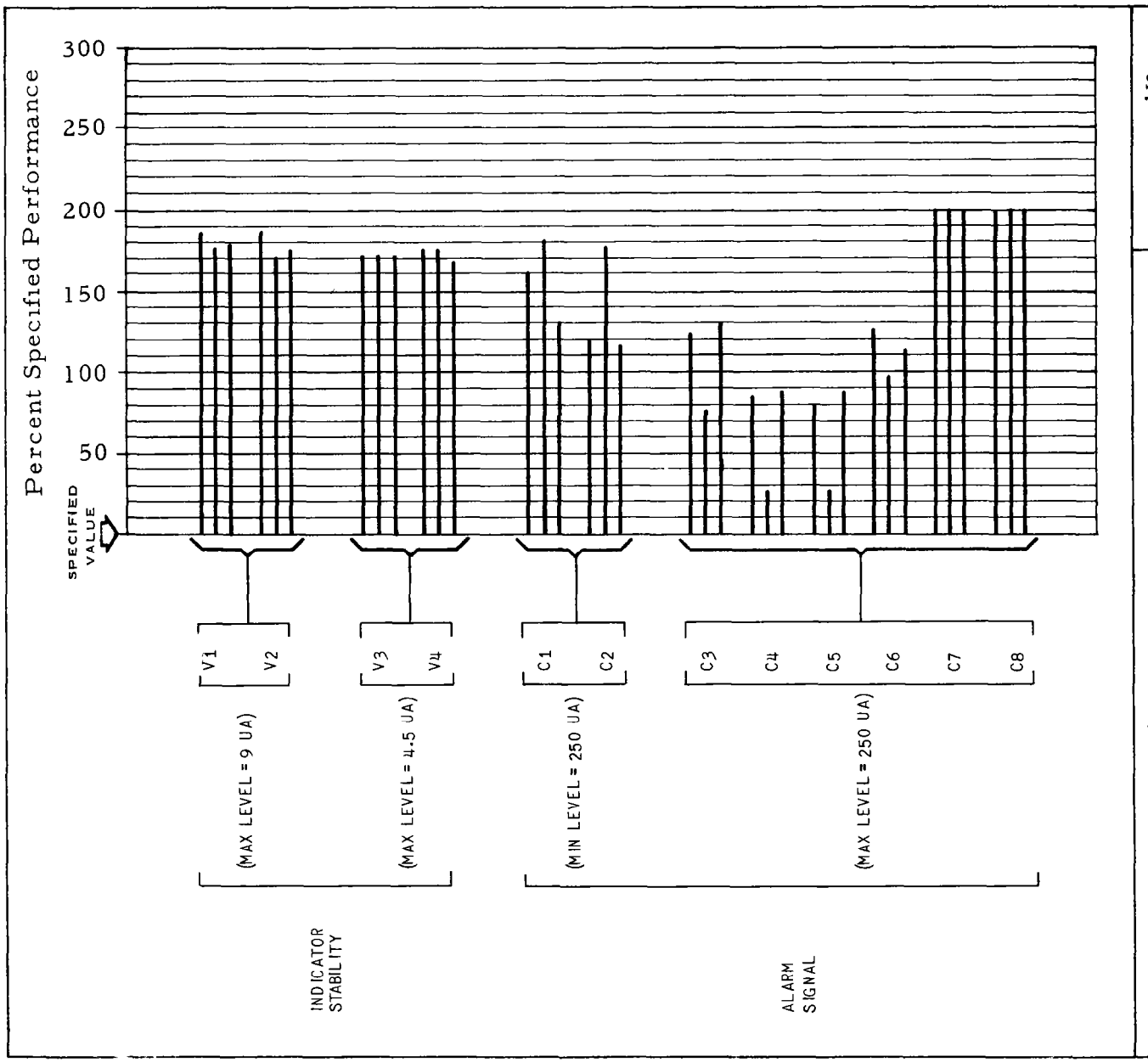


3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-1

(continued on Page C-283)

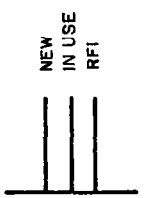
Figure C-4(a)



PERCENT
SPECIFIED PERFORMANCE
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

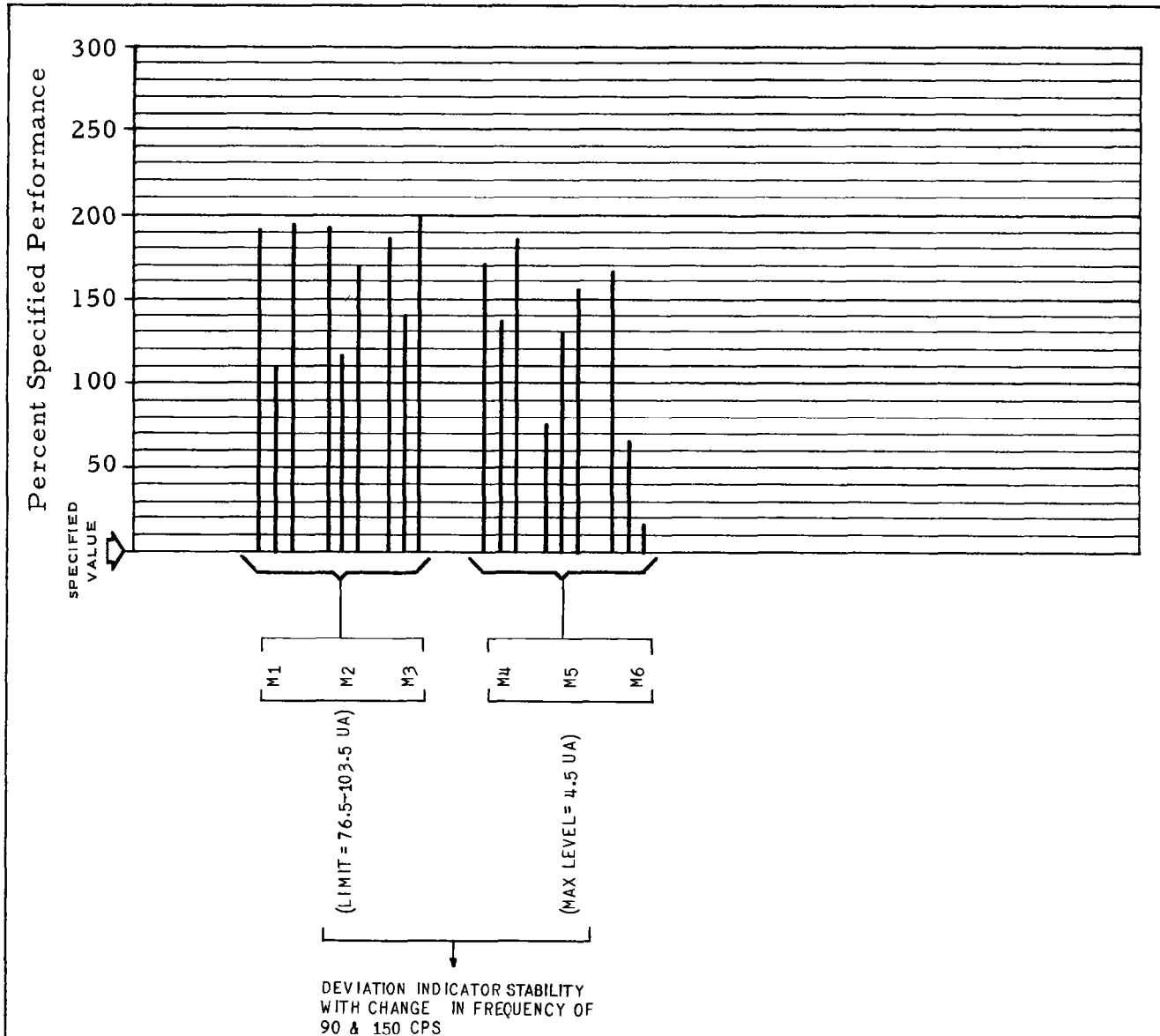


3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

Figure C-4(a)

PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-1

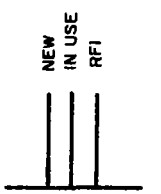
(continued on Page C-283a)



PERCENT
SPECIFIED PERFORMANCE
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Notes:

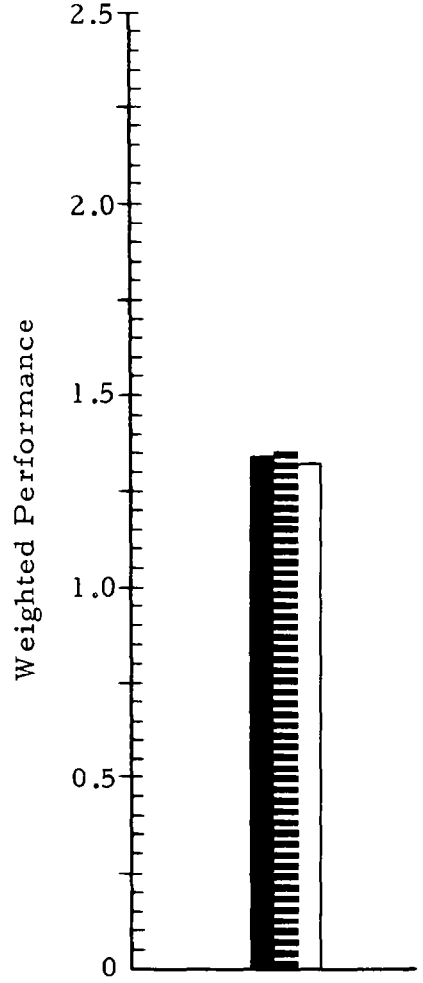
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



3. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-1

Figure C-4(a)



Alarm Signal:
c_1, c_2, c_3, c_4, c_5, c_6, c_7, c_8 1/80 ea.

Deviation Indicator Stability:
m_1, m_2, m_3, m_4, m_5, m_6 1/120 ea.

Note:
1. Graph based on arithmetic mean for above characteristics.

WEIGHTED PERFORMANCE

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2

WEIGHTING FACTORS

Centering Characteristic: 3/20

Frequency Channel Selection: 3/20

Sensitivity & Deflection:
$\Delta v_1, \Delta v_2$ 3/40 ea.

Selectivity:

f_c low	-530 kc	3/160
f_c	-450 kc	3/160
f_c	-230 kc	3/160
f_c	- 60 kc	3/160
f_c	+ 60 kc	3/160
f_c	+230 kc	3/160
f_c	+450 kc	3/160
f_c high	+530 kc	3/160

Deflection Linearity: 1/10

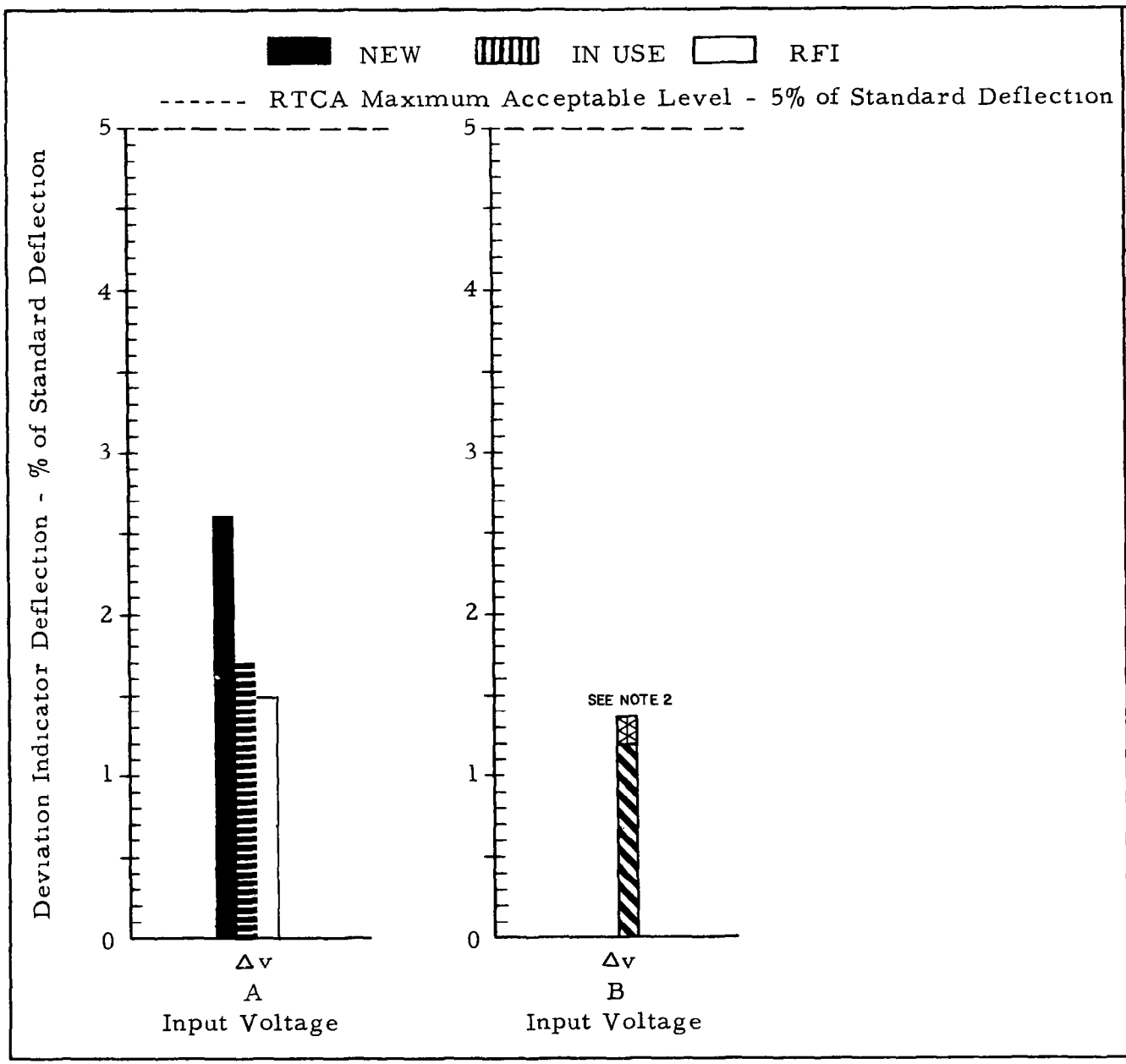
90 & 150 cps Phase Characteristic: 1/10

Indicator Stability:
v_1, v_2, v_3, v_4 1/80 ea.

← continued next column

Figure C-4(a)

WEIGHTED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-1



CENTERING CHARACTERISTIC

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.3

LEGEND

Δ v - 100 - 30,000 uv
Standard Deflection - 90 ua

Standard Deviation

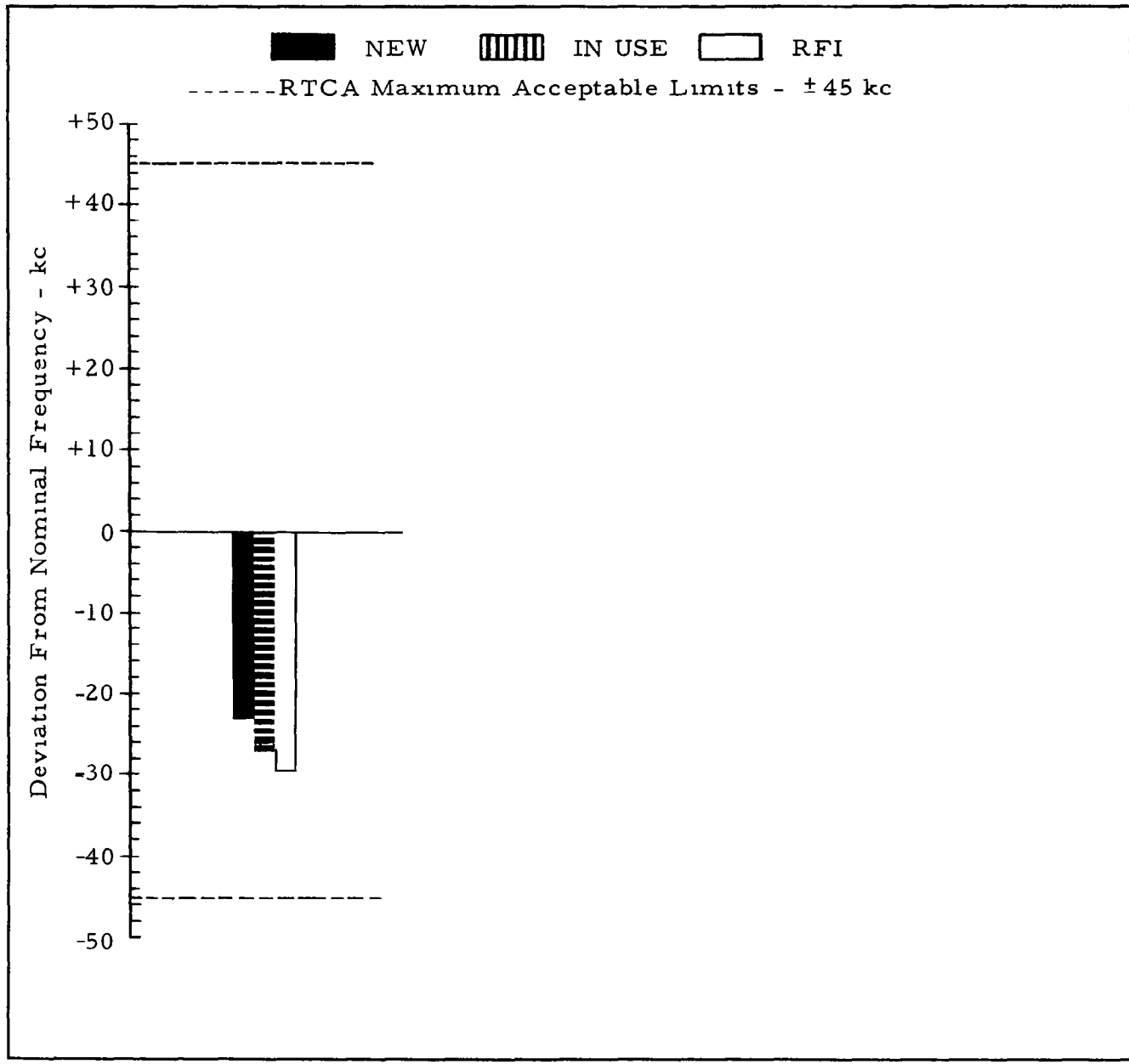
Test	New	In Use	RFI
A	0.63	0.92	0.63
B		1.16	
		1.40	

Notes:

1. Each bar in Graph A represents the arithmetic mean for 3 units. Each bar in Graph B represents the arithmetic mean for 2 units.
2. "In Use" units before adjustments.
   "In Use" units after adjustments.
3. RTCA maximum acceptable level - 5% of standard deflection.
4. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-4(a)

CENTERING CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-1



FREQUENCY
CHANNEL SELECTION
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-54,
Para 2.18

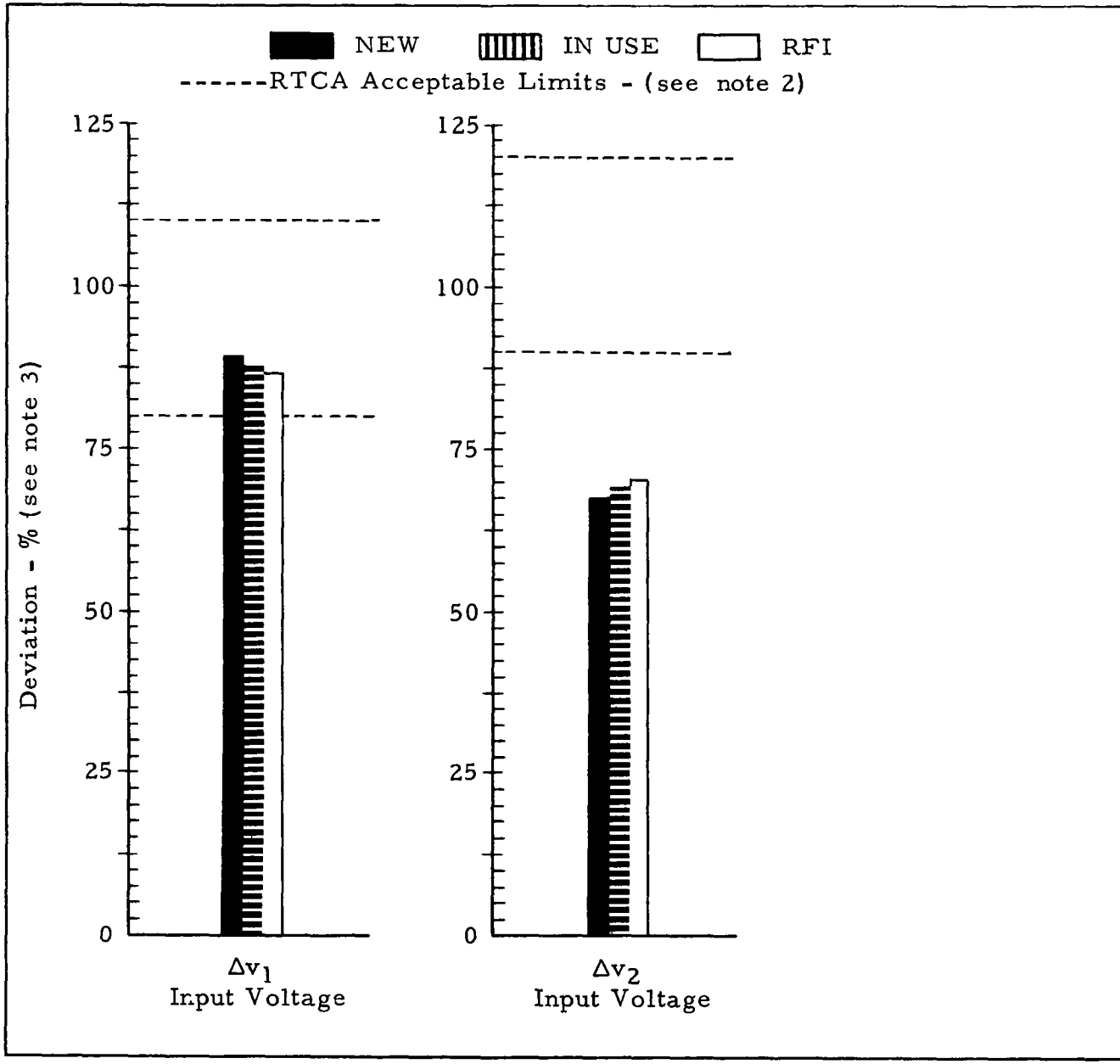
Standard Deviation

New	In Use	RFI
11.9	26.5	15.4

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable limits - ±45 kc.

FREQUENCY CHANNEL SELECTION - GLIDE SLOPE RECEIVER - GS-1

Figure C-4(a)



SENSITIVITY & DEFLECTION CHARACTERISTIC

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.4

LEGEND

Δv_1 - input between 40 and 200 uv which produced maximum indicator variation

Δv_2 - input between 200 and 30,000 uv which produced maximum indicator variation

Standard Deviation

Test	New	In Use	RFI
Δv_1	3.9	16.4	11.0
Δv_2	4.5	5.2	8.9

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable limits:

Δv_1 - 100% $\begin{bmatrix}+10\% \\ -20\%\end{bmatrix}$

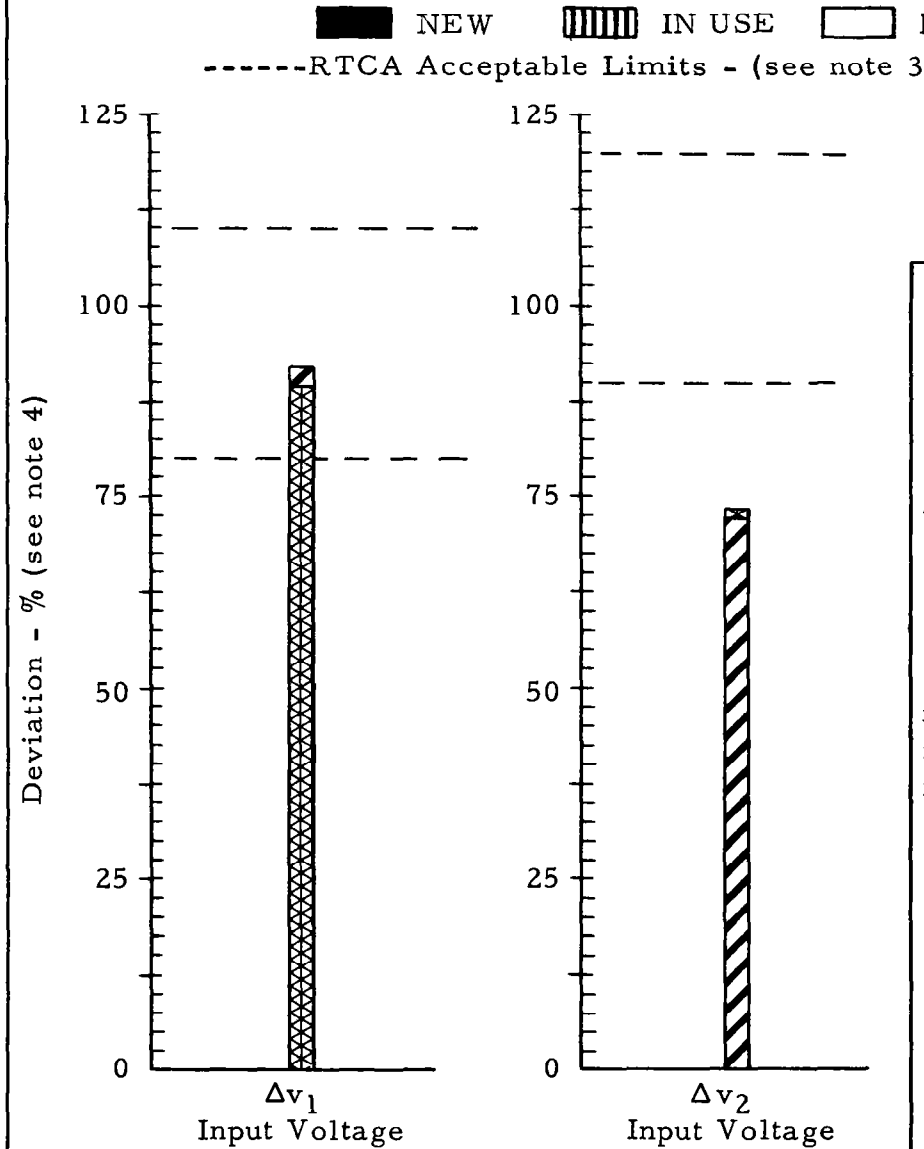
Δv_2 - 100% $\begin{bmatrix}+20\% \\ -10\%\end{bmatrix}$

3. Percentage of deflection obtained with 200 uv input.

Figure C-4(a)

SENSITIVITY & DEFLECTION CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-1

(continued on Page C-288)



3. RTCA acceptable limits:

Δv_1 - 100% [+10% / -20%]

Δv_2 - 100% [+20% / -10%]

4. Percentage of deflection obtained with 200 uv input.

5. Adjustments were made in accordance with manufacturer's recommended practices.

SENSITIVITY & DEFLECTION CHARACTERISTIC

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.4

LEGEND

Δv_1 - Input between 40 and 200 uv which produced maximum indicator variation.

Δv_2 - Input between 200 and 30,000 uv which produced maximum indicator variation.

Standard Deviation

Test	In Use	
	Before	After
Δv_1	22.0	23.7
Δv_2	7.1	8.9

Notes:

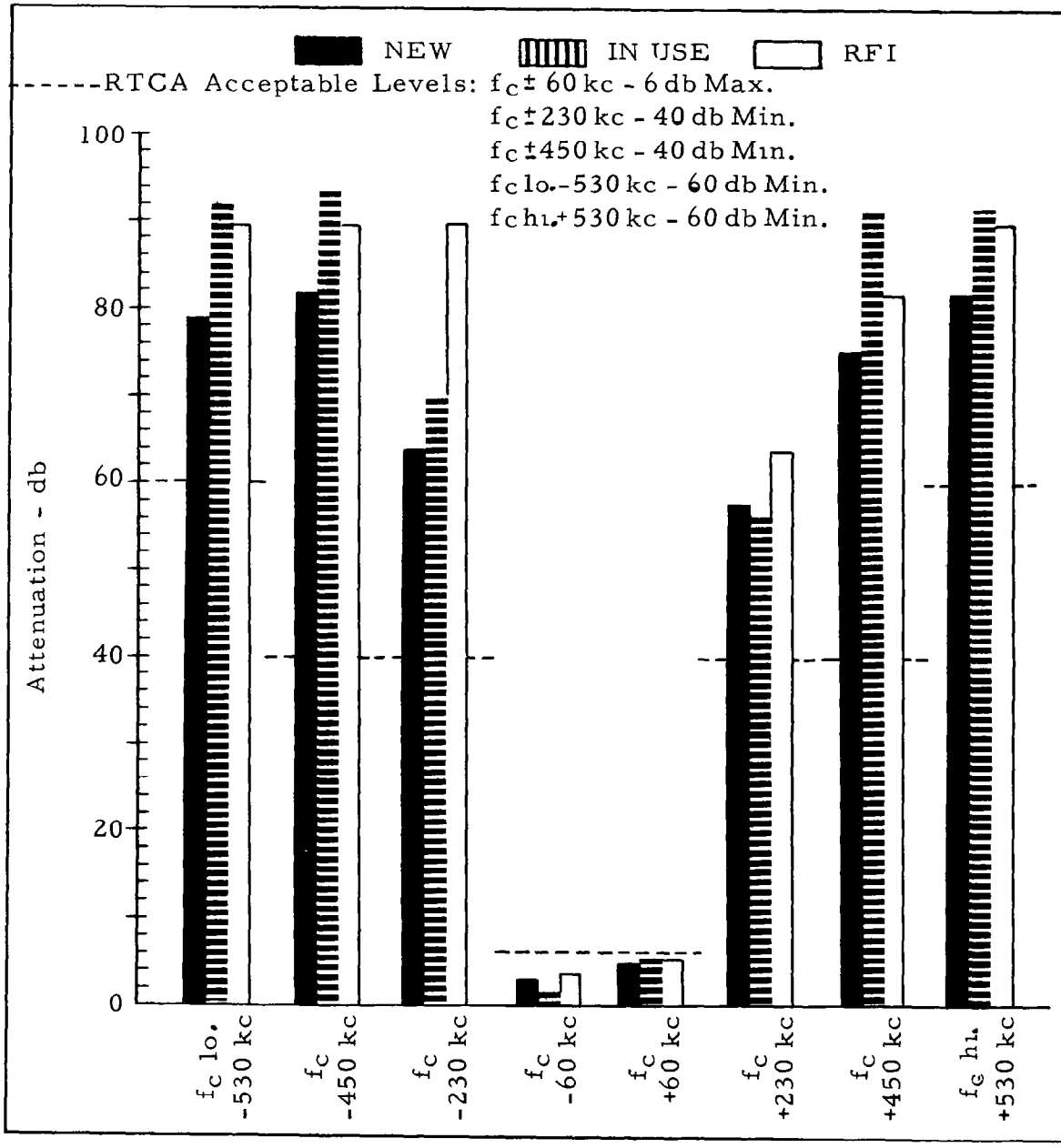
1. Each bar represents the arithmetic mean of 2 "In Use" units.

2. "In Use" units before adjustments.
   "In Use" units after adjustments.

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SENSITIVITY & DEFLECTION CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-1

Figure C-4(a)



SELECTIVITY

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.6

LEGEND

f_c - 332.0 mc
f_c low - 329.3 mc
f_c high - 335.0 mc

Standard Deviation

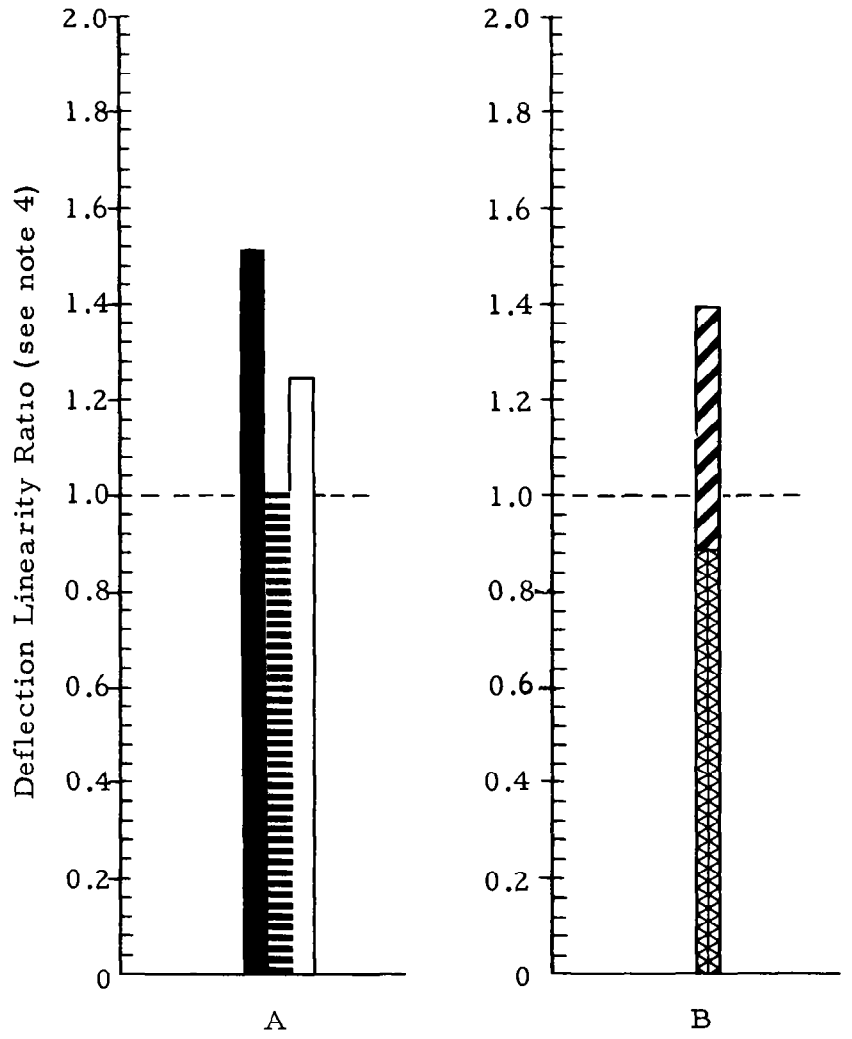
Test	New	In Use	RFI
f_c -530	7.90	2.20	5.0
f_c -450	10.40	4.60	5.0
f_c -230	5.90	20.00	5.0
f_c -60	2.30	0.36	4.3
f_c +60	0.96	6.90	5.6
f_c +230	2.20	5.40	20.0
f_c +450	22.30	3.10	14.3
f_c +530	6.30	2.20	5.0

Note:

1. Each bar represents the arithmetic mean for 3 units.

SELECTIVITY - GLIDE SLOPE RECEIVER - GS-1

Figure C-4(a)



DEFLECTION LINEARITY

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 89-54/DO-58,
Para 2.5

Standard Deviation

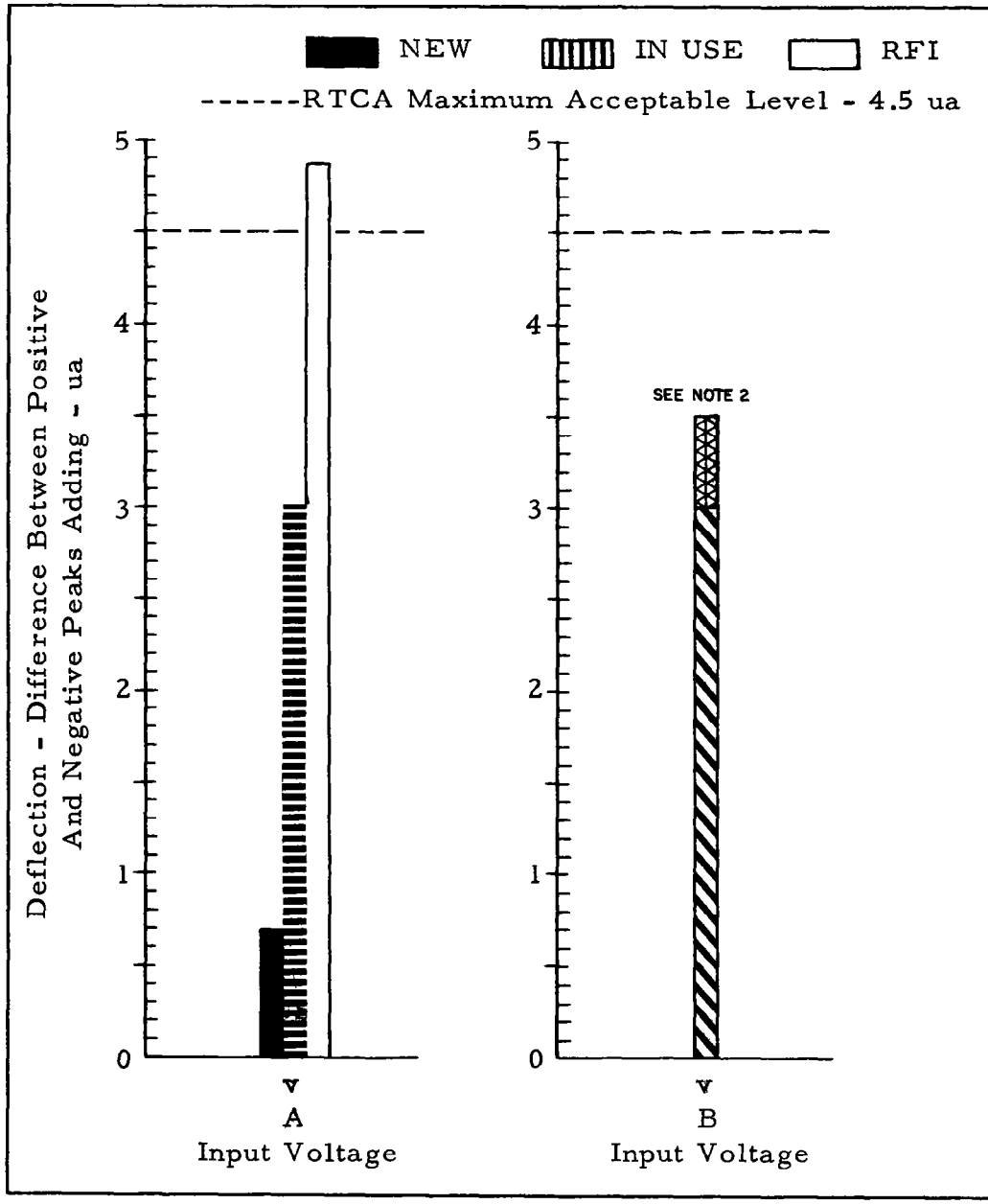
Test	New	In Use	RFI
A	.28	.36	.22
B		.36 .71	

Notes:

1. Each bar in graph "A" represents the arithmetic mean for 3 units. Each bar in graph "B" represents the arithmetic mean for 2 units.
2. Graph B:
   - "In Use" units before adjustments.
   - "In Use" units after adjustments.
3. RTCA maximum acceptable level - 1.0.
4. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.

Figure C-4(a)

DEFLECTION LINEARITY - GLIDE SLOPE RECEIVER - GS-1



90 AND 150 CPS PHASE CHARACTERISTIC

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.17

LEGEND

v - 1000 uv

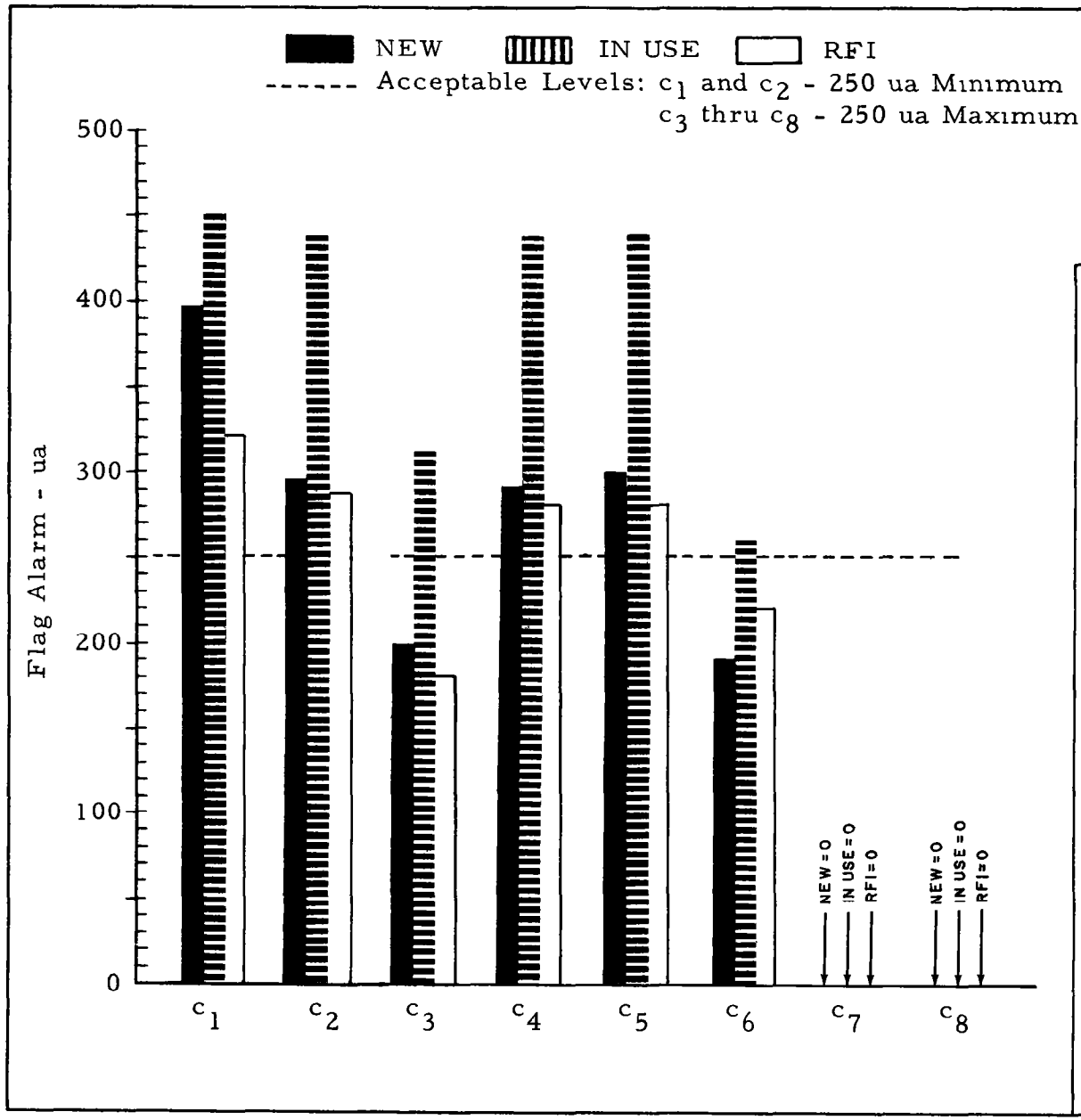
Standard Deviation

Test	New	In Use	RFI
A	1.15	1.74	2.85
B		2.10	
		1.40	

Notes:

1. Each bar in Graph A represents the arithmetic mean for 3 units. Each bar in Graph B represents the arithmetic mean for 2 units.
2. Graph B:
   - "In Use" units before adjustments.
   - "In Use" units after adjustments.
3. RTCA maximum acceptable level - 4.5 ua.
4. Adjustments were made in accordance with manufacturer's recommended practices.

90 AND 150 CPS PHASE CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-1



ALARM SIGNAL

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.9

LEGEND

c_1 - std. test sig. @ 40 uv
c_2 - std. test sig. @ min. alarm current
c_3 - std. dev. sig @ 50% deflection
c_4 - mod. 0% - 150 cps & 45% - 90 cps
c_5 - mod. 0% - 90 cps & 45% - 150 cps
c_6 - mod. 22.5% of 90 & 150 cps
c_7 - absence of R. F.
c_8 - absence of modulation

Standard Deviation

Test	New	In Use	RFI
c_1	41.8	86.6	15.70
c_2	15.4	115.5	7.32
c_3	24.6	152.0	61.40
c_4	38.6	115.5	28.30
c_5	30.0	114.0	20.00
c_6	55.6	184.0	19.00
c_7	0	0	0
c_8	0	0	0

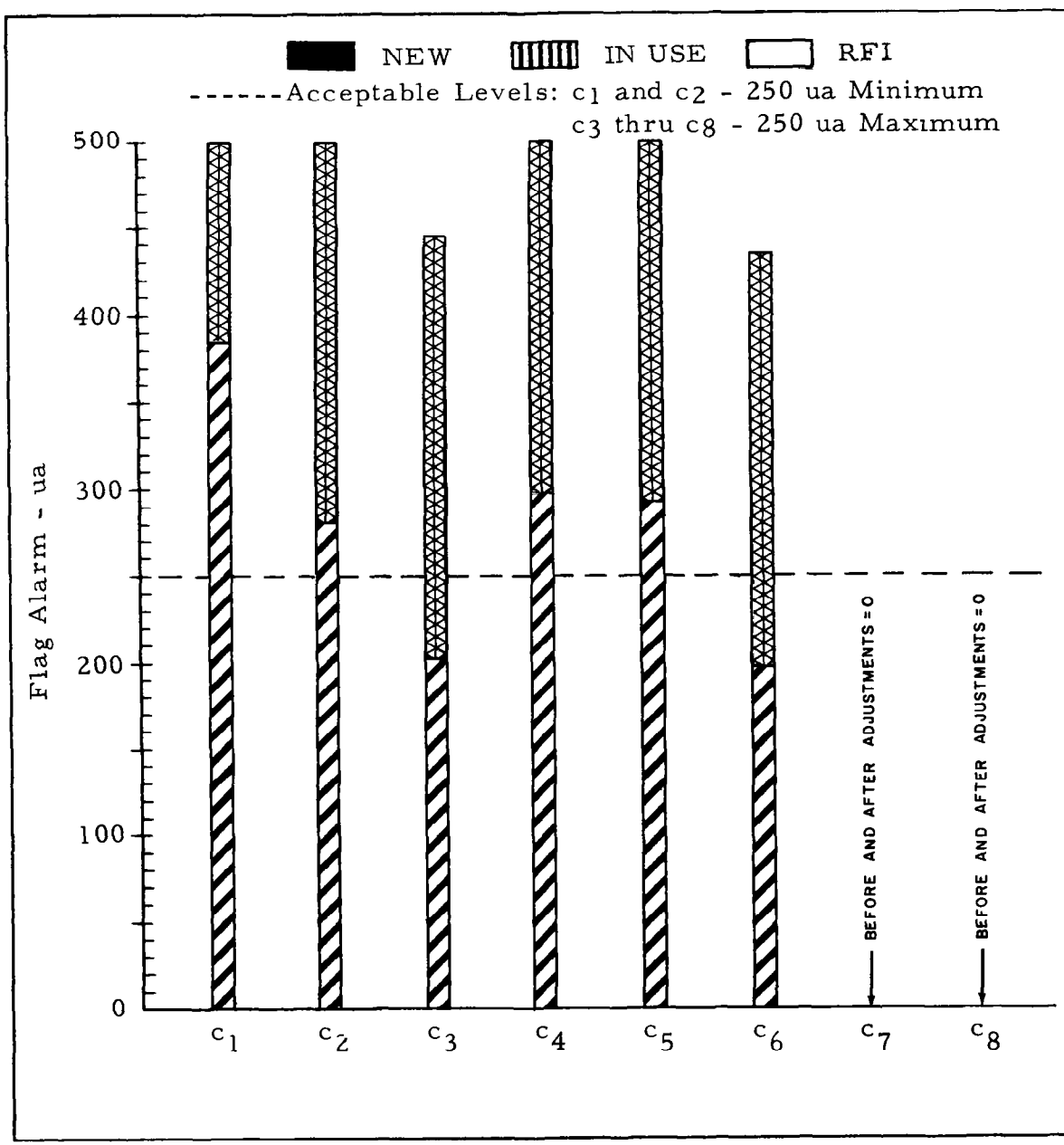
Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA paper as a guide.

Figure C-4(a)

ALARM SIGNAL - GLIDE SLOPE RECEIVER - GS-1

(continued on Page C-293)



ALARM SIGNAL

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.9

LEGEND

c_1 - std. test sig. @ 40 uv
c_2 - std. test sig. @ min. alarm current
c_3 - std. dev. sig. @ 50% deflection
c_4 - mod. 0% - 150 cps & 45% - 90 cps
c_5 - mod. 0% - 90 cps & 45% - 150 cps
c_6 - mod. 22.5% of 90 & 150 cps
c_7 - absence of R.F.
c_8 - absence of modulation

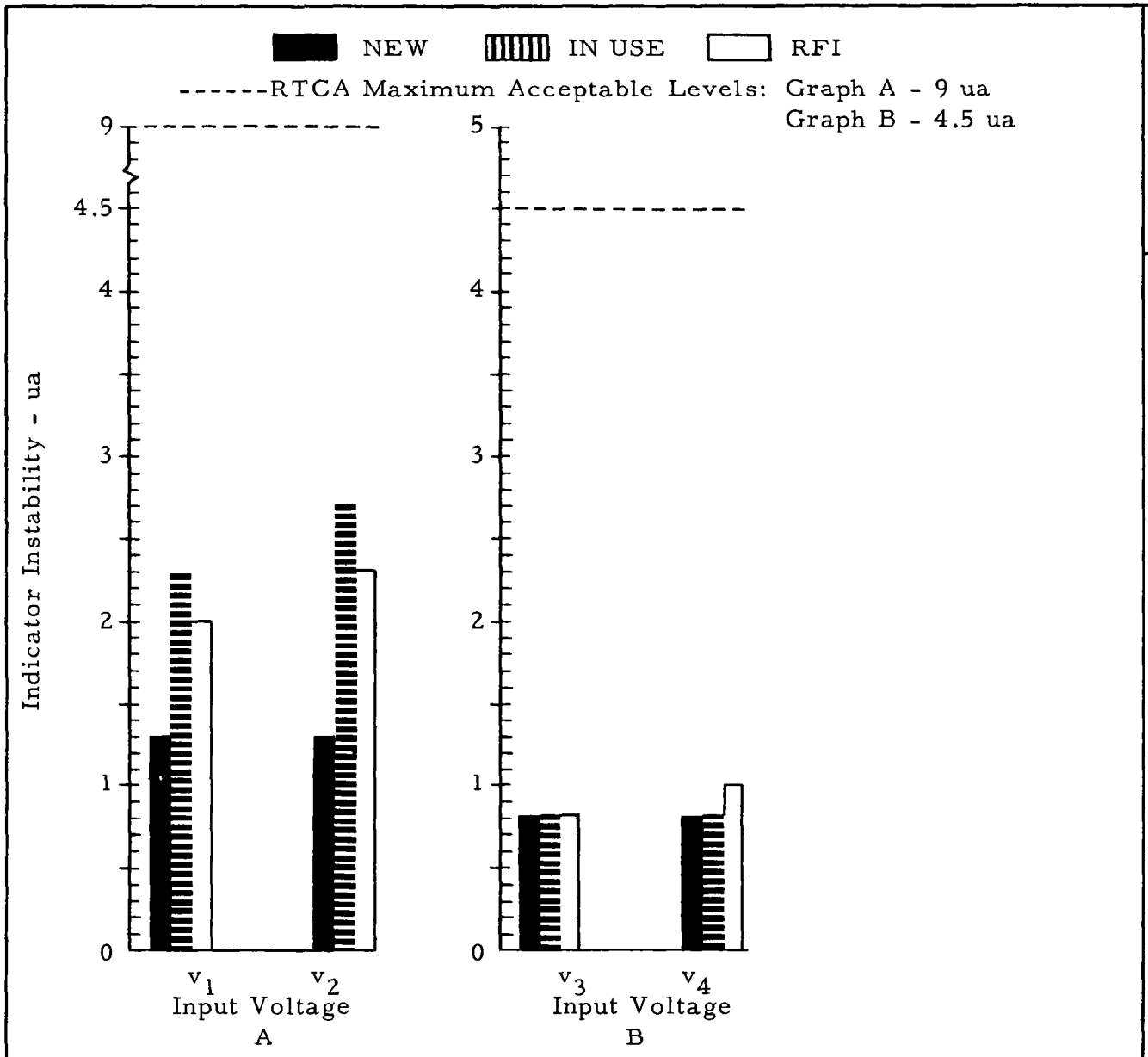
Standard Deviation

Test	In Use	
	Before	After
c_1	0	154.00
c_2	0	1.42
c_3	78	23.00
c_4	0	22.60
c_5	0	29.70
c_6	46	22.60
c_7 and c_8	0	0

Notes:
1. Each bar represents the arithmetic mean for 2 units.
2. ⊠ "In Use" units before adjust.
   ◪ "In Use" units after adjust.
3. Acceptable levels were determined by using RTCA paper as a guide.

Figure C-4(a)

ALARM SIGNAL - GLIDE SLOPE RECEIVER - GS-1



INDICATOR STABILITY

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.16

LEGEND

v_1 - 40 uv centering signal
v_2 - 40 uv deviation signal
v_3 - 200 uv centering signal
v_4 - 200 uv deviation signal

Standard Deviation

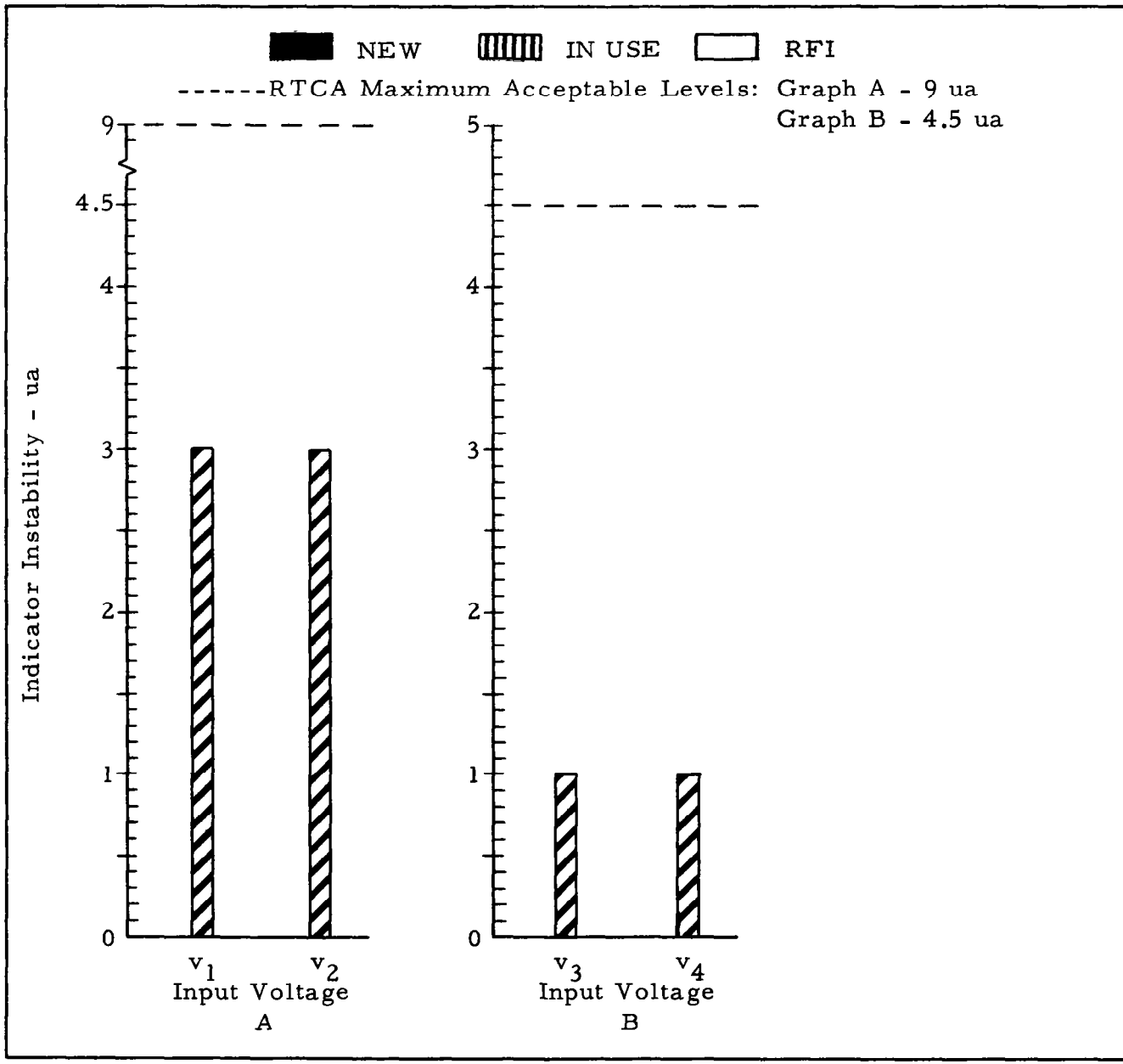
Test	New	In Use	RFI
v_1	.580	.580	1.00
v_2	.580	.580	3.66
v_3	.037	.037	0.37
v_4	.370	.380	0.87

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable levels:
Graph A: v_1 and v_2 - 9 ua
Graph B: v_3 and v_4 - 4.5 ua.

Figure C-4(a)

INDICATOR STABILITY - GLIDE SLOPE RECEIVER - GS-1

(continued on Page C-295)



INDICATOR STABILITY

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.16

LEGEND

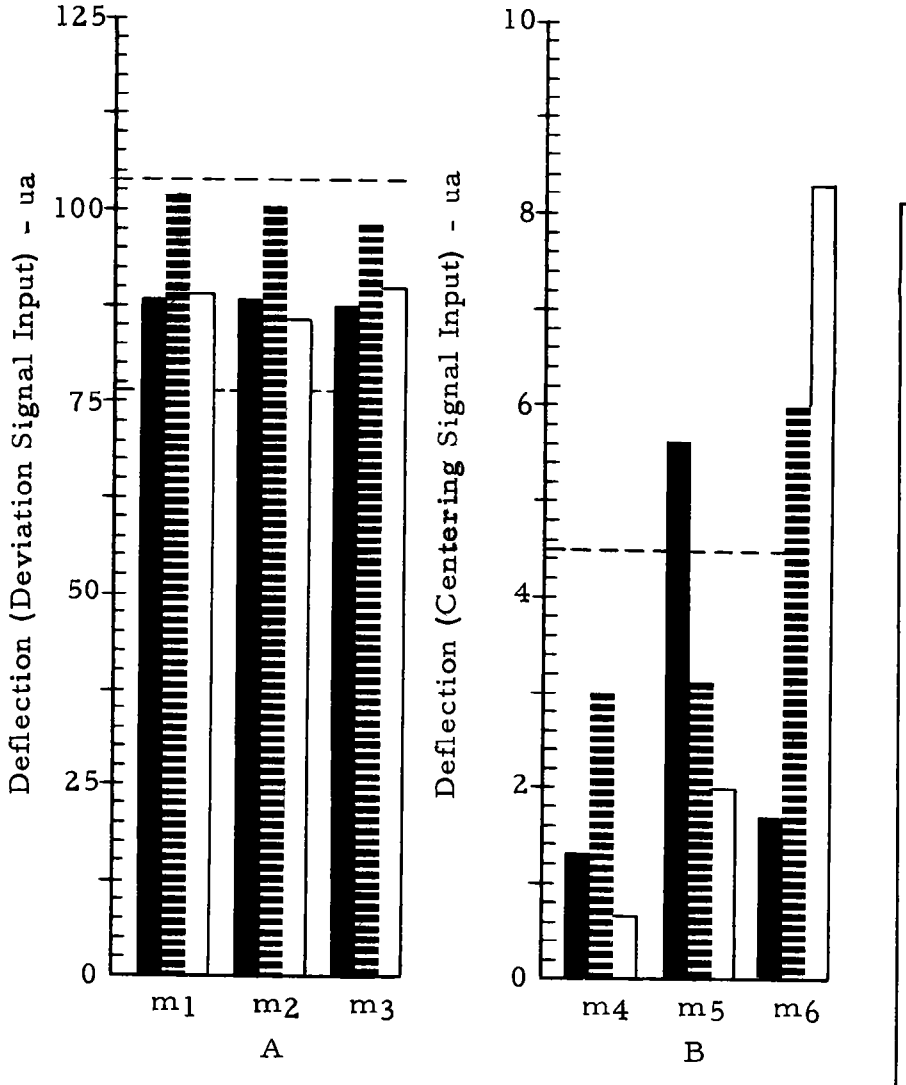
v_1 - 40 uv centering signal
v_2 - 40 uv deviation signal
v_3 - 200 uv centering signal
v_4 - 200 uv deviation signal

Notes:

1. Each bar represents one "In Use" unit before and after adjustments.
2. Graph A and B:
   - "In Use" unit before adjustments.
   - "In Use" unit after adjustments.
3. Values for before and after adjustments did not change.
4. RTCA maximum acceptable levels:
   Graph A: v_1 and v_2 - 9 ua
   Graph B: v_3 and v_4 - 4.5 ua.
5. Adjustments were made in accordance with manufacturer's recommended practices.

INDICATOR STABILITY - GLIDE SLOPE RECEIVER - GS-1

Figure C-4(a)



DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQ. OF 90 & 150 cps SIGNALS

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.13 (a) (b)

LEGEND

m_1 & m_4 - 90 & 150 cps
m_2 & m_5 - 87.75 & 146.25 cps
m_3 & m_6 - 92.25 & 153.75 cps

Standard Deviation

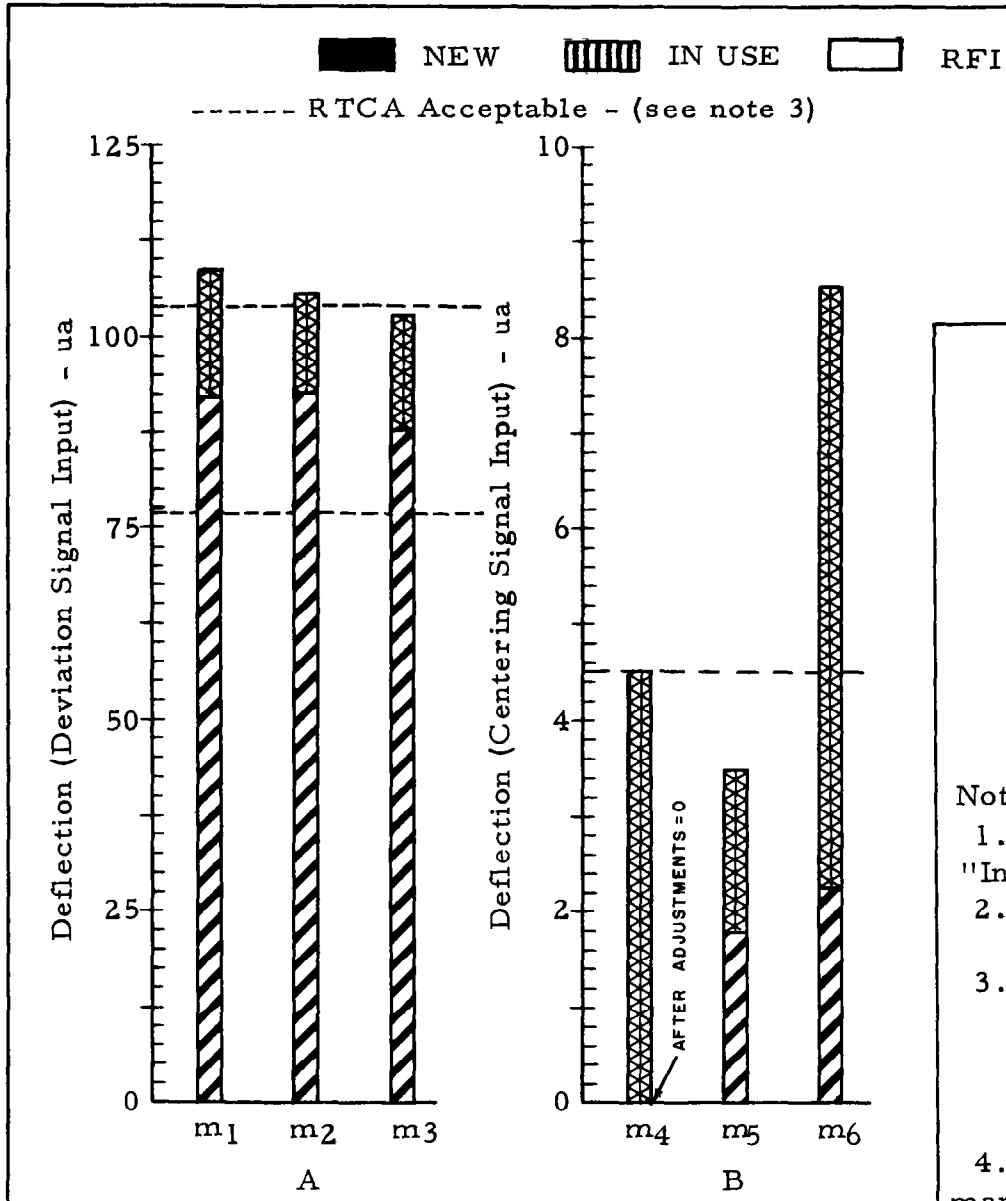
Test	New	In Use	RFI
m_1	1.46	25.5	1.7
m_2	6.2	18.6	5.1
m_3	2.5	28.4	7.2
m_4	1.5	3.0	1.2
m_5	4.7	1.6	2.0
m_6	1.5	1.98	6.7

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable:
   Graph A: Limits for deviation signal input - 76.5 to 103.5 ua
   Graph B: Level for centering signal input - 4.5 ua maximum.

DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQUENCY OF 90 & 150 cps SIGNALS
GLIDE SLOPE RECEIVER - GS-1 (continued on Page C-297)

Figure C-4(a)



DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQ. OF 90 & 150 cps SIGNALS

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.13 (a) (b)

LEGEND

m_1 & m_4 - 90 & 150 cps
m_2 & m_5 - 87.75 & 146.25 cps
m_3 & m_6 - 92.25 & 153.75 cps

Test	Standard Deviation In Use	
	Before	After
m_1	31.8	25.5
m_2	32.5	18.5
m_3	38.1	28.3
m_4	2.1	3.0
m_5	2.1	1.61
m_6	6.4	2.0

Notes:

1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. ▩ "In Use" units before adjustments.
   ◪ "In Use" units after adjustments.
3. RTCA acceptable:
   Graph A: Limits for deviation signal input - 76.5 to 103.5 ua.
   Graph B: Level for centering signal input - 4.5 ua maximum.
4. Adjustments were made in accordance with manufacturer's recommended practices.

DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQUENCY OF 90 & 150 cps SIGNALS
GLIDE SLOPE RECEIVER - GS-1

Figure C-4(a)

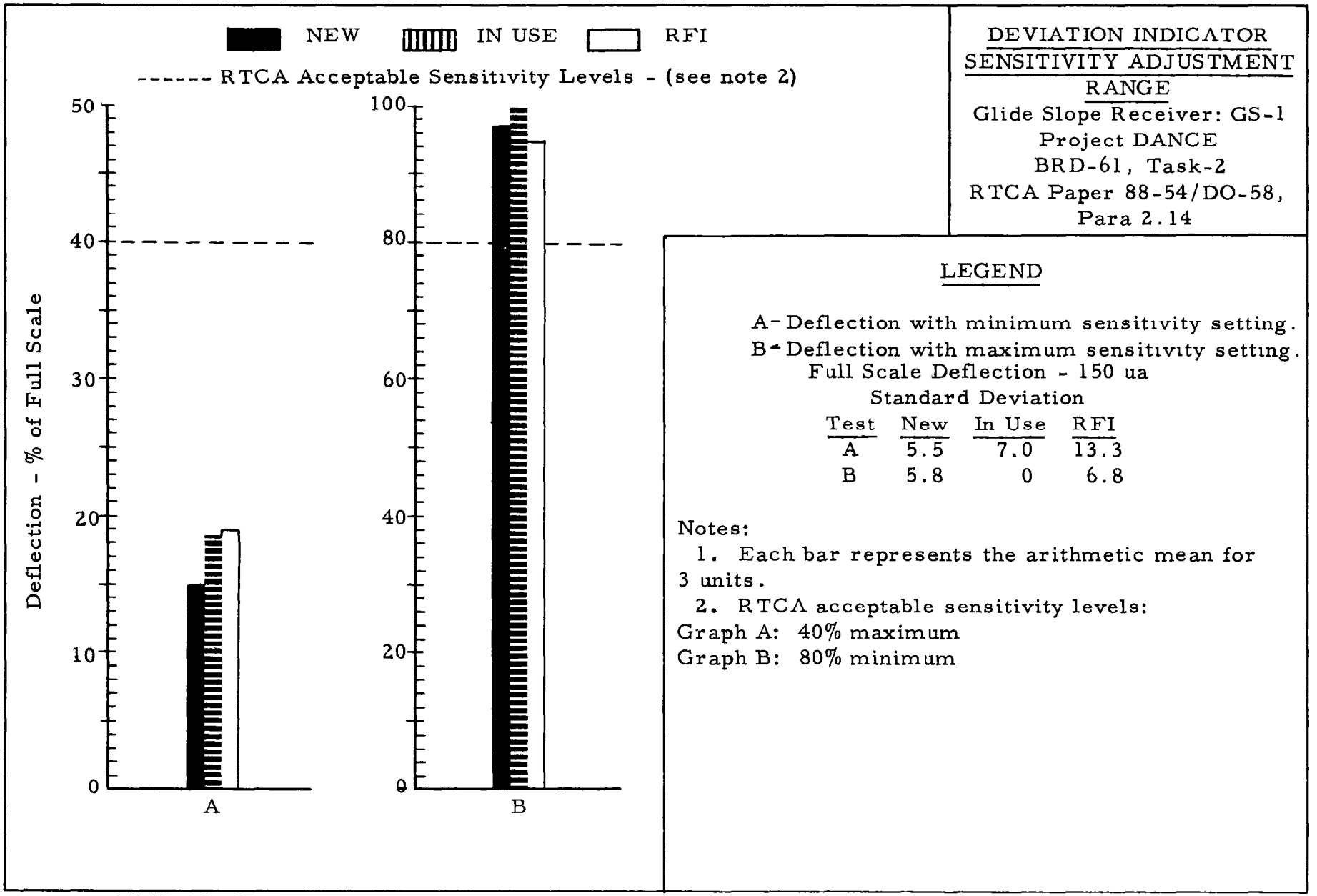
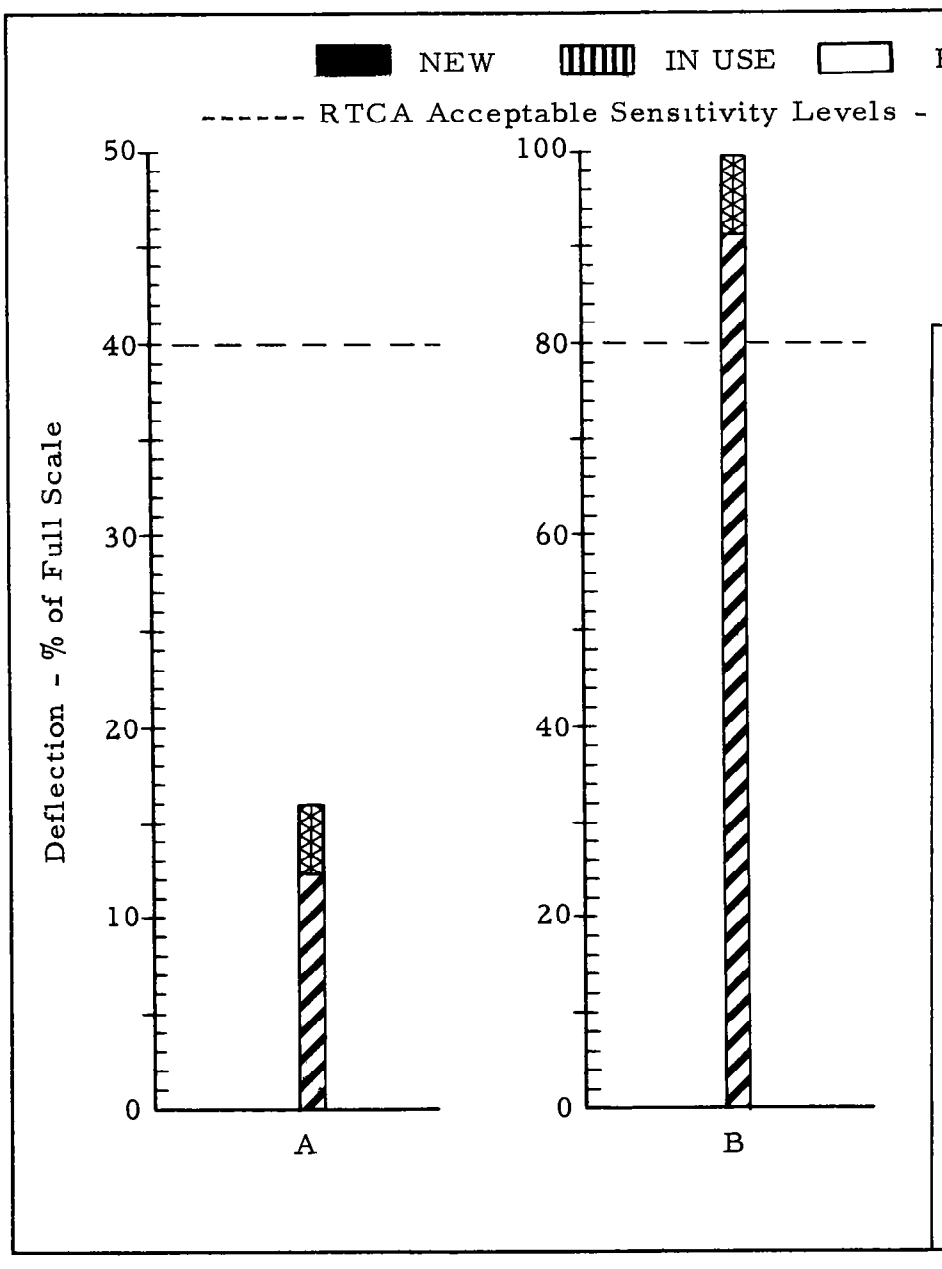


Figure C-4(a)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-1

(continued on Page C-299)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

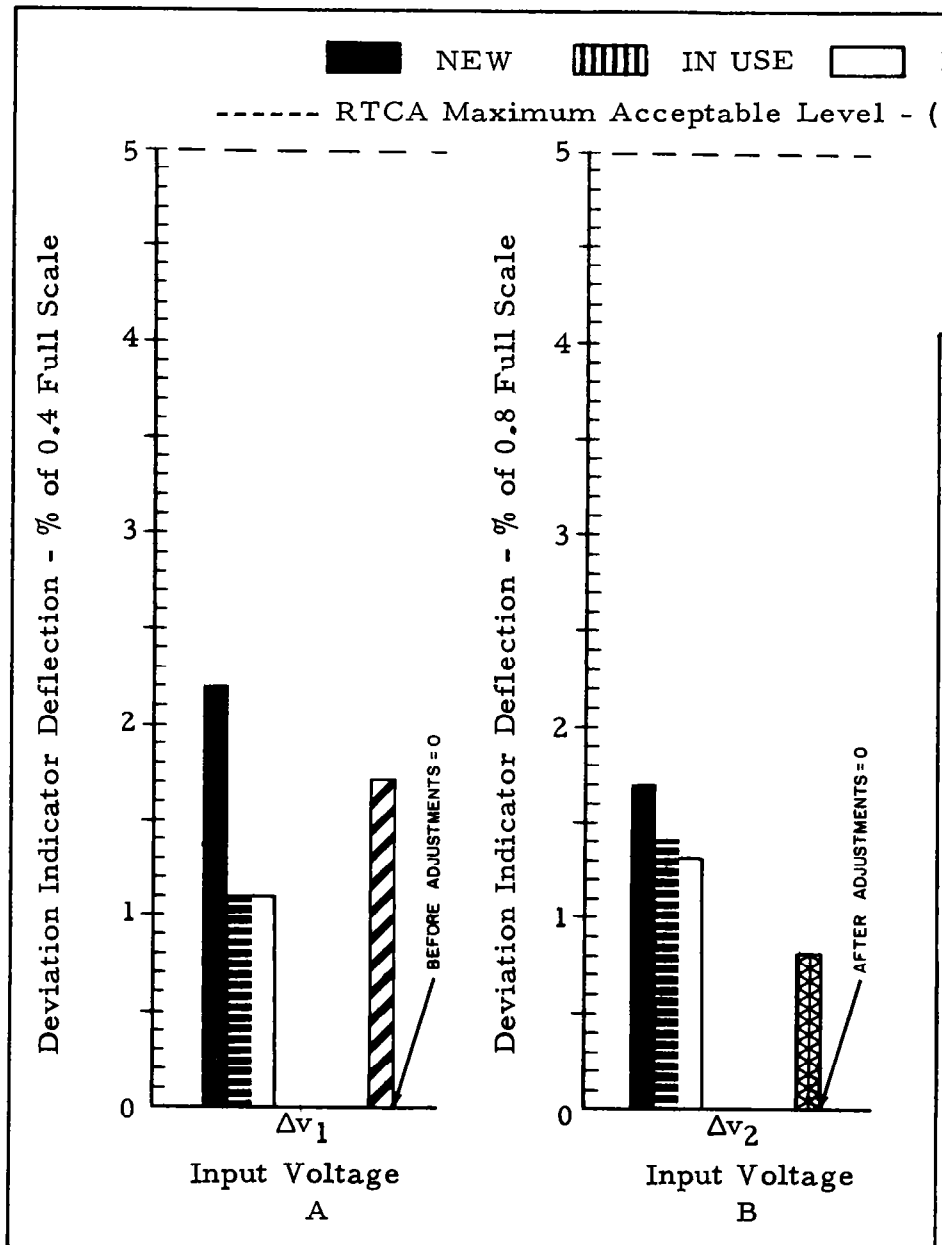
A- Deflection with minimum sensitivity setting.
B- Deflection with maximum sensitivity setting.
Full Scale Deflection - 150 ua
Standard Deviation

Test	In Use	
	Before	After
A	0.0	7.0
B	5.7	2.1

Notes:
1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. "In Use" units before adjustment.
   "In Use" units after adjustment.
3. RTCA acceptable sensitivity levels:
Graph A: 40% maximum
Graph B: 80% minimum
4. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-4(a)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-1



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Centering Characteristic)
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

Δv_1 - 100 - 30,000 uv, 0.4 Full Scale Adjustment
Δv_2 - 100 - 30,000 uv, 0.8 Full Scale Adjustment
Full Scale Deflection - 150 ua
Standard Deviation

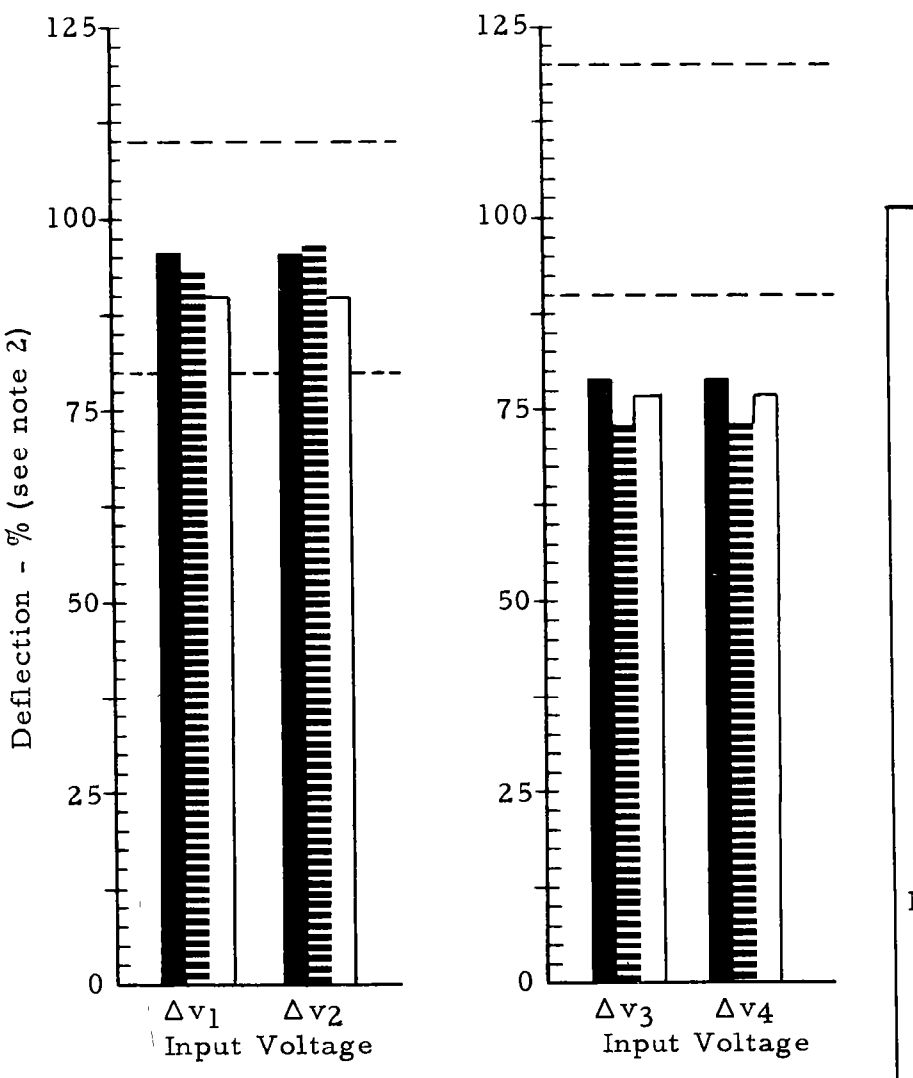
Test		New	In Use		RFI
			Before	After	
A	Δv_1	0.92	1.91	—	0.961
	Δv_1	—	0	3.54	—
B	Δv_2	2.22	0.96	—	1.110
	Δv_2	—	0	0	—

Notes:

1. Each bar in graphs A and B represents the arithmetic mean for 3 units except before and after adjustment bars represent arithmetic mean for 2 "In Use" units.
2. ▩ "In Use" units before adjustments.
   ▨ "In Use" units after adjustments.
3. Graph A: Δv_1 - 5% at 0.4 Full Scale
   Graph B: Δv_2 - 5% at 0.8 Full Scale
4. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-4(a)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-1
(Centering Characteristic)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Sensitivity and Deflection)
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

Δv_1 - Input between 40 - 200 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_2 - Input between 40 - 200 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

Δv_3 - Input between 200 - 30,000 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_4 - Input between 200 - 30,000 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

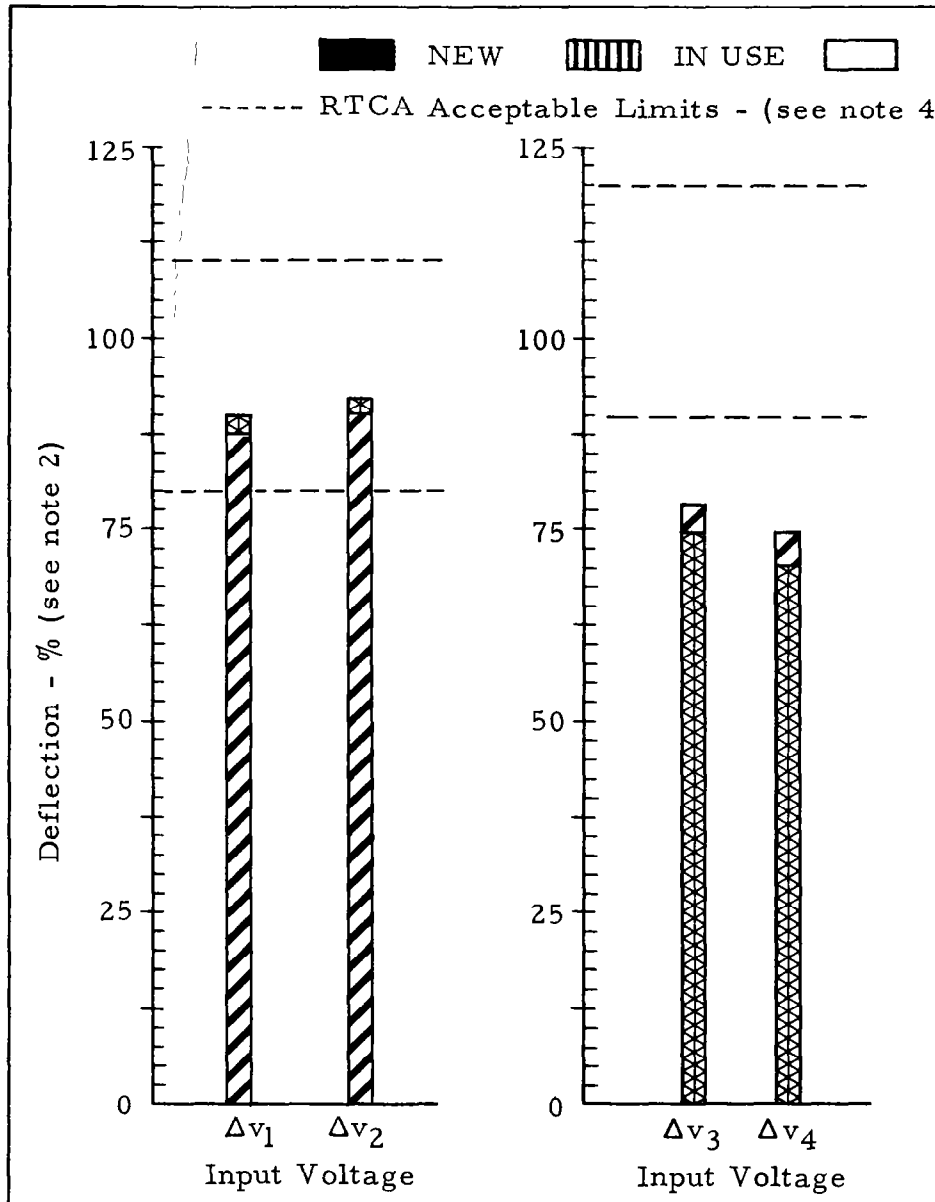
Standard Deviation

Test	New	In Use	RFI
Δv_1	2.7	13.3	13.3
Δv_2	4.5	15.7	13.2
Δv_3	6.5	5.0	12.0
Δv_4	7.5	5.3	11.4

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Percentage of deflection obtained with 200 uv input.
3. RTCA acceptable limits:
   Δv_1 & v_2 - 100% $\begin{bmatrix}+10\% \\ -20\%\end{bmatrix}$
   $\Delta v3$ & v_4 - 100% $\begin{bmatrix}+20\% \\ -10\%\end{bmatrix}$

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-1
(Sensitivity and Deflection) (continued on Page C-302)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Sensitivity and Deflection)
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

Δv_1 - Input between 40-200 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_2 - Input between 40-200 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

Δv_3 - Input between 200-30,000 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_4 - Input between 200-30,000 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

Standard Deviation

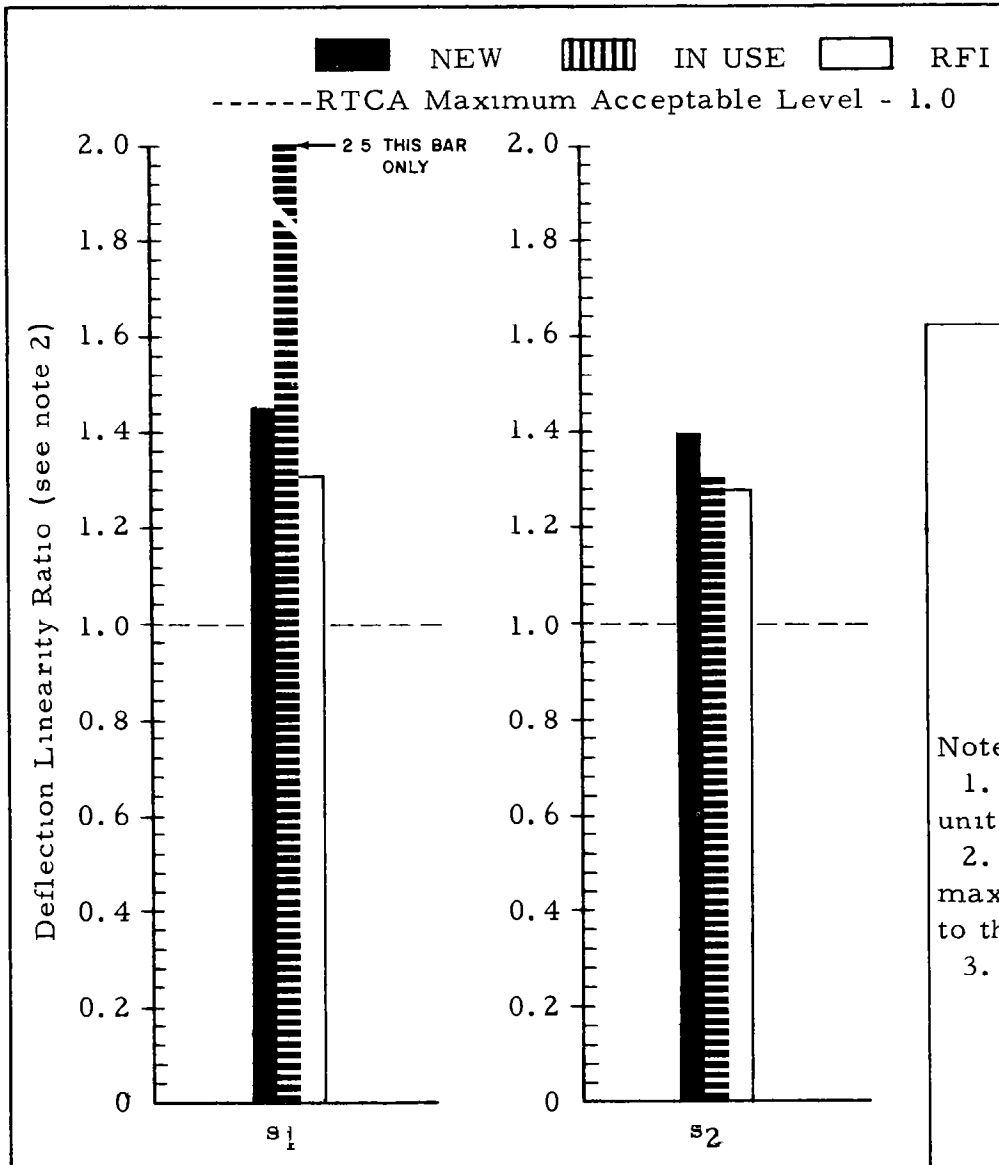
Test	In Use	
	Before	After
Δv_1	13.3	13.7
Δv_2	15.7	4.2
Δv_3	5.0	3.3
Δv_4	5.3	3.3

Notes:

1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. Percentage of deflection obtained with 200 uv input.
3. ⊠ "In Use" units after adjustment.
   ▨ "In Use" units before adjustment.
4. RTCA acceptable limits:
   Δv_1 & Δv_2 - 100% [+10% / -20%]
   Δv_3 & Δv_4 - 100% [+20% / -10%]

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-1
(Sensitivity and Deflection)

Figure C-4(a)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Deflection Linearity)
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

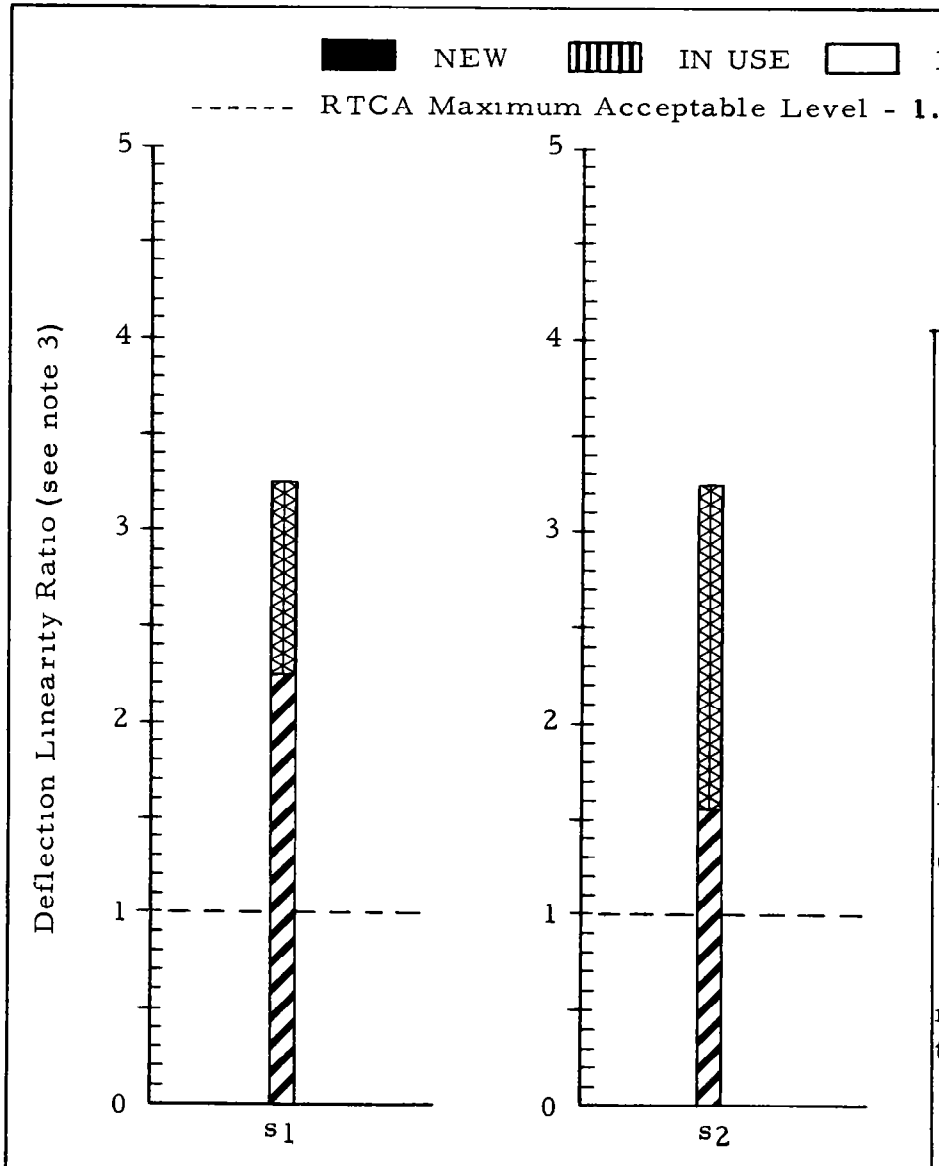
Sensitivity Setting
S_1 - 0.4 of Full Scale Adjustment
S_2 - 0.8 of Full Scale Adjustment
Full Scale Deflection - 150 ua
Standard Deviation

Test	New	In Use	RFI
S_1	.35	3.12	.98
S_2	.26	1.00	.38

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.
3. RTCA maximum acceptable level - 1.0.

Figure C-4(a)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-1
(Deflection Linearity) (continued on Page C-304)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Deflection Linearity)
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

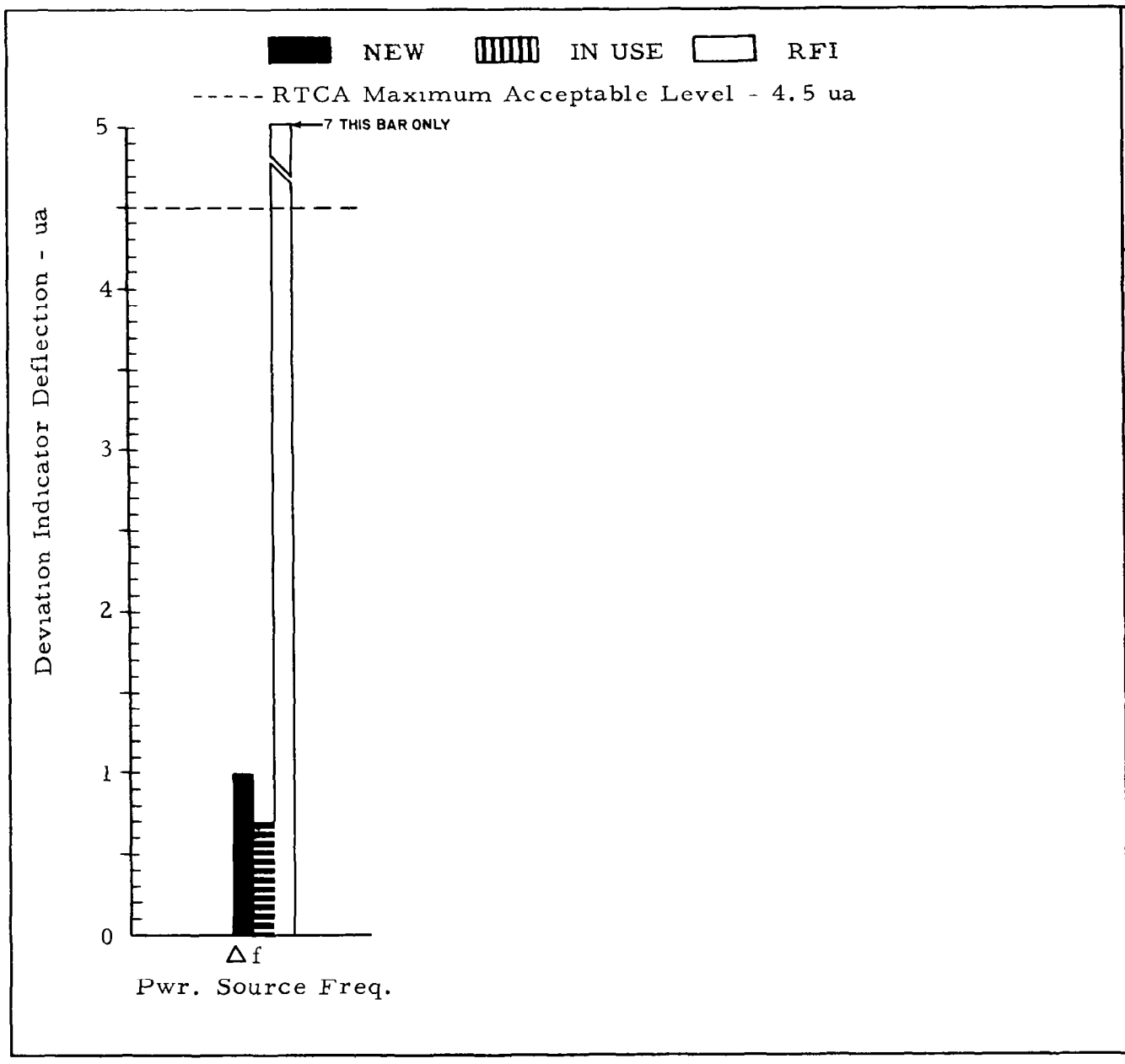
Sensitivity Setting
s_1 - 0.4 of Full Scale Adjustment
s_2 - 0.8 of Full Scale Adjustment
Full Scale Deflection - 150 ua

Test	Standard Deviation In Use	
	Before	After
s_1	3.9	.77
s_2	1.2	2.00

Notes:
1. Each bar represents the arithmetic mean for 2 "In Use" units.
2. ▩ "In Use" units before adjustments.
   ▨ "In Use" units after adjustments.
3. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.
4. RTCA maximum acceptable level - 1.0.
5. Adjustments were made in accordance with manufacturer's recommended practices.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-1
(Deflection Linearity)

Figure C-4(a)



POWER SOURCE FREQUENCY VARIATION
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.12

LEGEND

Δf - 320 - 1,000 cps

Standard Deviation

New	In Use	RFI
1.0	.36	4.6

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 4.5 ua.

Figure C-4(a)

POWER SOURCE FREQUENCY VARIATION - GLIDE SLOPE RECEIVER - GS-1

INTERFERENCE TESTS

Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Test	Frequency (mc)	F_C (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.7	0.19 to 1500	332.0	Acceptable level excluding the band 328.77 to 335.53 mc: ≥60 db.	Actual Level: ≥60 db. All frequencies within performance standards.	Yes
Cross Modulation RTCA Para: 2.8	329 to 335.3	332.0	Acceptable level excluding the band within $F_C \pm 300$ kc ≤9 microamps.	Actual Level: 0 microamps. All frequencies within performance standards.	Yes
Cable Conducted Interference RTCA Para: 2.10a	0.15 to 25	332.0	Acceptable Emission: ≤200 microvolts.	Actual Emission on+28v line: <200 microvolts except at 23.4 mc. On 115 v 400 cycle line: <200 microvolts. All other frequencies within performance standards.	Partially
Antenna Conducted Interference RTCA Para: 2.10b	0.19 to 1500	332.0	Acceptable Emission: ≤400 micro-microwatts.	Actual Emission: <400 micro-microwatts. All frequencies within performance standards	Yes

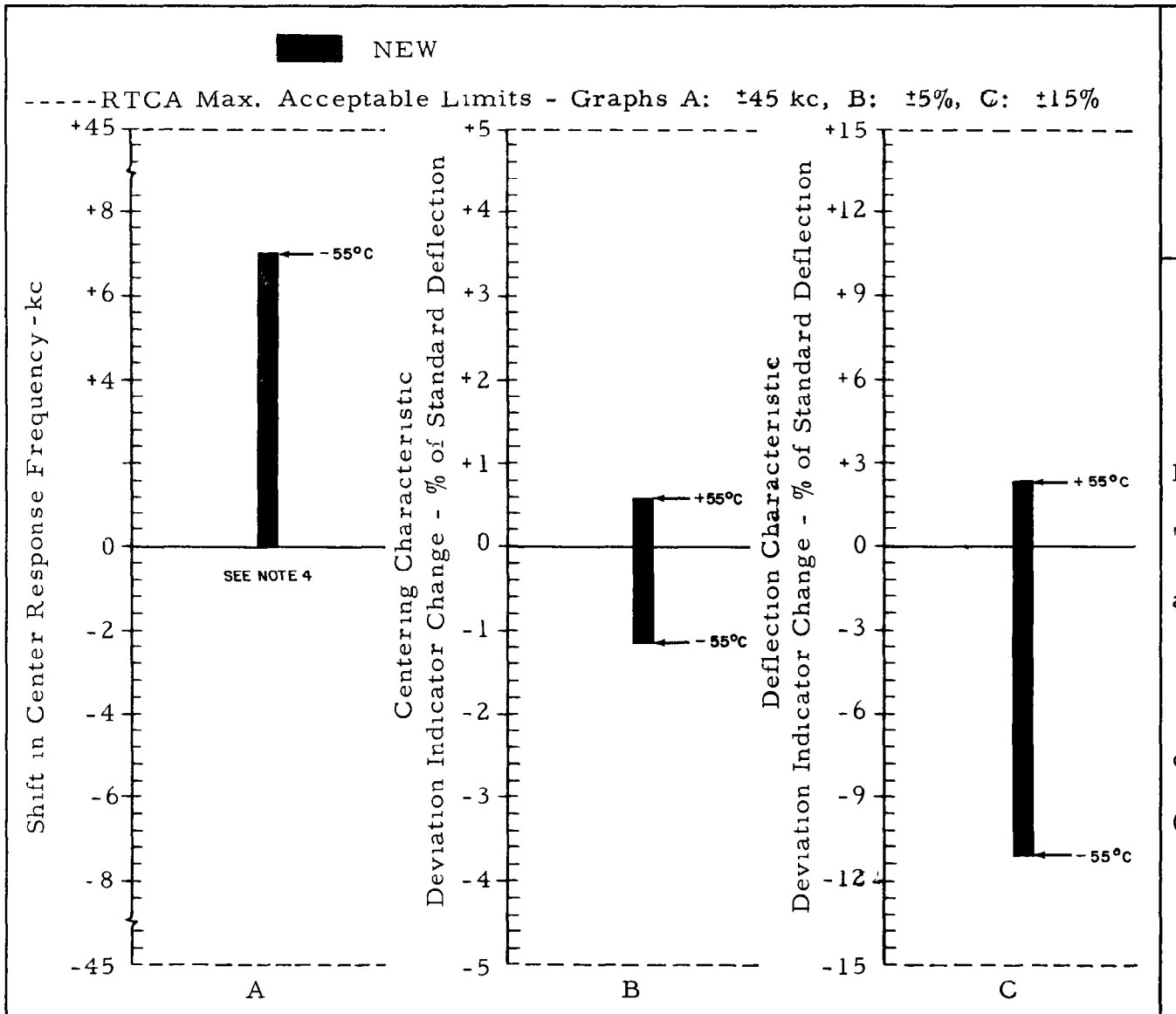
INTERFERENCE TESTS - GLIDE SLOPE RECEIVER - GS-1
(continued on Page C-307)

Figure C-4(a)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.15	329.3 to 335.0	Varied over Glide Slope band	Acceptable Operation: Deviation indication shall not exceed 5% of standard deflection.	Actual Operation: Deviation indication did not exceed one microamp.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	332.0	None	(Not Applicable)

INTERFERENCE TESTS - GLIDE SLOPE RECEIVER - GS-1



TEMPERATURE VARIATION TEST
Glide Slope Receiver: GS-1
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 3.3(a)(b)(c)

Notes:

1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits:
   Graph A: ±45 kc
   Graph B: ±5%
   Graph C: ±15%
3. This unit is designed to operate above 15,000 feet.
4. +55°C frequency shift - 0. kc.

Figure C-4(a)

TEMPERATURE VARIATION TEST - GLIDE SLOPE RECEIVER - GS-1

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

5. Laboratory and Field Test Data

b. GS-2, Glide Slope Receiver

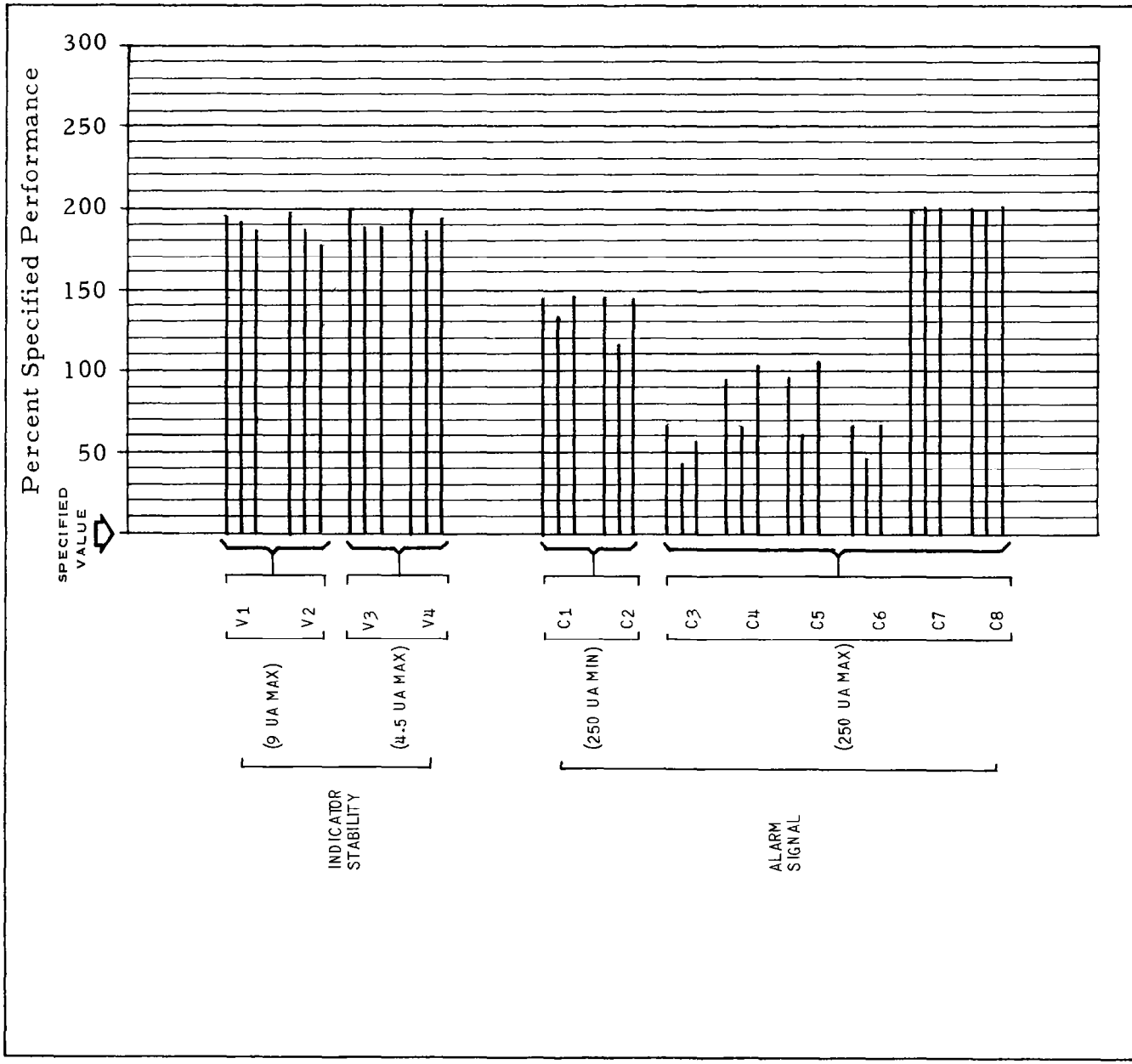
General:

Frequency Range:	329.3 - 335.0 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	20
Number of Channels Available at Operator's Position:	20
Means of Frequency Selection:	Rotary Switch

Technical:

	Page(s)
Percent Specified Performance	C-310 - 311
Weighted Performance	C-312
Centering Characteristic	C-313
Frequency Channel Selection	C-314
Sensitivity and Deflection Characteristic	C-315
Selectivity	C-316
Deflection Linearity	C-317
90 & 150 cps Phase Characteristic	C-318
Alarm Signal	C-319 - 320
Indicator Stability	C-321
Deviation Indicator Stability with change in Frequency of 90 & 150 cps Signal	C-322 - 323
Deviation Indicator Sensitivity Adjustment Range	C-324
Deviation Indicator Sensitivity Adjustment Range - Centering Characteristic	C-325
Deviation Indicator Sensitivity Adjustment Range - Sensitivity & Deflection Characteristic	C-326 - 327
Deviation Indicator Sensitivity Adjustment Range - Deflection Linearity	C-328
Power Source Frequency Variation	C-329
Interference Tests	C-330 - 331
Temperature Variation Test	C-332

PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-2
(continued on Page C-311)



PERCENT
SPECIFIED PERFORMANCE
Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

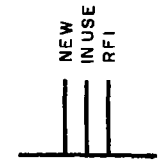
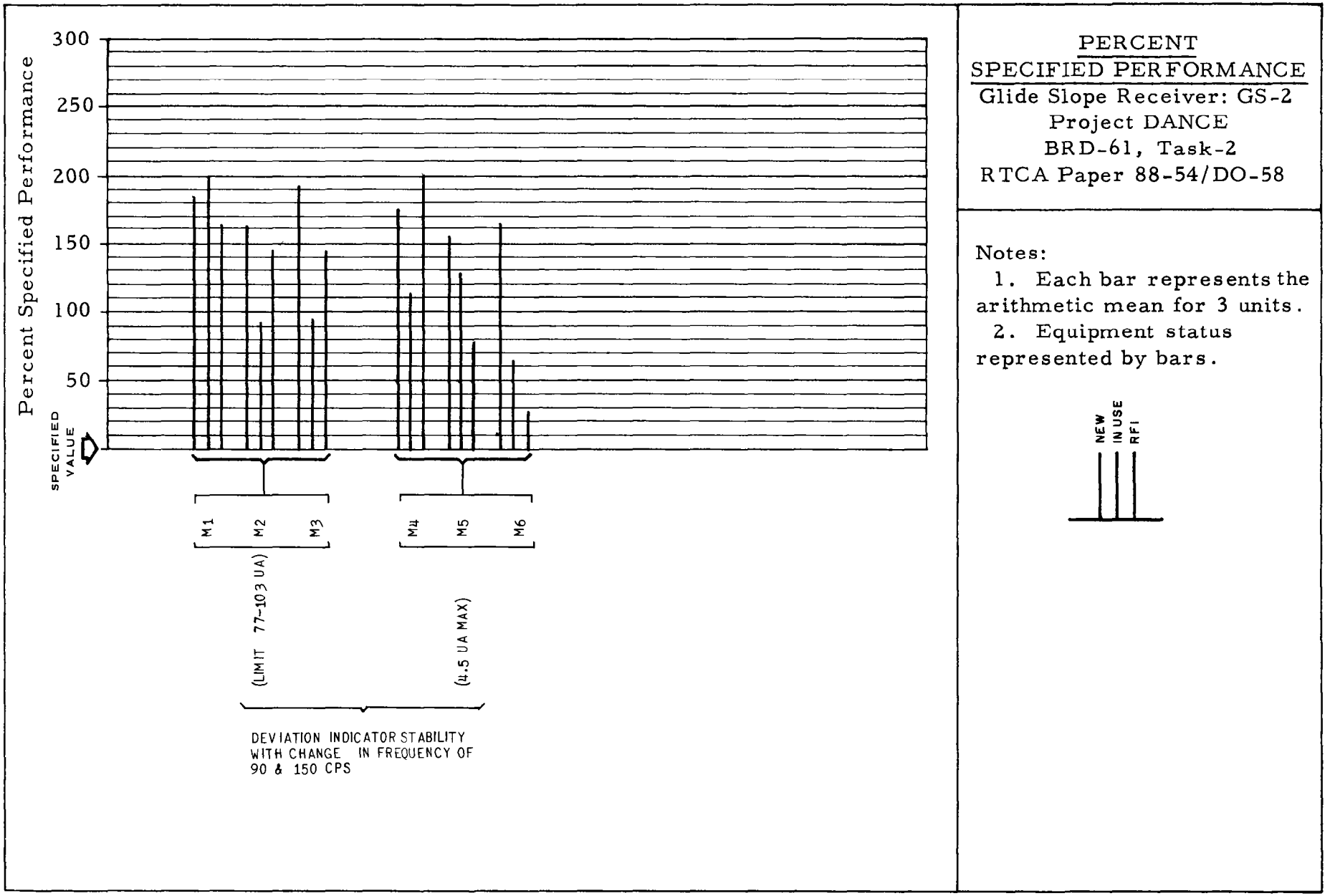


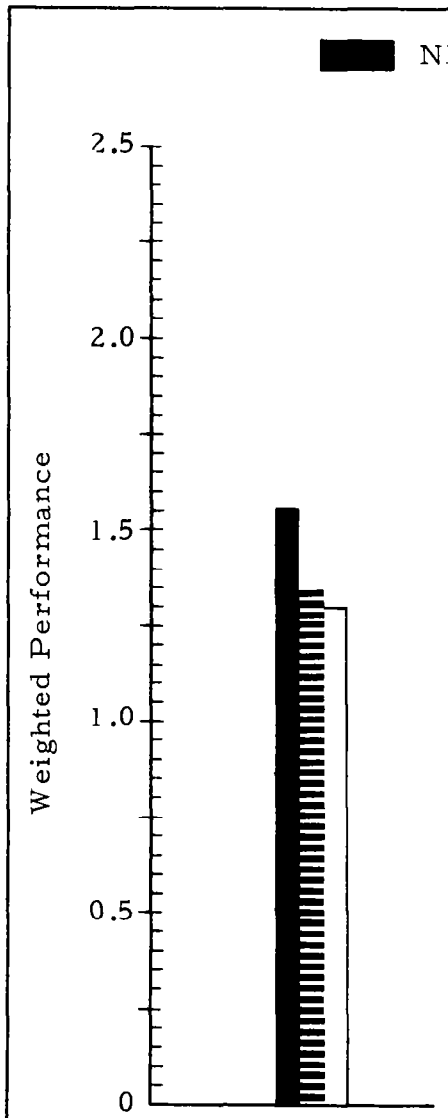
Figure C-4(b)

PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-2

(continued on Page C-311a)



PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-2



WEIGHTED PERFORMANCE

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2

Alarm Signal:
c_1, c_2, c_3, c_4, c_5, c_6, c_7, c_8 1/80 ea.

Deviation Indicator Stability:
m_1, m_2, m_3, m_4 1/120 ea.

Note:
1. Graph based on arithmetic mean for above characteristics.

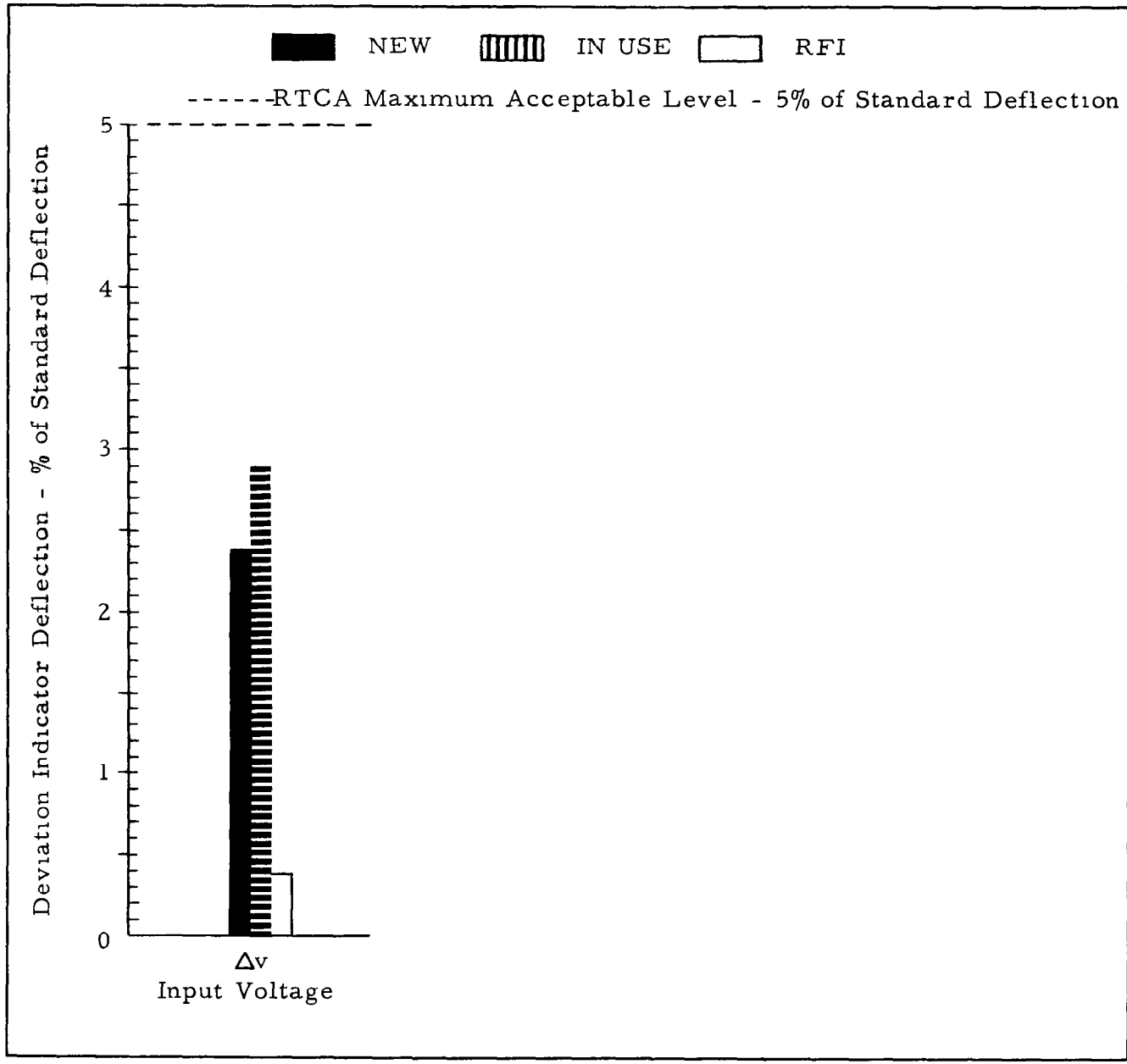
WEIGHTING FACTORS

Centering Characteristic:		3/20
Frequency Channel Selection:		3/20
Sensitivity & Deflection:		
Δv_1, Δv_2		3/40 ea.
Selectivity:		
f_c low	-530 kc	3/160
f_c	-450 kc	3/160
f_c	-230 kc	3/160
f_c	- 60 kc	3/160
f_c	+ 60 kc	3/160
f_c	+230 kc	3/160
f_c	+450 kc	3/160
f_c high	+530 kc	3/160
Deflection Linearity:		1/10
90 & 150 cps Phase Characteristic:		1/10
Indicator Stability:		
v_1, v_2, v_3, v_4		1/80 ea.

←continued next column

Figure C-4(b)

WEIGHTED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-2



CENTERING CHARACTERISTIC

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2,
RTCA Paper 88-54/DO-58,
Para 2.3

LEGEND

Δv - 100 - 30,000 uv
Standard Deflection - 90 ua

Standard Deviation

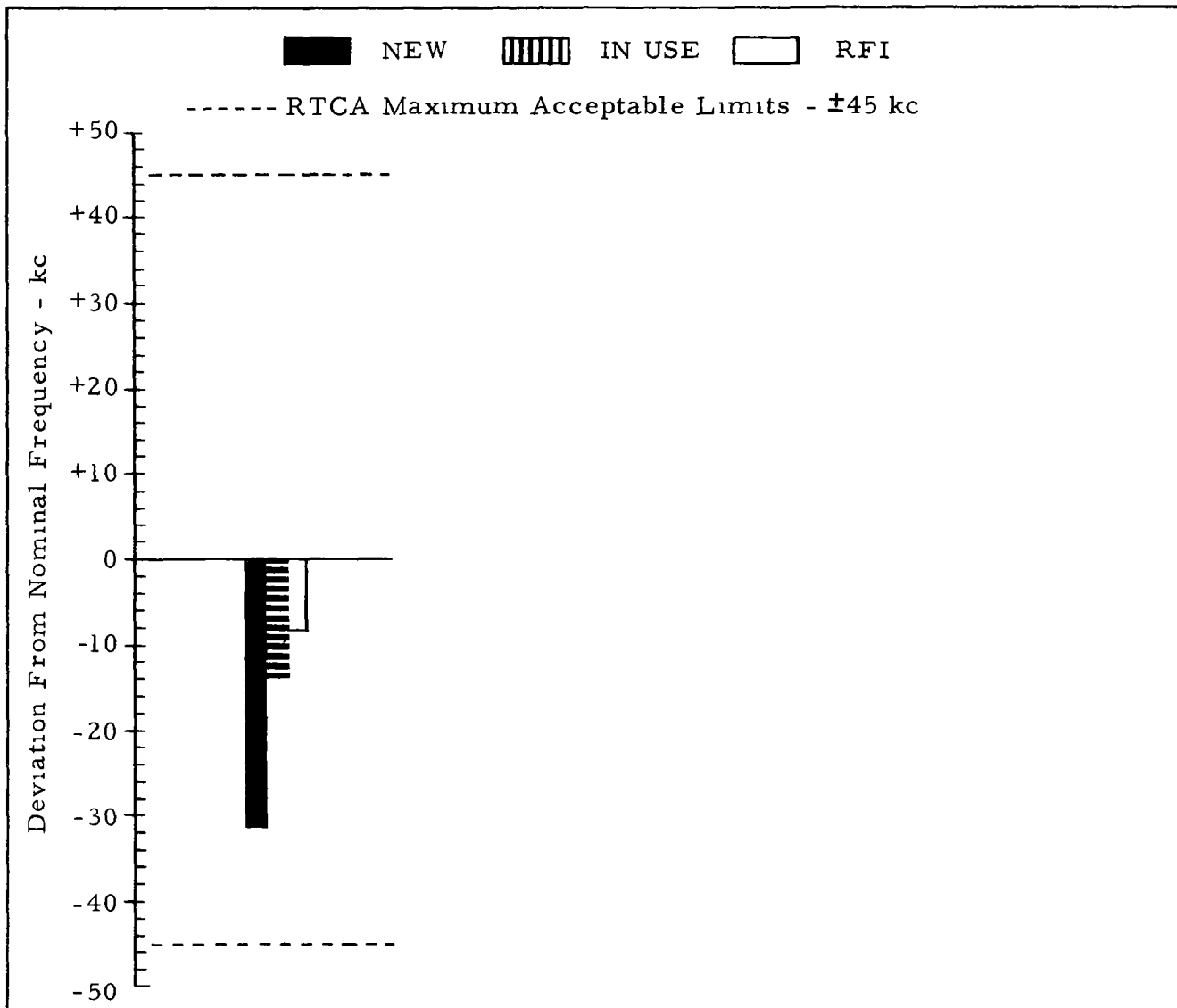
New	In Use	RFI
1.92	0.13	.15

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 5% of standard deflection.
3. "In Use" units before and after adjustment values did not change.
4. Adjustments were made in accordance with manufacturer's recommended practices.

CENTERING CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-2

Figure C-4(b)



FREQUENCY
CHANNEL SELECTION
Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.18

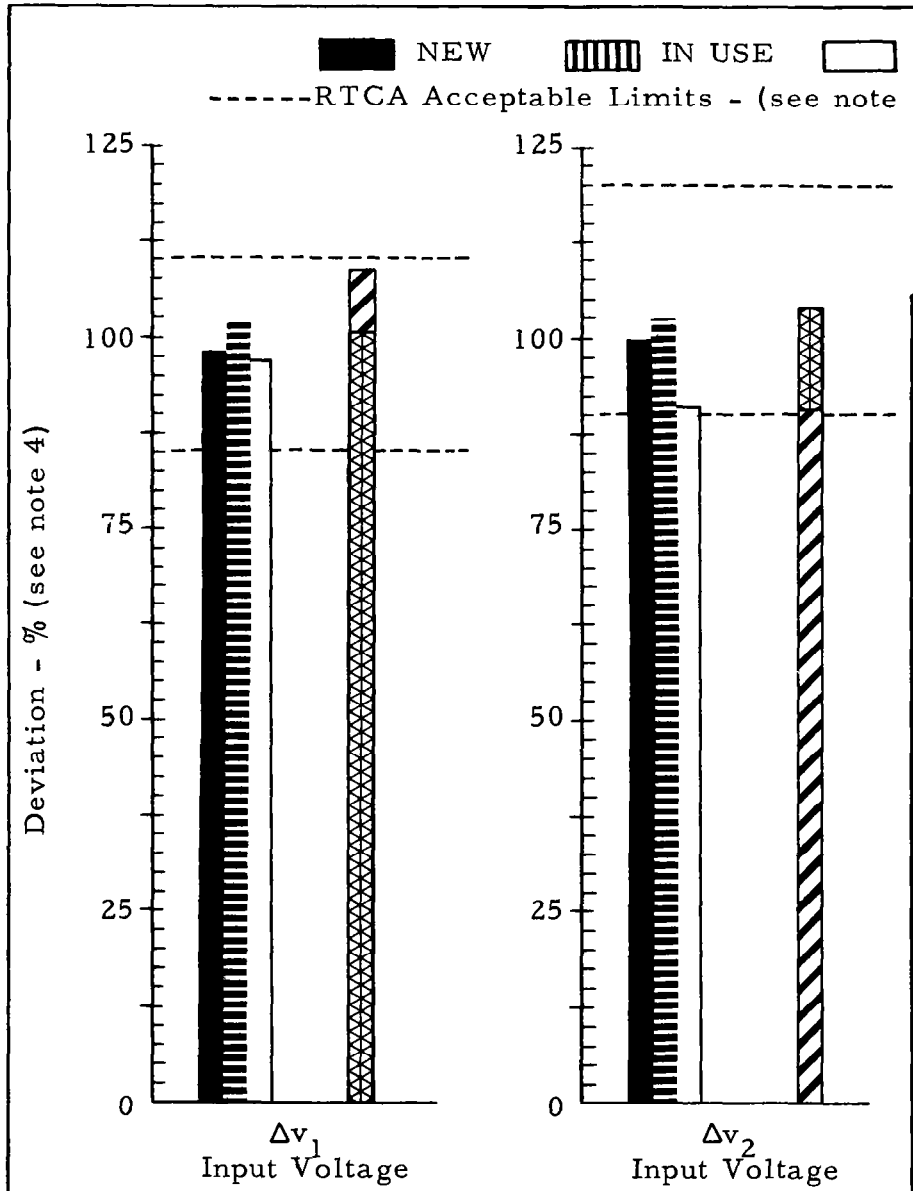
Standard Deviation

New	In Use	RFI
12.1	10.2	20.9

Notes::
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable limits - ±45 kc.

FREQUENCY CHANNEL SELECTION - GLIDE SLOPE RECEIVER - GS-2

Figure C-4(b)



3. RTCA acceptable limits:

Δv_1 - 100% [+10% -20%]

Δv_2 - 100% [+20% -10%]

4. Percentage of deflection obtained with 200 uv input.

5. Adjustments were made in accordance with manufacturer's recommended practices.

SENSITIVITY & DEFLECTION CHARACTERISTIC

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.4

LEGEND

Δv_1 - input between 40 and 200 uv which produced maximum indicator variation.

Δv_2 - input between 200 and 30,000 uv which produced maximum indicator variation.

Standard Deviation

Test	New	In Use	RFI
Δv_1	1.01	1.50	1.16
Δv_2	1.09	1.97	1.91

Notes:

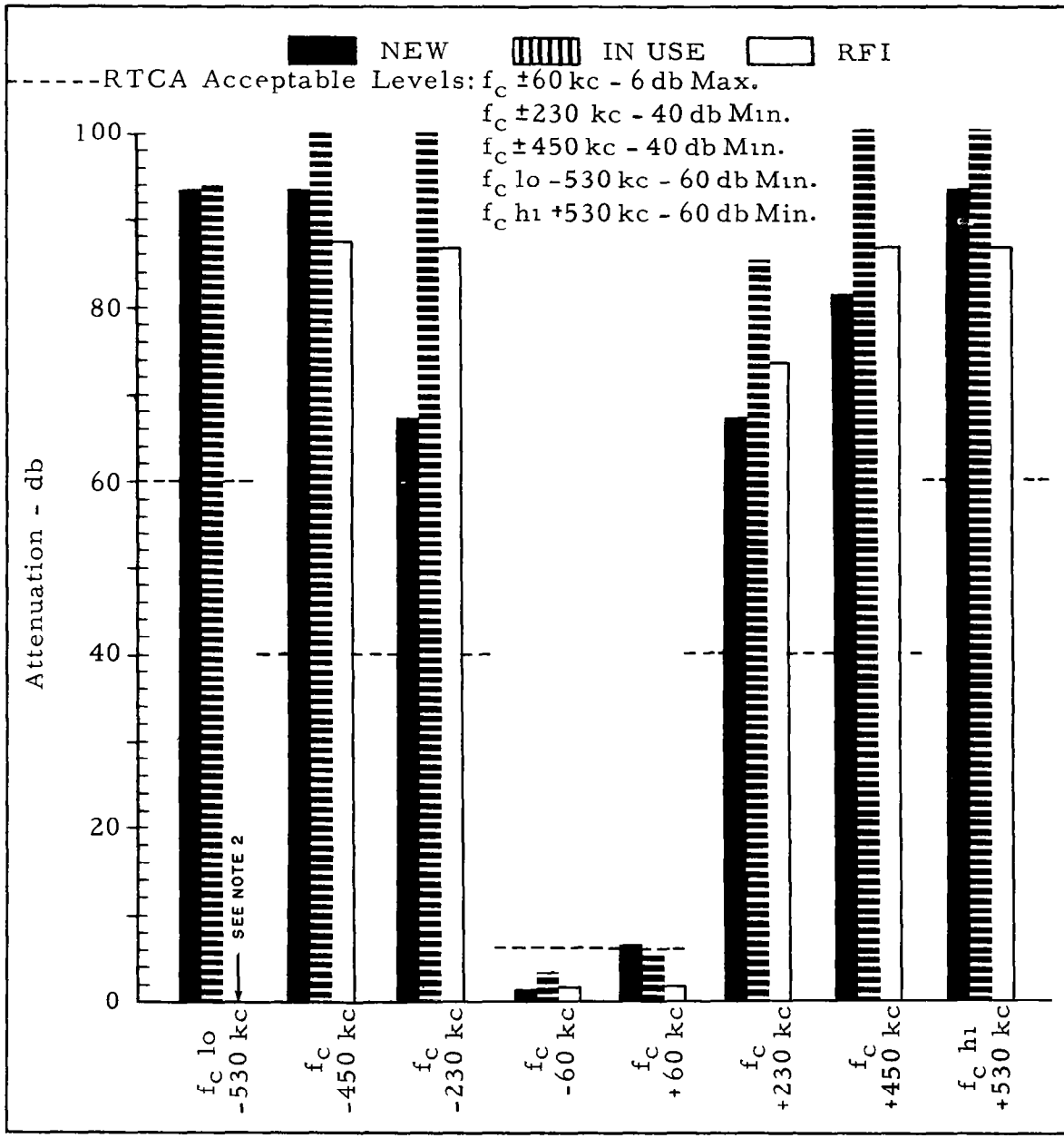
1. Each bar represents the arithmetic mean for 3 units, except in before & after adjustments, each bar represents one "In Use" unit.

2. "In Use" unit before adjustments.
   "In Use" unit after adjustments.

←continued next column

SENSITIVITY & DEFLECTION CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-2

Figure C-4(b)



SELECTIVITY

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.6

LEGEND

f_c - 332.0 mc
f_c low - 329.3 mc
f_c high - 335.0 mc

Standard Deviation

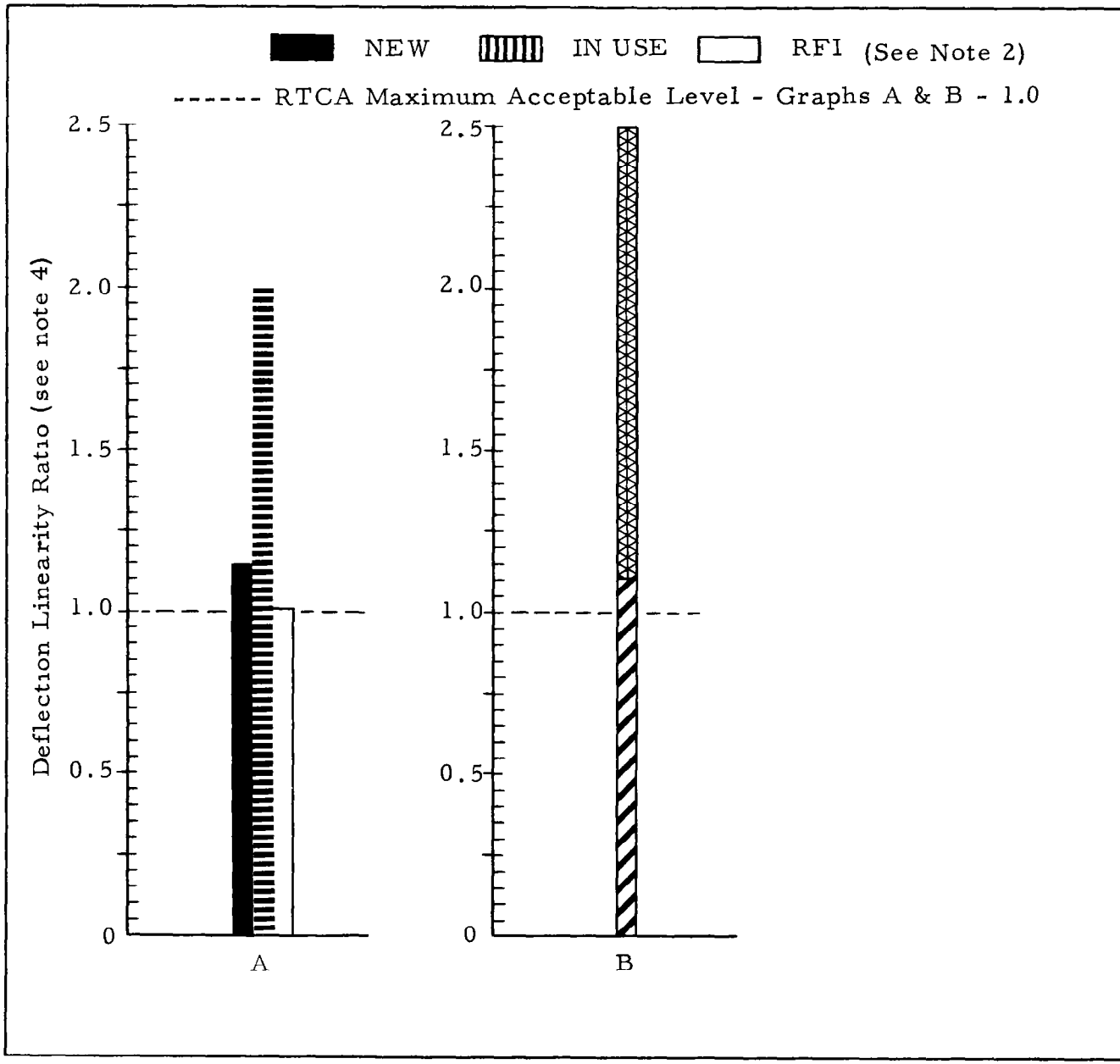
Test	New	In Use	RFI
f_c -530	1.82	----	---
f_c -450	1.82	12.4	6.75
f_c -230	14.80	12.4	6.75
f_c -60	0.68	5.4	1.62
f_c +60	1.15	6.9	2.37
f_c +230	14.00	38.0	21.00
f_c +450	25.50	12.4	6.75
f_c +530	1.82	12.4	6.75

Notes:

1. Each bar represents the arithmetic mean for 3 units, except "In Use" f_c low which represents one unit.
2. No data for "RFI" units - crystals not available at field facilities.

SELECTIVITY - GLIDE SLOPE RECEIVER - GS-2

Figure C-4(b)



DEFLECTION LINEARITY

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.5

Standard Deviation

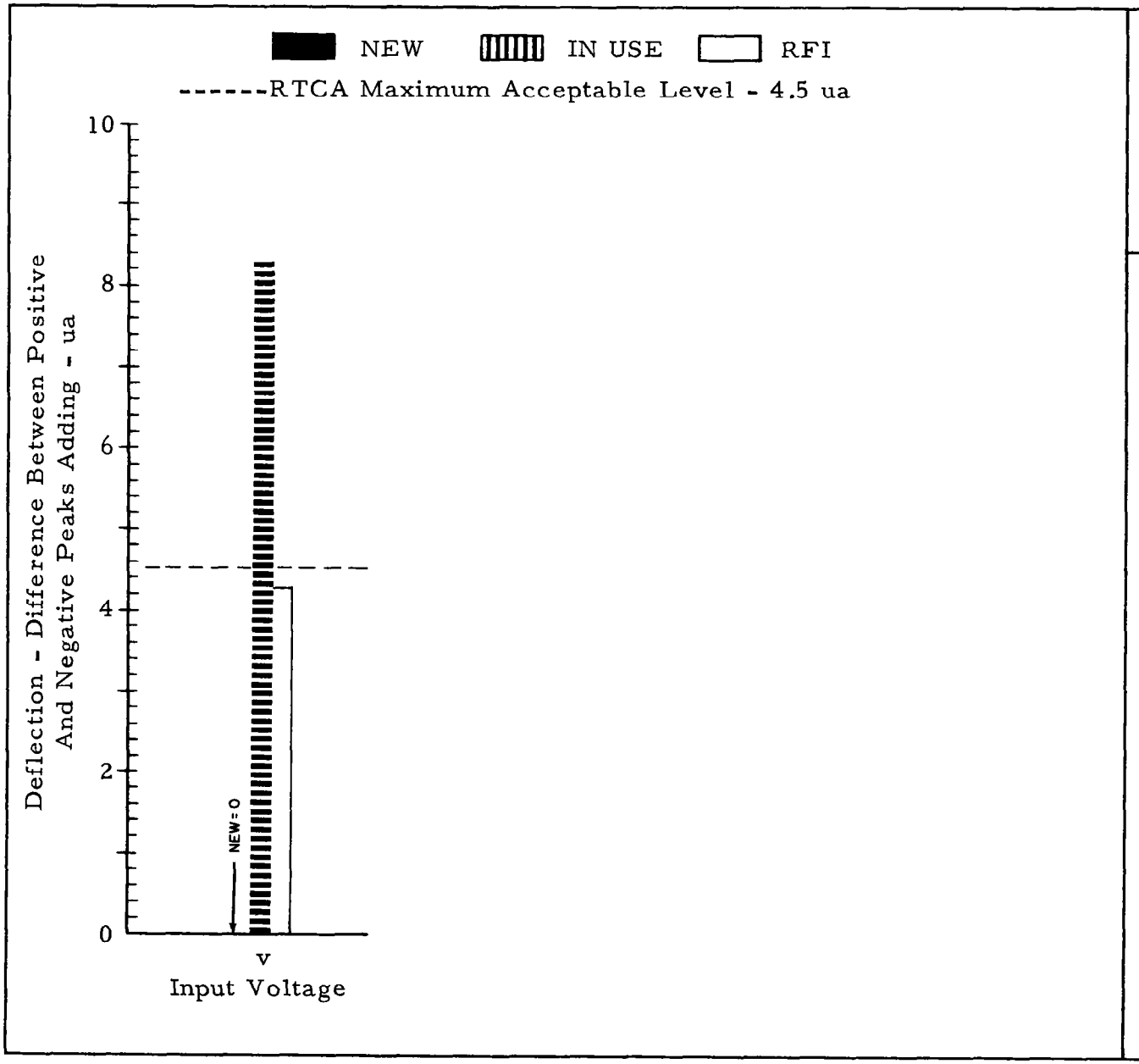
New	In Use	RFI
0	.7	.16

Notes:

1. Each bar in graph "A" represents the arithmetic mean for 3 units. Each bar in graph "B" represents one "In Use" unit.
2. Graph B:
   - "In Use" unit before adjustments.
   - "In Use" unit after adjustments.
3. RTCA maximum acceptable level - 1.0.
4. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.

Figure C-4(b)

DEFLECTION LINEARITY - GLIDE SLOPE RECEIVER - GS-2



90 AND 150 cps PHASE CHARACTERISTIC

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.17

LEGEND

v - 1000 uv

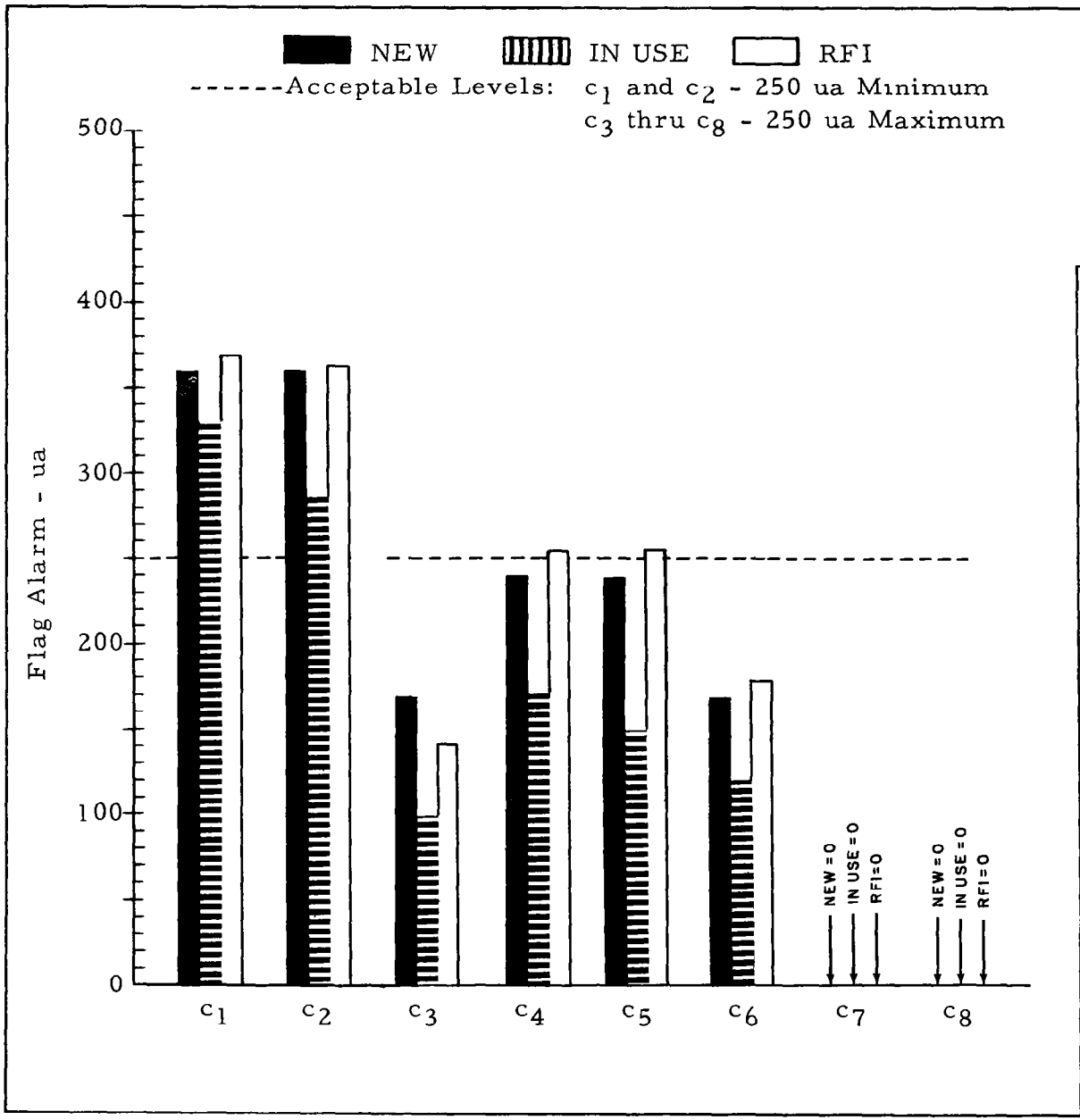
Standard Deviation

New	In Use	RFI
0	2.55	2.31

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 4.5 ua.

Figure C-4(b)

90 AND 150 cps PHASE CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-2



ALARM SIGNAL

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.9

LEGEND

c_1 - std. test sig. @ 40 uv
c_2 - std. test sig. @ min. alarm current
c_3 - std. dev. sig. @ 50% deflection
c_4 - mod. 0% - 150 cps & 45% - 90 cps
c_5 - mod. 0% - 90 cps & 45% - 150 cps
c_6 - mod. 22.5% of 90 & 150 cps
c_7 - absence of R. F.
c_8 - absence of modulation

Standard Deviation

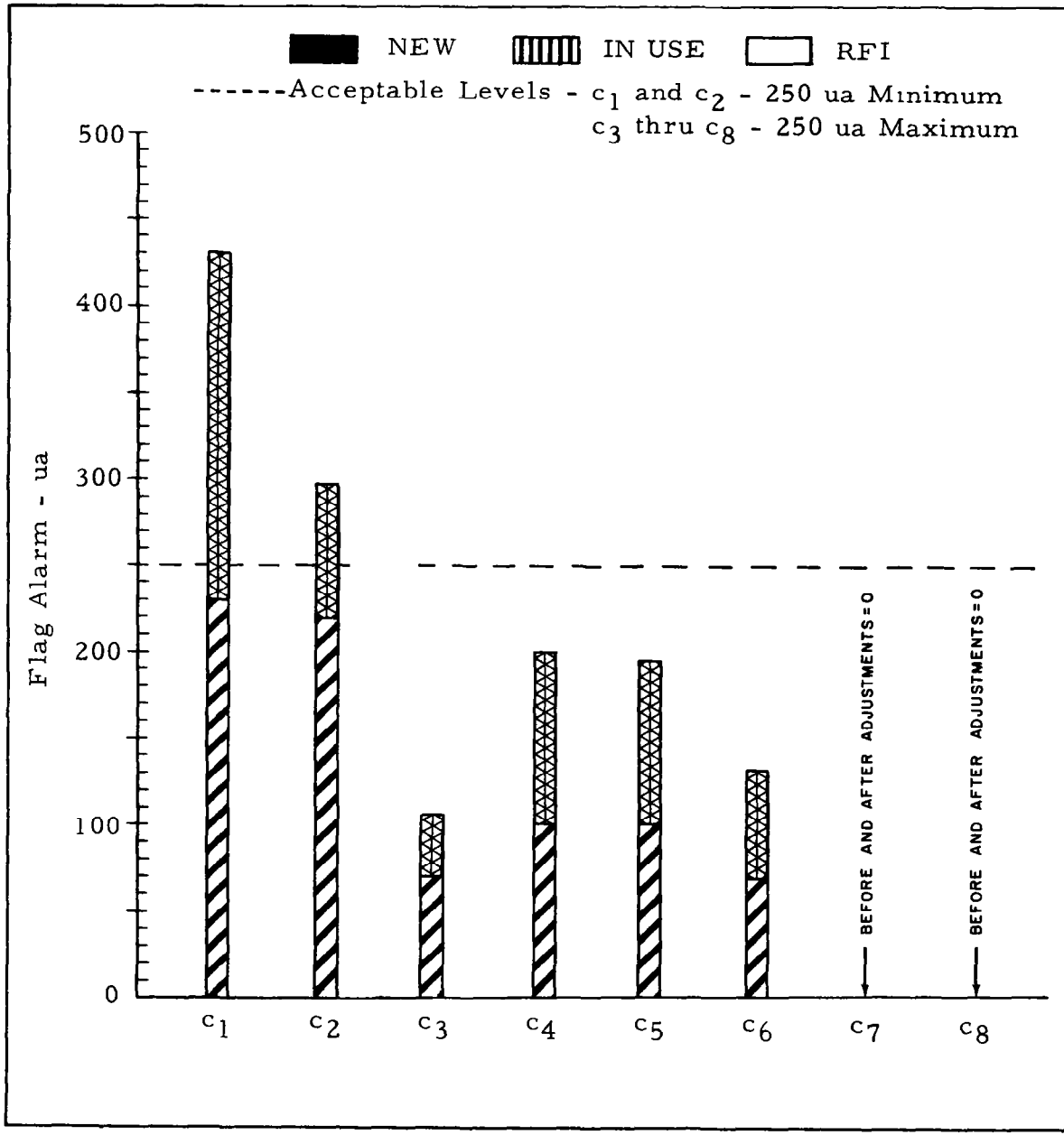
Test	New	In Use	RFI
c_1	8.0	148.0	45.0
c_2	8.0	192.0	37.0
c_3	17.6	53.5	45.5
c_4	10.0	124.0	53.5
c_5	10.0	85.0	49.2
c_6	7.6	95.2	39.0
c_7	0	0	0
c_8	0	0	0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA paper as a guide.

ALARM SIGNAL - GLIDE SLOPE RECEIVER - GS-2

(continued on Page C-320)



ALARM SIGNAL

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.9

LEGEND

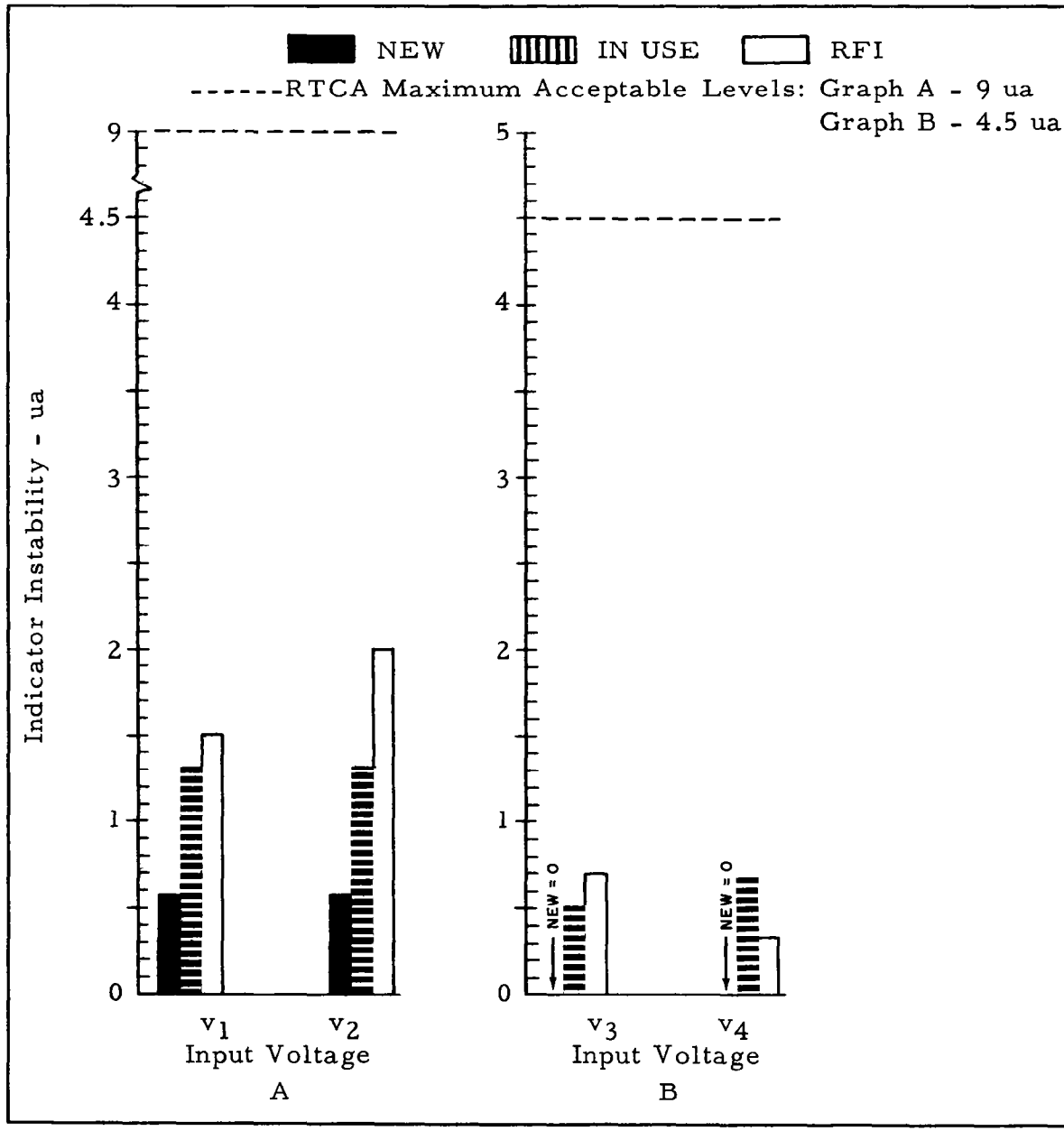
c_1 - std. test sig. @ 40 uv
c_2 - std. test sig. @ min. alarm current
c_3 - std. dev. sig. @ 50% deflection
c_4 - mod. 0% - 150 cps & 45% - 90 cps
c_5 - mod. 0% - 90 cps & 45% - 150 cps
c_6 - mod. 22.5% of 90 & 150 cps
c_7 - absence of R. F.
c_8 - absence of modulation

Notes:

1. Each bar represents one "In Use" unit.
2. "In Use" unit before adjustments.
   "In Use" unit after adjustments.
3. Acceptable levels were determined by using RTCA paper as a guide.
4. Adjustments were made in accordance with the manufacturer's recommended practices.

Figure C-4(b)

ALARM SIGNAL - GLIDE SLOPE RECEIVER - GS-2



INDICATOR STABILITY

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.16

LEGEND

v_1 - 40 uv centering signal
v_2 - 40 uv deviation signal
v_3 - 200 uv centering signal
v_4 - 200 uv deviation signal

Standard Deviation

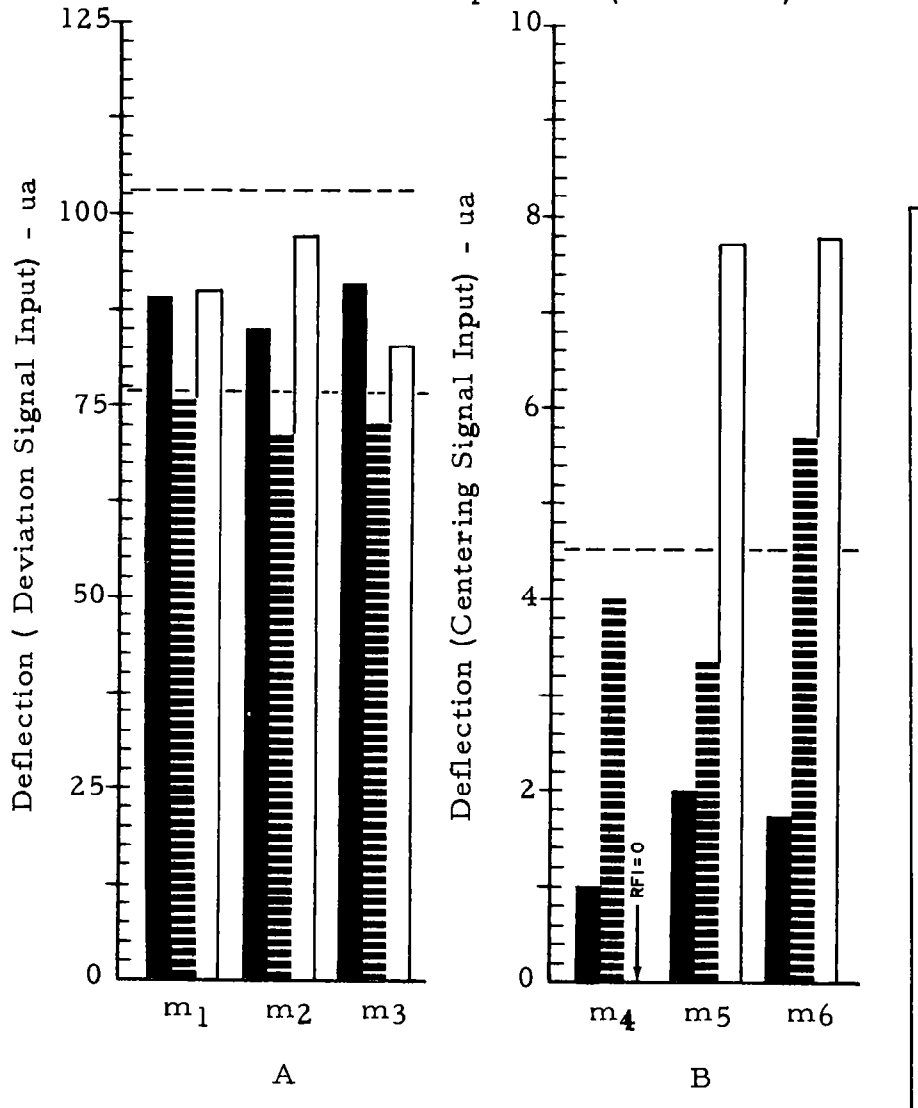
Test	New	In Use	RFI
v_1	.91	.23	1.30
v_2	.90	.58	2.00
v_3	0	.50	0.68
v_4	0	.60	0.20

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable levels:
Graph A: v_1 and v_2, 9 ua
Graph B: v_3 and v_4, 4.5 ua.

Figure C-4(b)

INDICATOR STABILITY - GLIDE SLOPE RECEIVER - GS-2



DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQ. OF 90 & 150 cps SIGNALS

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.13 (a) (b)

LEGEND

m_1 & m_4 - 90 & 150 cps
m_2 & m_5 - 87.75 & 146.25 cps
m_3 & m_6 - 92.25 & 153.75 cps

Standard Deviation

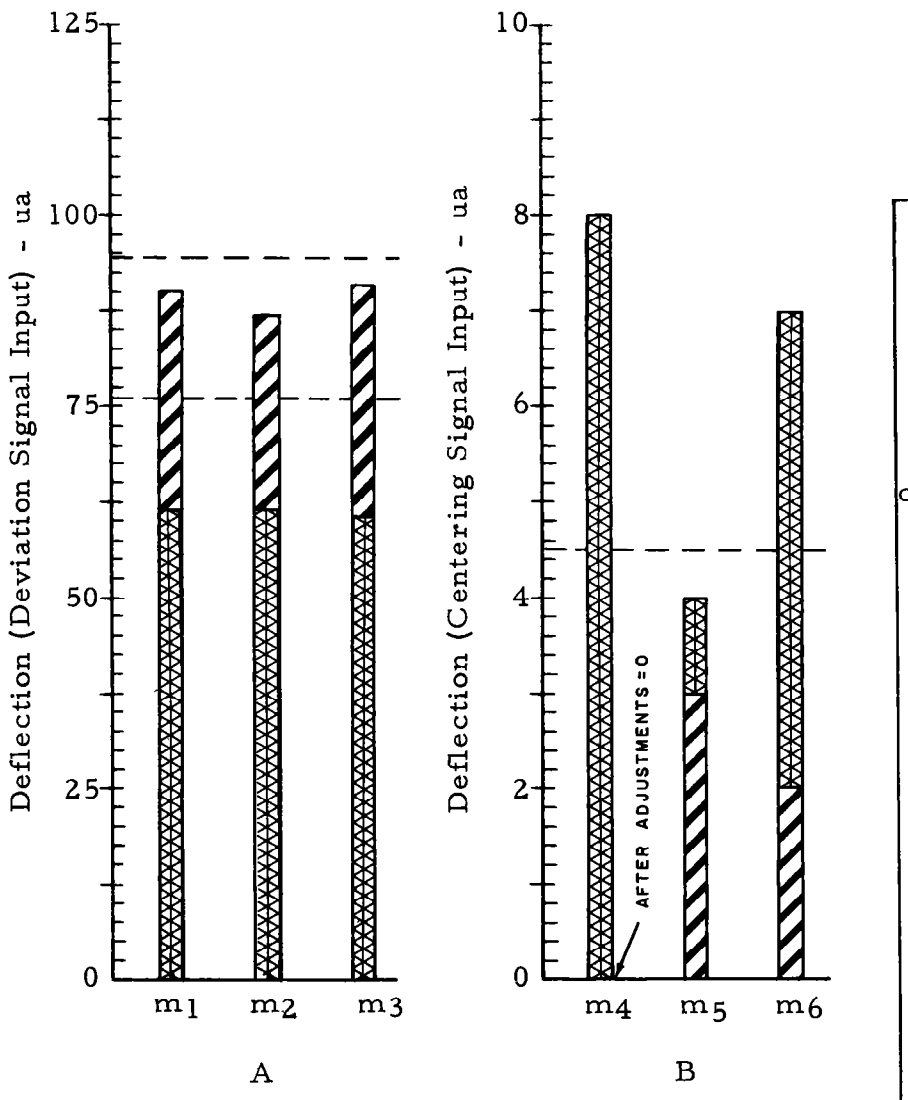
Test	New	In Use	RFI
m_1	1.15	12.1	0
m_2	2.08	8.3	15.9
m_3	3.0	11.7	13.7
m_4	1.0	4.0	0
m_5	2.0	1.15	9.9
m_6	2.08	1.15	10.5

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable:
   Graph A: Limits for deviation signal input - 76.5 to 103.5 ua.
   Graph B: Level for centering signal input - 4.5 ua maximum.

DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQUENCY OF 90 & 150 cps SIGNALS
GLIDE SLOPE RECEIVER - GS-2 (continued on Page C-323)

Figure C-4(b)



DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQ. OF 90 & 150 cps SIGNALS

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.13 (a) (b)

LEGEND

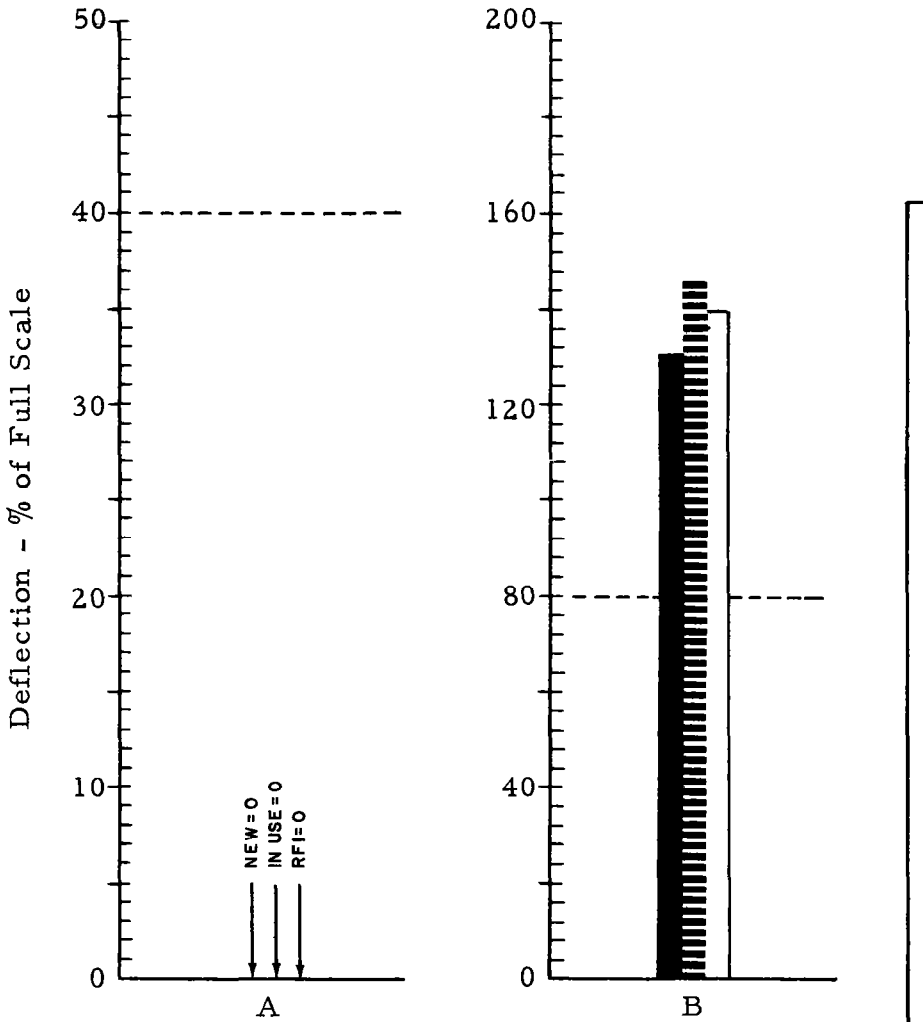
m_1 & m_4 - 90 & 150 cps
m_2 & m_5 - 87.75 & 146.25 cps
m_3 & m_6 - 92.25 & 153.75 cps

Notes:

1. Each bar represents the arithmetic mean for one "In Use" unit.
2. ▩ "In Use" unit before adjustment.
   ▨ "In Use" unit after adjustment.
3. RTCA acceptable:
   Graph A: Limits for deviation signal input - 76.5 to 103.5 ua.
   Graph B: Level for centering signal input - 4.5 ua maximum.
4. Adjustments were made in accordance with manufacturer's recommended practices.

DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQUENCY OF 90 & 150 cps SIGNALS
GLIDE SLOPE RECEIVER - GS-2

Figure C-4(b)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

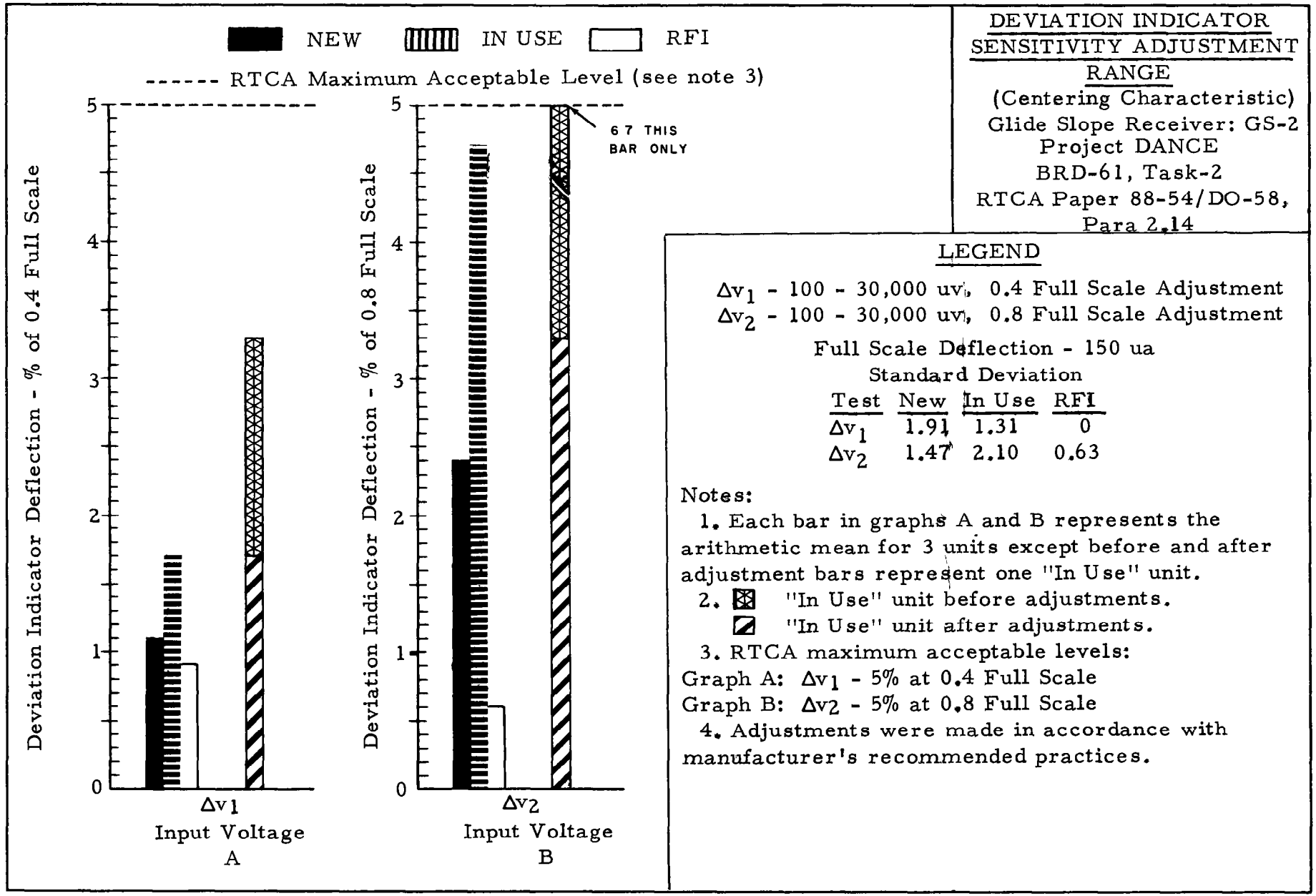
A - Deflection with minimum sensitivity setting.
B - Deflection with maximum sensitivity setting.
Full Scale Deflection - 150 ua

	Standard Deviation		
Test	New	In Use	RFI
A	0	0	0
B	16.3	9.2	15

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable sensitivity levels:
Graph A: 40% maximum
Graph B: 80% minimum
3. No change in values before and after adjustment of one "In Use" unit.
4. Adjustments were made in accordance with manufacturer's recommended practices.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-2

Figure C-4(b)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Centering Characteristic)
Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

Δv_1 - 100 - 30,000 uv, 0.4 Full Scale Adjustment
Δv_2 - 100 - 30,000 uv, 0.8 Full Scale Adjustment

Full Scale Deflection - 150 ua

Standard Deviation

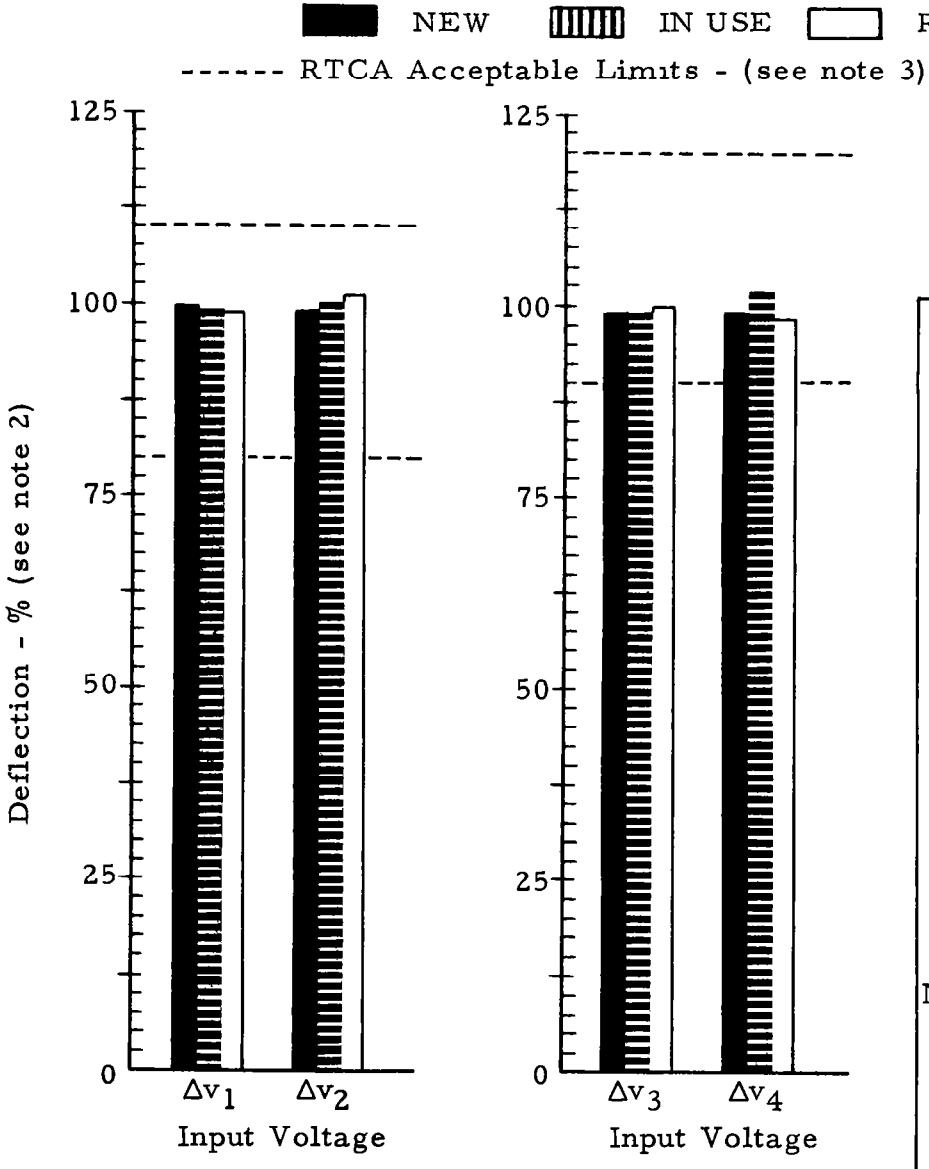
Test	New	In Use	RFI
Δv_1	1.91	1.31	0
Δv_2	1.47	2.10	0.63

Notes:

1. Each bar in graphs A and B represents the arithmetic mean for 3 units except before and after adjustment bars represent one "In Use" unit.
2. "In Use" unit before adjustments.
   "In Use" unit after adjustments.
3. RTCA maximum acceptable levels:
Graph A: Δv_1 - 5% at 0.4 Full Scale
Graph B: Δv_2 - 5% at 0.8 Full Scale
4. Adjustments were made in accordance with manufacturer's recommended practices.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-2
(Centering Characteristic)

Figure C-4(b)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Sensitivity and Deflection)
Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

Δv_1 - Input between 40-200 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_2 - Input between 40-200 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

Δv_3 - Input between 200-30,000 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

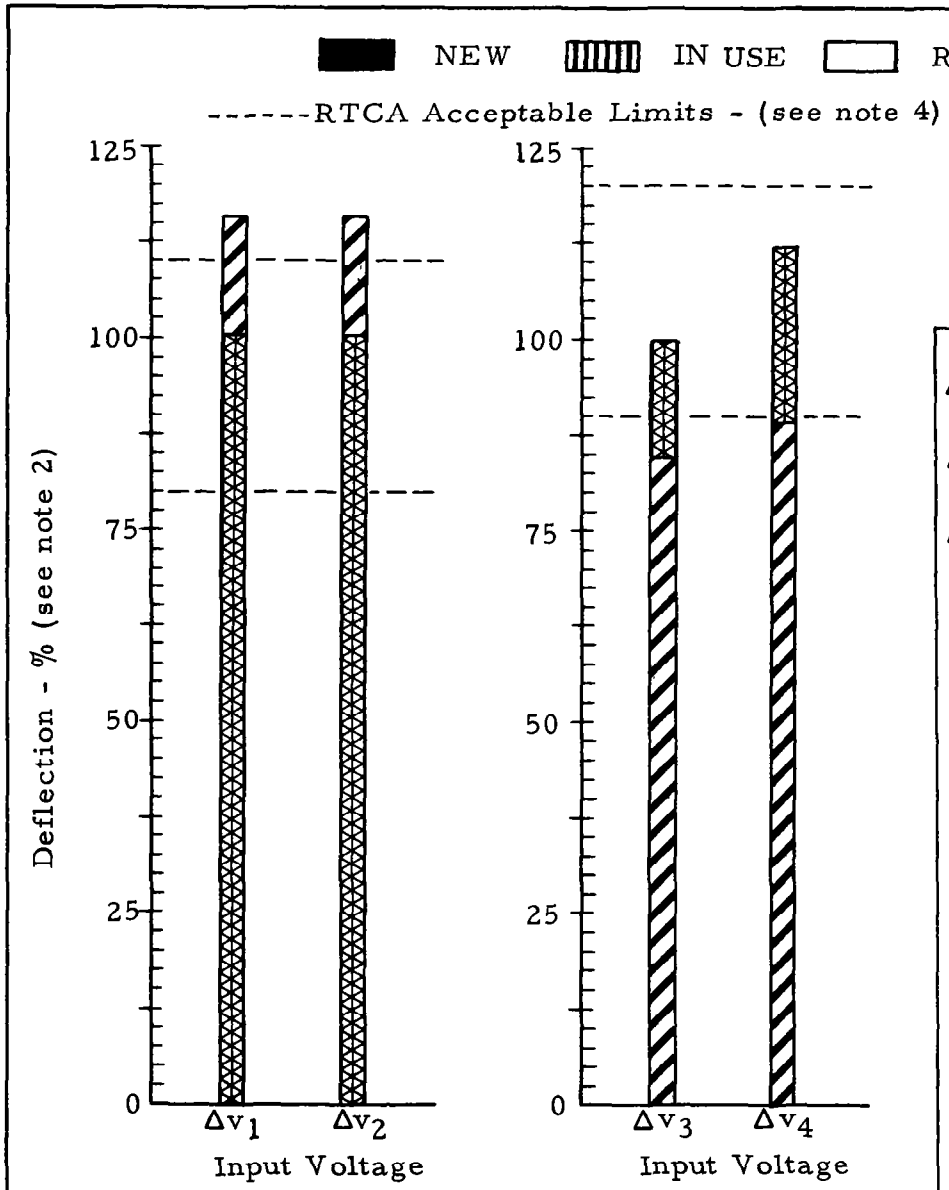
Δv_4 - Input between 200-30,000 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

Test	Standard Deviation New	In Use	RFI
Δv_1	3.3	2.4	3.8
Δv_2	2.9	2.2	7.0
Δv_3	2.5	2.9	2.9
Δv_4	2.2	2.5	4.3

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. Percentage of deflection obtained with 200 uv input.
3. RTCA acceptable limits:
   Δv_1 & Δv_2 - 100% [+10% -20%]
   Δv_3 & Δv_4 - 100% [+20% -10%]

Figure C-4(b)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-2
(Sensitivity and Deflection)(continued on Page C-327)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Sensitivity and Deflection)
Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58
Para 2.14

LEGEND

Δv_1 - Input between 40-200 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_2 - Input between 40-200 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

Δv_3 - Input between 200-30,000 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_4 - Input between 200-30,000 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

Notes:

1. Each bar represents one "In Use" unit.
2. Percentage of deflection obtained with 200 uv input.
3. "In Use" unit before adjustment.
   "In Use" unit after adjustment.
4. RTCA acceptable limits:

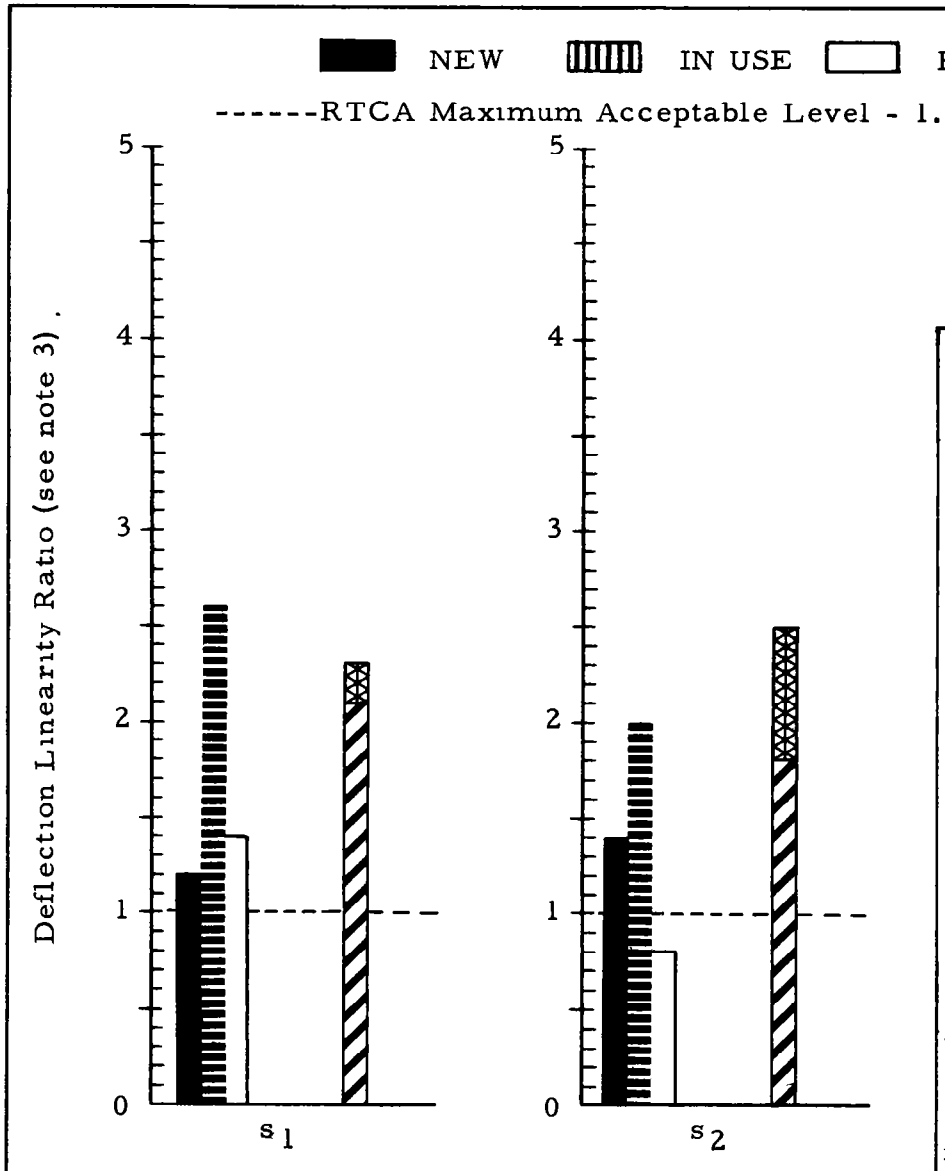
$$\Delta v_1 \ \& \ v_2 \ - \ 100\% \begin{bmatrix} +10\% \\ -20\% \end{bmatrix}$$

$$\Delta v_3 \ \& \ v_4 \ - \ 100\% \begin{bmatrix} +20\% \\ -10\% \end{bmatrix}$$

5. Adjustments were made in accordance with manufacturer's recommended practices.

Figure C-4(b)

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-2
(Sensitivity and Deflection)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Deflection Linearity)
Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

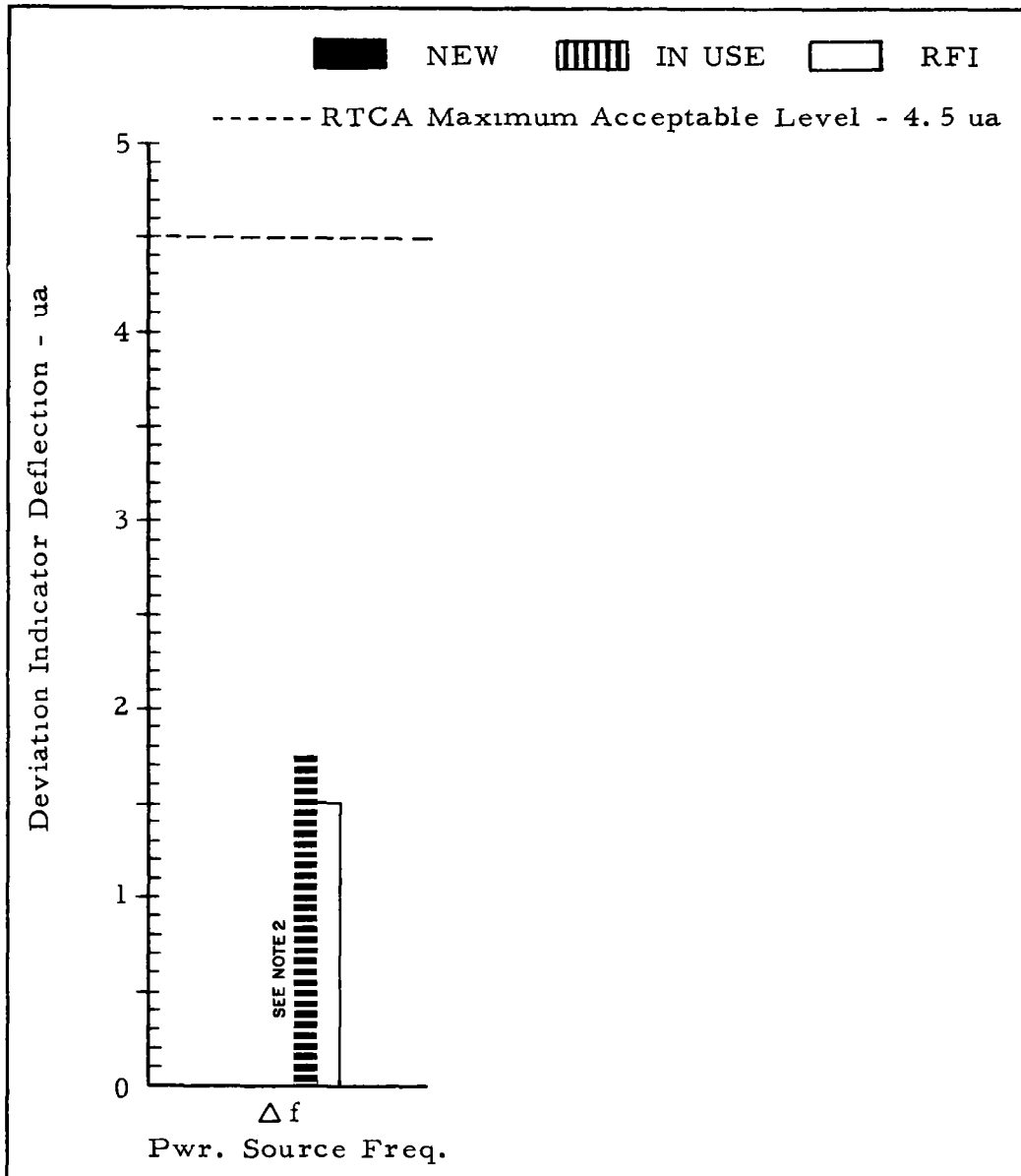
Sensitivity Setting
s_1 - 0.4 of Full Scale Adjustment
s_2 - 0.8 of Full Scale Adjustment
Full Scale Deflection - 150 ua
Standard Deviation

Test	New	In Use	RFI
s_1	.158	.59	.60
s_2	.470	.62	.52

Notes:
1. Each bar represents the arithmetic mean for 3 units except the before & after adjustment bars represent one unit.
2. "In Use" unit before adjustment.
   "In Use" unit after adjustment.
3. Deflection linearity ratio is defined as: the maximum measured error normalized with repect to the RTCA maximum acceptable error.
4. RTCA maximum acceptable level - 1.0.
5. Adjustments were made in accordance with manufacturer's recommended practices.

DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER -GS-2
(Deflection Linearity)

Figure C-4(b)



POWER SOURCE FREQUENCY VARIATION
Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.12

LEGEND

Δf - 320 - 1,000 cps

Standard Deviation

New	In Use	RFI
—	.35	.71

Notes:
1. Each bar represents the arithmetic mean for 2 units.
2. Three "New" units tested had direct current power sources and one each of "In Use" and "RFI" units had direct current power sources.
3. RTCA maximum acceptable level - 4.5 ua.

POWER SOURCE FREQUENCY VARIATION - GLIDE SLOPE RECEIVER - GS-2

Figure C-4(b)

INTERFERENCE TESTS

Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.7	.19 to 1500	332.0	Acceptable level excluding the band 328.77 to 335.53 mc: ≥60 db.	Actual Level: ≥ 60 db. All frequencies within performance standards.	Yes
Cross Modulation RTCA Para: 2.8	329 to 335.3	332.0	Acceptable level excluding the band within F_c ±300 kc ≤9 microamps.	Actual Level: 0 microamps. All frequencies within performance standards.	Yes
Cable Conducted Interference RTCA Para: 2.10a	.15 to 25	332.0	Acceptable Emission: ≤200 microvolts.	Actual Emission on+28 v line: <200 microvolts except at 12.8 mc. All other frequencies within performance standards.	Partially
Antenna Conducted Interference RTCA Para: 2.10b	.19 to 1500	332.0	Acceptable Emission: ≤ 400 micro-microwatts.	Actual Emission: <400 micro-microwatts except at: 26, 310, and 1032 mc. All other frequencies within performance standards.	Partially

INTERFERENCE TESTS - GLIDE SLOPE RECEIVER - GS-2

(continued on Page C-331)

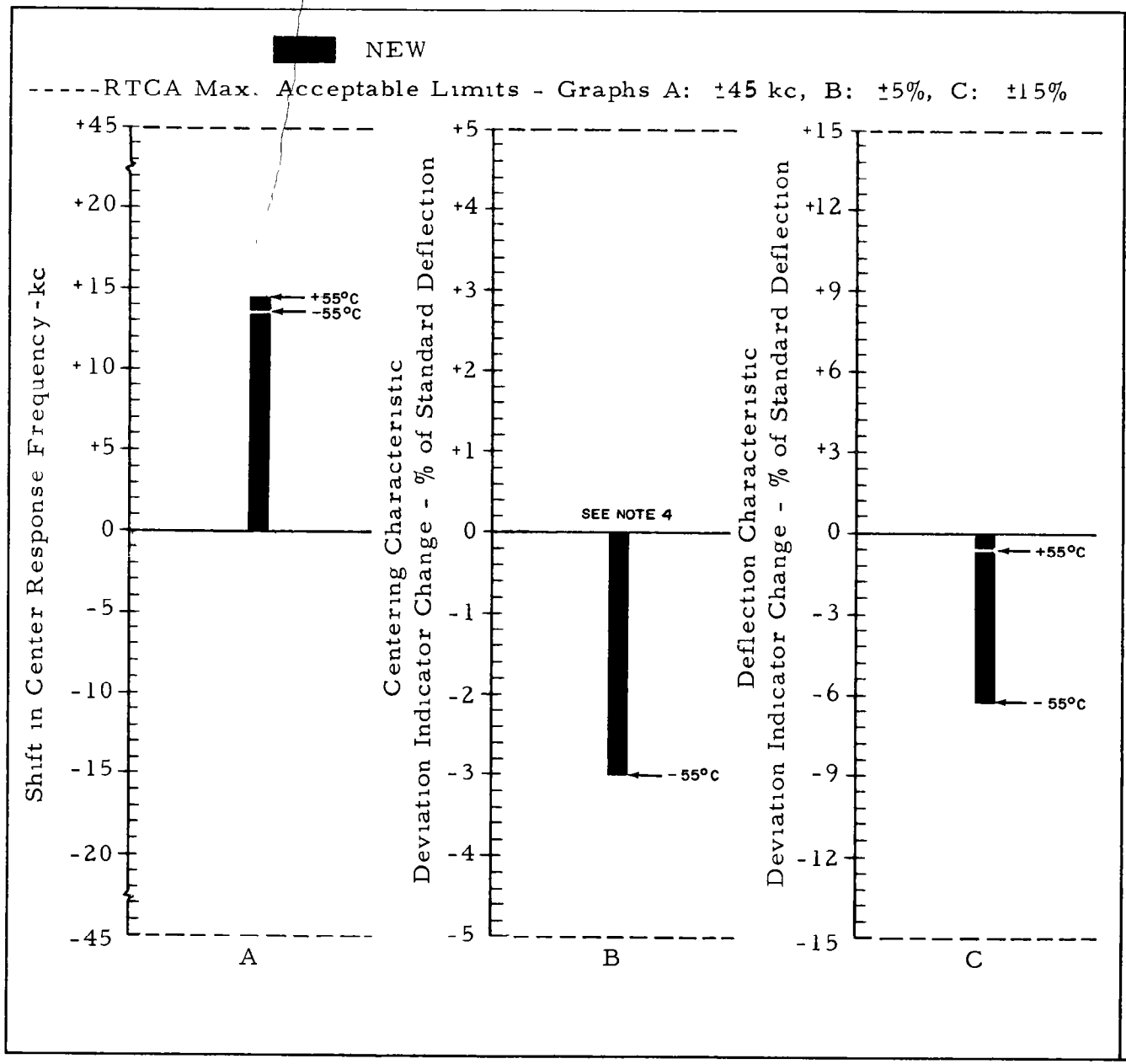
Figure C-4(b)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.15	329.3 to 335.0	Varied over Glide Slope band	Acceptable Operation: Deviation indication shall not exceed 5% of standard deflection.	Actual Operation: No change in deviation indication.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	332.0	None	(Not Applicable)

INTERFERENCE TESTS - GLIDE SLOPE RECEIVER - GS-2

Figure C-4(b)



TEMPERATURE VARIATION TEST
Glide Slope Receiver: GS-2
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 3.3(a)(b)(c)

Notes:

1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits:
   Graph A: ±45 kc
   Graph B: ± 5%
   Graph C: ±15%
3. This unit is designed to operate above 15,000 feet.
4. +55°C standard deflection - 0. %

Figure C-4(b)

TEMPERATURE VARIATION TEST - GLIDE SLOPE RECEIVER - GS-2

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

(Task 2)

Sub-Section

5. Laboratory and Field Test Data

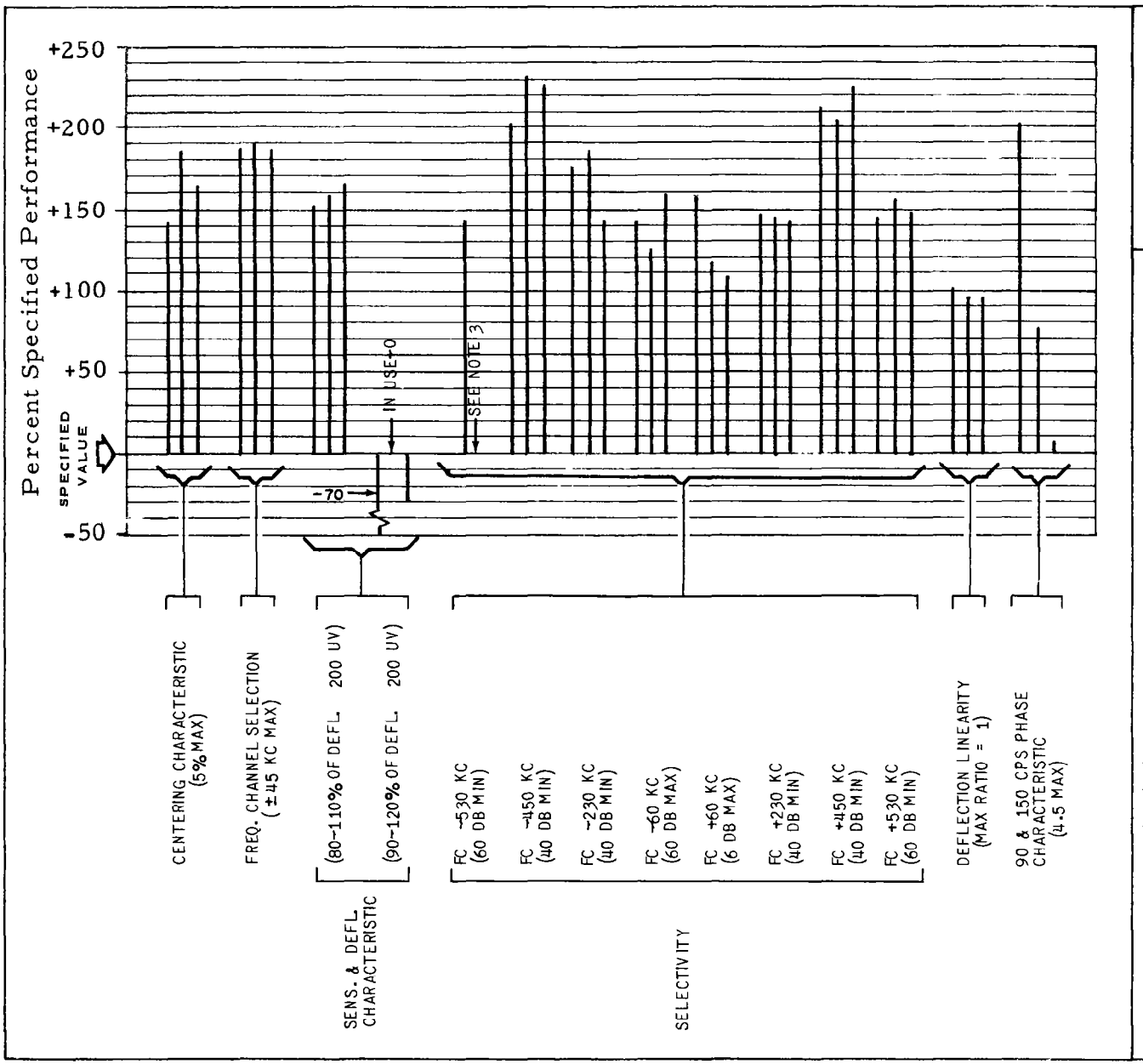
c. GS-3, Glide Slope Receiver

General:

Frequency Range:	329.3 - 335.0 mc
Means of Frequency Control:	Crystal
Total Number of Channels:	20
Number of Channels Available at Operator's Position:	20
Means of Frequency Selection:	Rotary Switch

Technical:

	Page(s)
Percent Specified Performance	C-334 - 335
Weighted Performance	C-336
Centering Characteristic	C-337
Frequency Channel Selection	C-338
Sensitivity and Deflection Characteristic	C-339
Selectivity	C-340
Deflection Linearity	C-341
90 & 150 cps Phase Characteristic	C-342
Alarm Signal	C-343
Indicator Stability	C-344
Deviation Indicator Stability with change in Frequency of 90 & 150 cps Signal	C-345
Deviation Indicator Sensitivity Adjustment Range	C-346
Deviation Indicator Sensitivity Adjustment Range - Centering Characteristic	C-347
Deviation Indicator Sensitivity Adjustment Range - Sensitivity & Deflection Characteristic	C-348
Deviation Indicator Sensitivity Adjustment Range - Deflection Linearity	C-349
Power Source Frequency Variation	C-350
Interference Tests	C-351 - 352
Temperature Variation Test	C-353

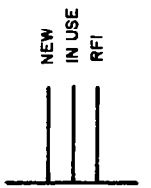


PERCENT
SPECIFIED PERFORMANCE

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Notes:

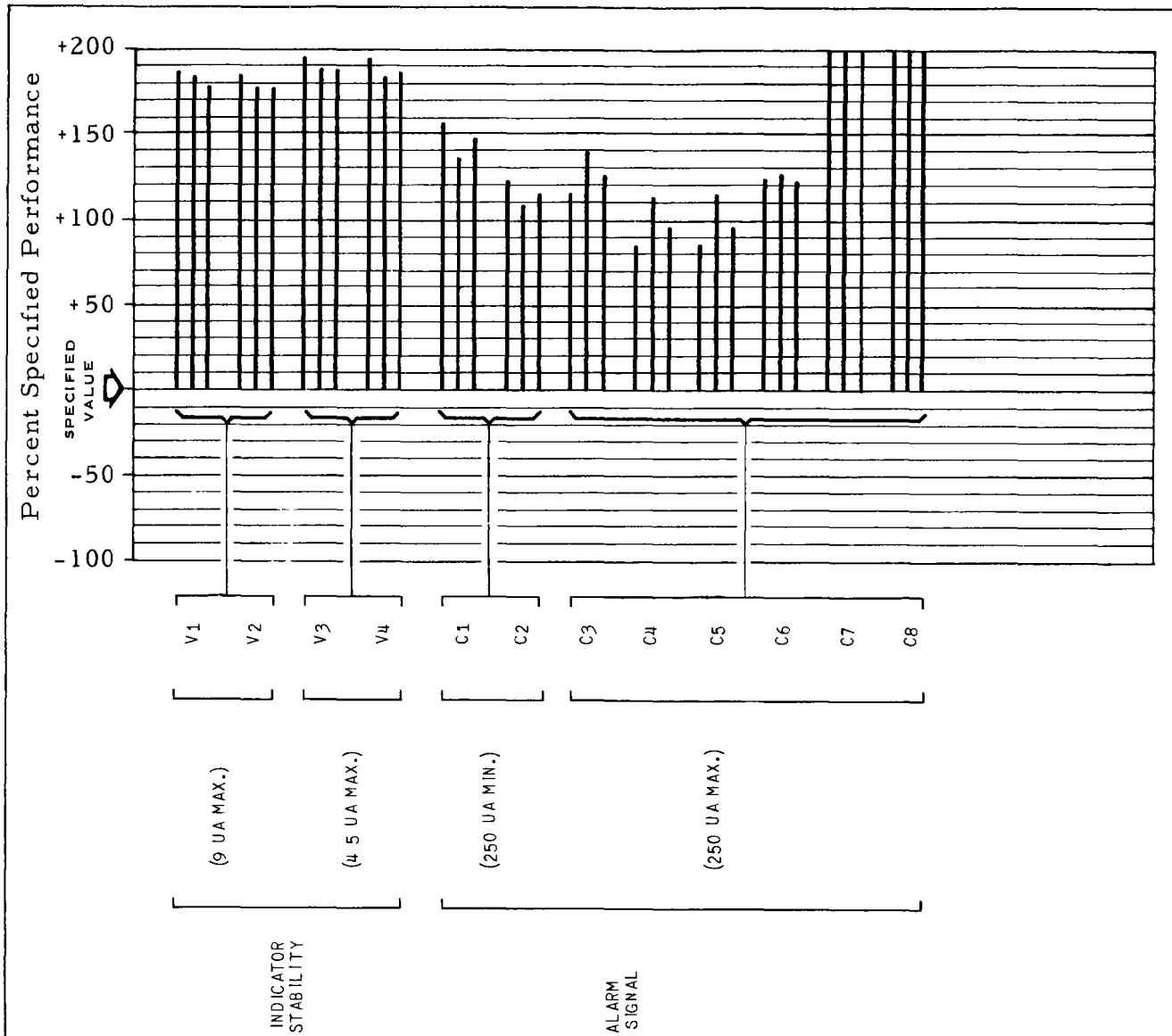
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



3. F_c low; No data.
4. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-3

(continued on Page C-335)



PERCENT
SPECIFIED PERFORMANCE

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.

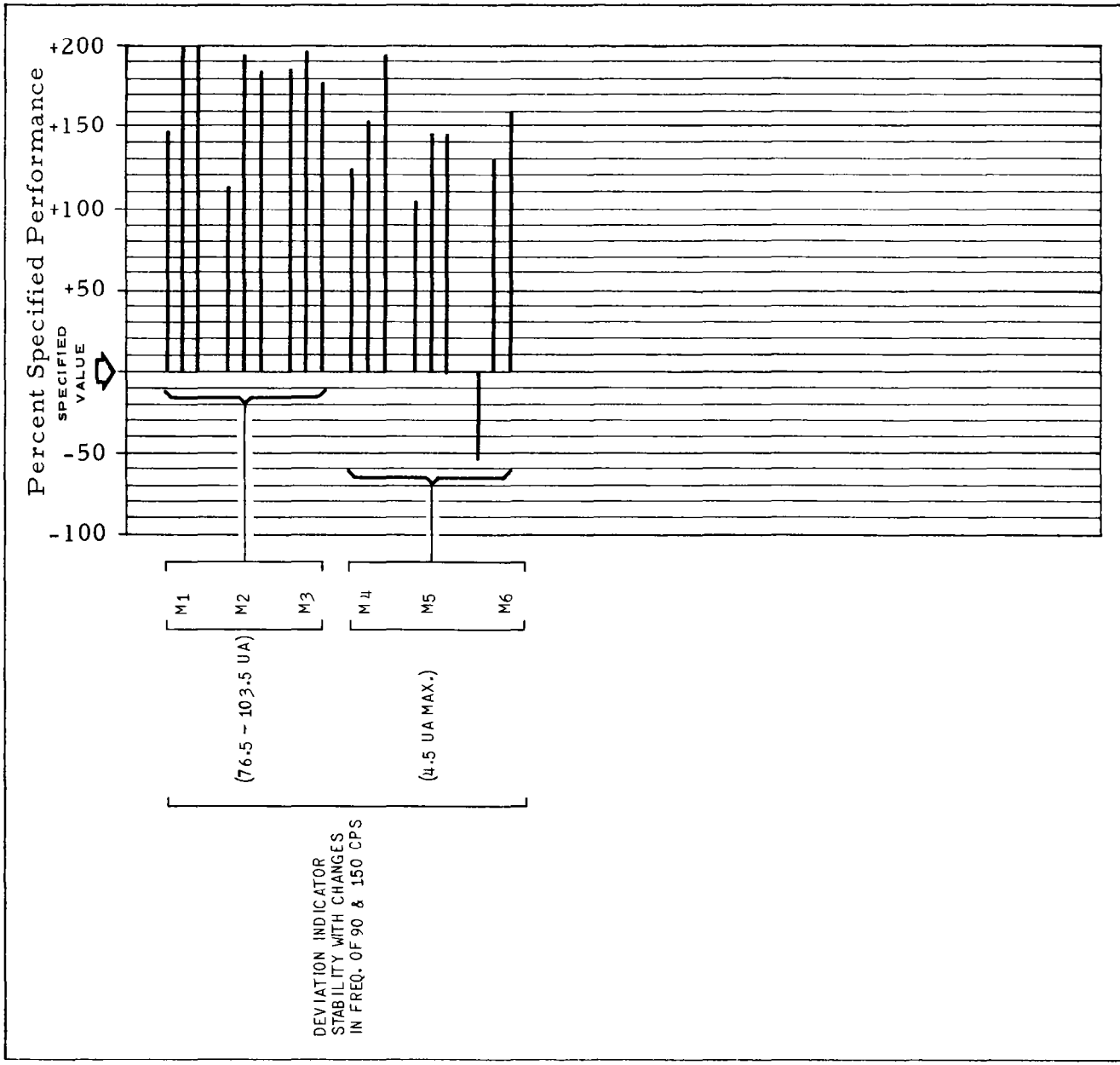


3. F_C low; No data.
4. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-3

(continued on Page C-335a)

Figure C-4(c)



PERCENT
SPECIFIED PERFORMANCE

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Notes:

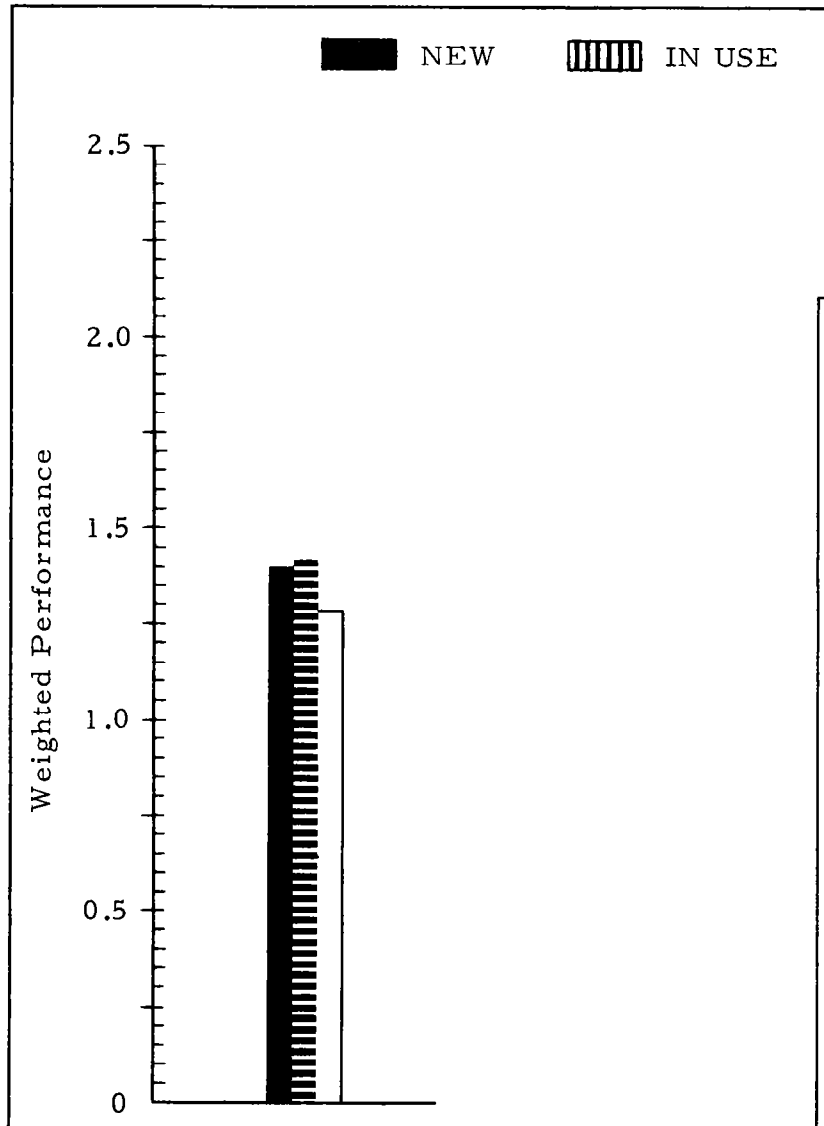
1. Each bar represents the arithmetic mean for 3 units.
2. Equipment status represented by bars.



3. F_c low; No data.
4. Negative percentage values represent the amount by which the adverse maximum (100%) was exceeded.

PERCENT SPECIFIED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-3

Figure C-4(c)



WEIGHTED PERFORMANCE

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2

Alarm Signal
c_1, c_2, c_3, c_4, c_5, c_6, c_7, c_8 1/80 ea.
Deviation Indicator Stability:
m_1, m_2, m_3, m_4, m_5, m_6 1/120 ea.

Note:
1. Graph based on arithmetic mean for above characteristics.

WEIGHTING FACTORS

Centering Characteristic: 3/20
Frequency Channel Selection: 3/20
Sensitivity & Deflection:
$\Delta v_1, \Delta v_2$ 3/40 ea.
Selectivity:

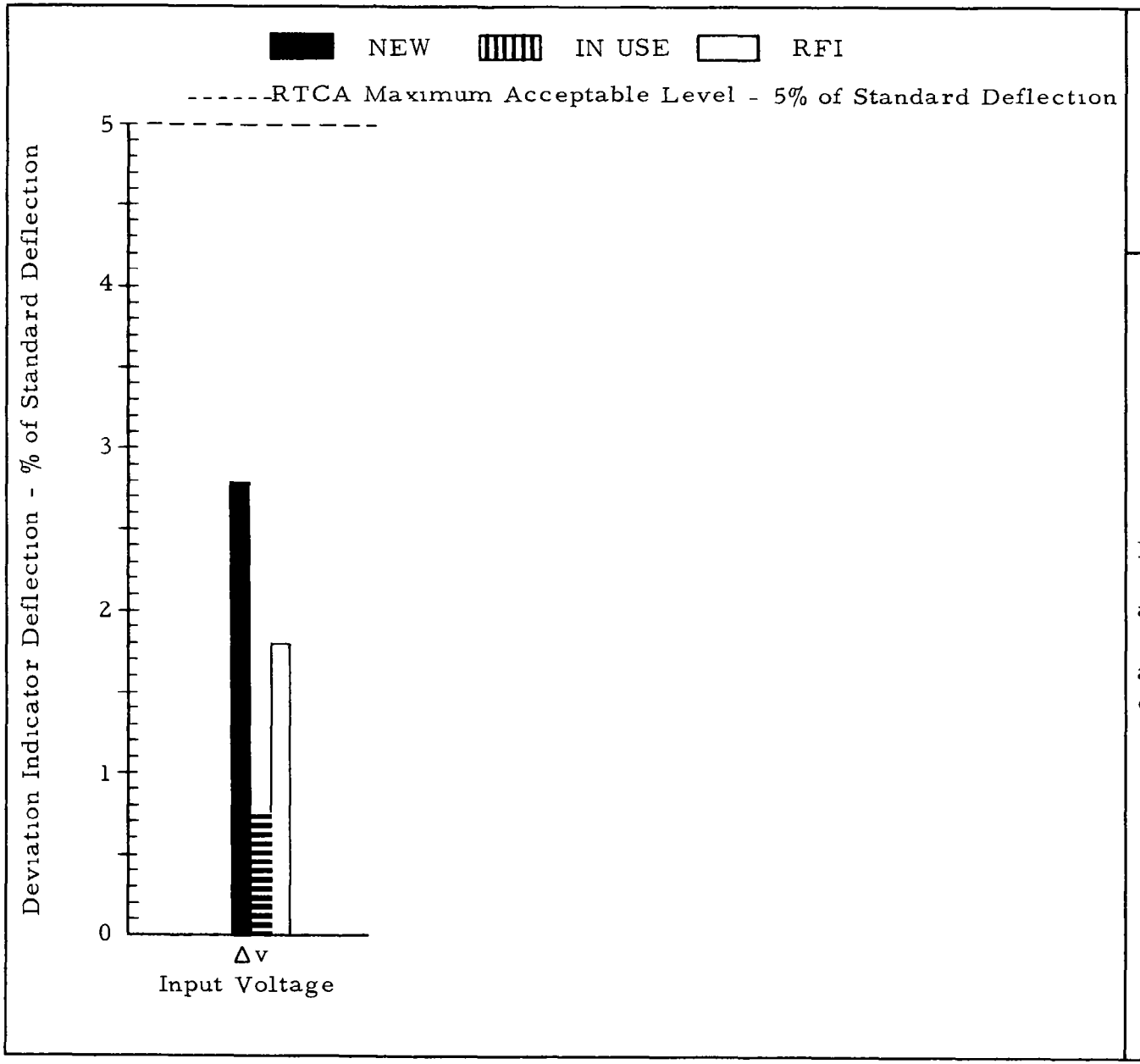
f_c low	-503 kc	3/160
f_c	-450 kc	3/160
f_c	-230 kc	3/160
f_c	- 60 kc	3/160
f_c	+ 60 kc	3/160
f_c	+ 230 kc	3/160
f_c	+ 450 kc	3/160
f_c high	+ 530 kc	3/160

Deflection Linearity: 1/10
90 & 150 cps Phase Characteristic: 1/10
Indicator Stability:
v_1, v_2, v_3, v_4 1/80 ea.

←continued next column

Figure C-4(c)

WEIGHTED PERFORMANCE - GLIDE SLOPE RECEIVER - GS-3



CENTERING CHARACTERISTIC

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58
Para 2.3

LEGEND

Δv - 100 - 30,000 uv
Standard Deflection - 90 ua

Standard Deviation

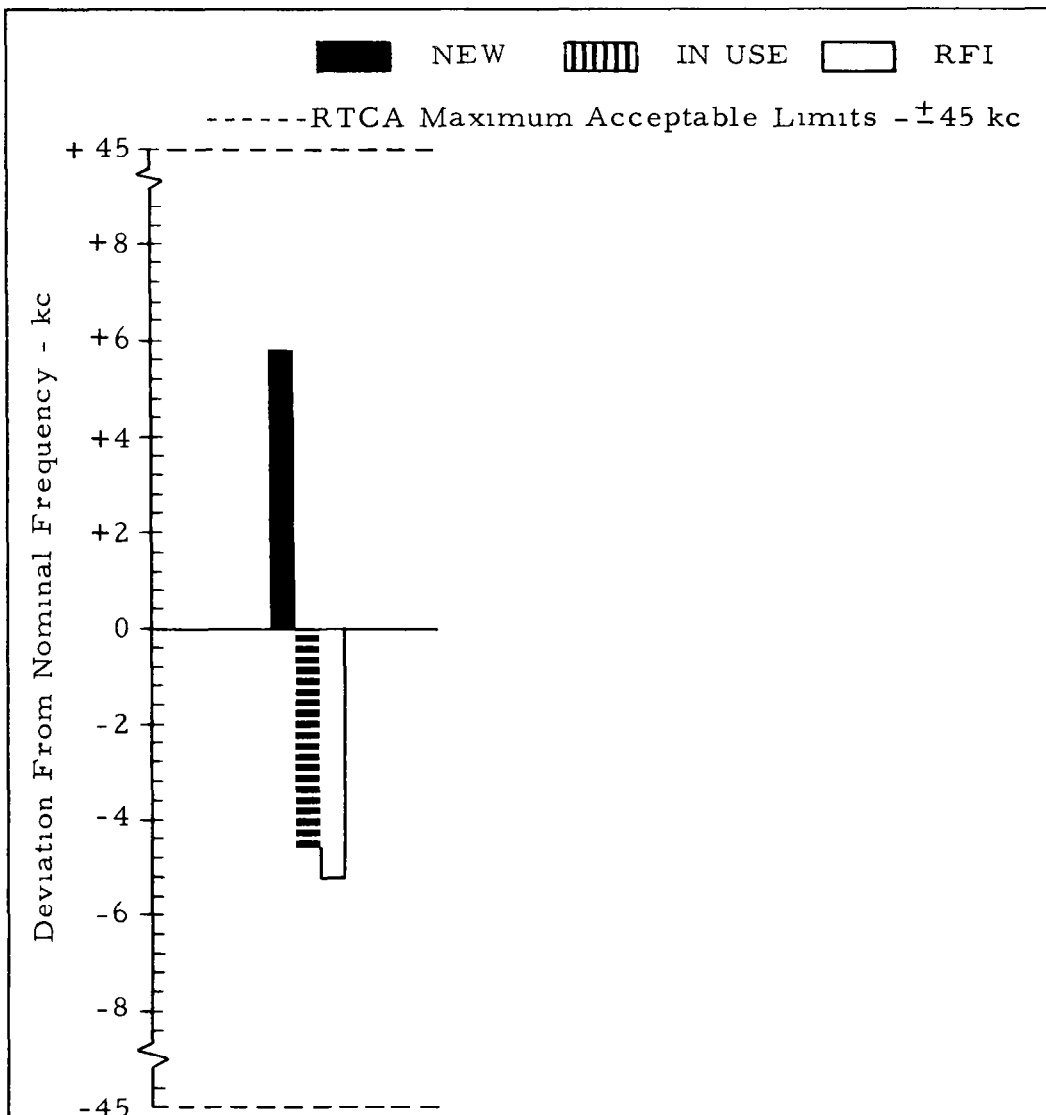
New	In Use	RFI
2.1	0.63	0.63

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 5% of standard deflection.

Figure C-4(c)

CENTERING CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-3



FREQUENCY CHANNEL SELECTION
Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.18

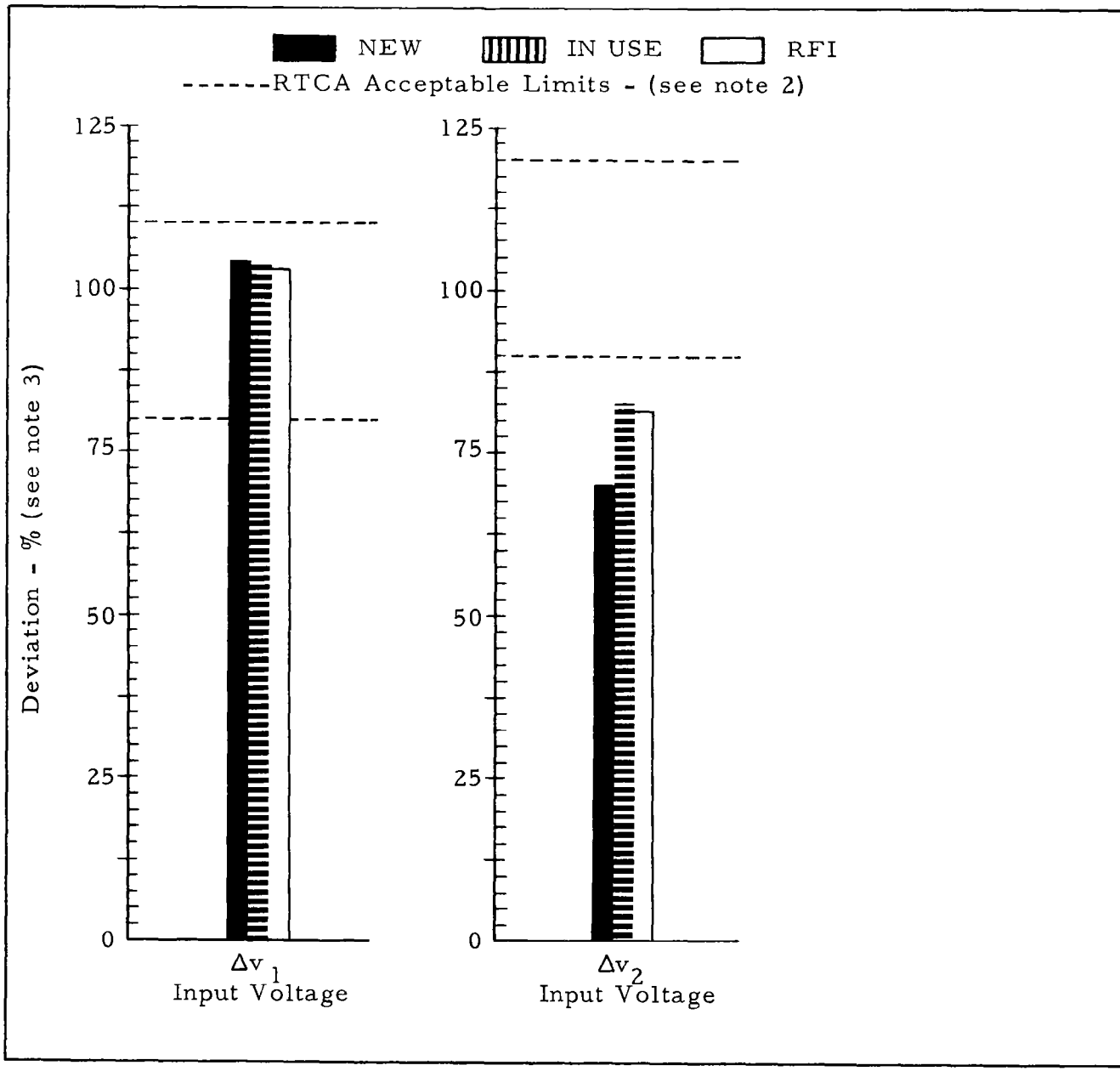
Standard Deviation

New	In Use	RFI
24.8	12.2	8.4

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable limits = ±45 kc.

Figure C-4(c)

FREQUENCY CHANNEL SELECTION - GLIDE SLOPE RECEIVER - GS-3



SENSITIVITY & DEFLECTION CHARACTERISTIC

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.4

LEGEND

Δv_1 - input between 40 and 200 uv which produced maximum indicator variation.

Δv_2 - input between 200 and 30,000 uv which produced maximum indicator variation.

Standard Deviation

Test	New	In Use	RFI
Δv_1	7.1	2.4	1.1
Δv_2	0	3.6	9.9

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA acceptable limits:

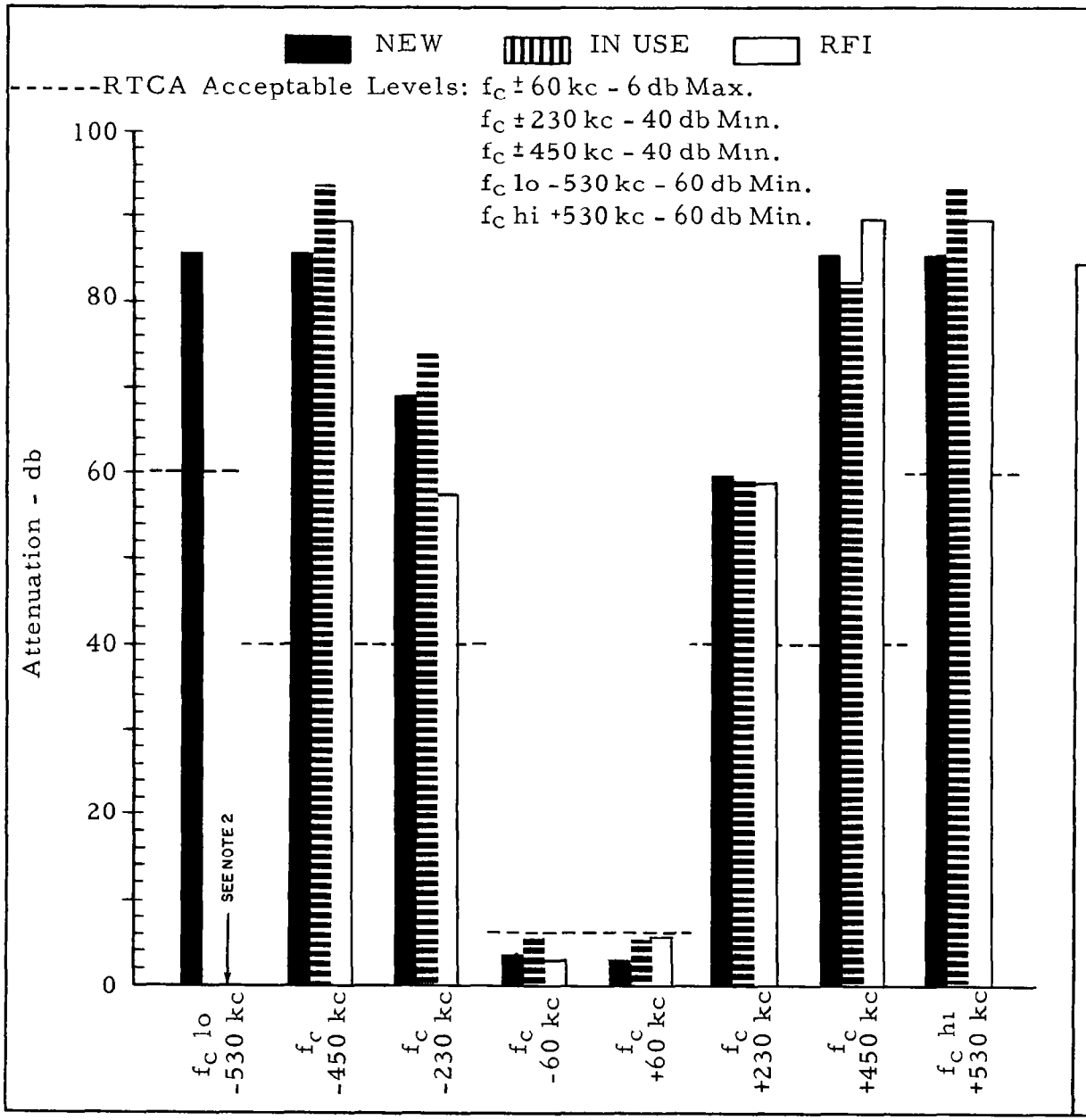
Δv_1 - 100% $\begin{bmatrix} +10\% \\ -20\% \end{bmatrix}$

Δv_2 - 100% $\begin{bmatrix} +20\% \\ -10\% \end{bmatrix}$

3. Percentage of deflection obtained with 200 uv input.

SENSITIVITY & DEFLECTION CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-3

Figure C-4(c)



SELECTIVITY

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task - 2
RTCA Paper 88-54/DO-58,
Para 2.6

LEGEND

f_c - 332.0 mc
f_c low - 329.3 mc
f_c high - 335.0 mc

Standard Deviation

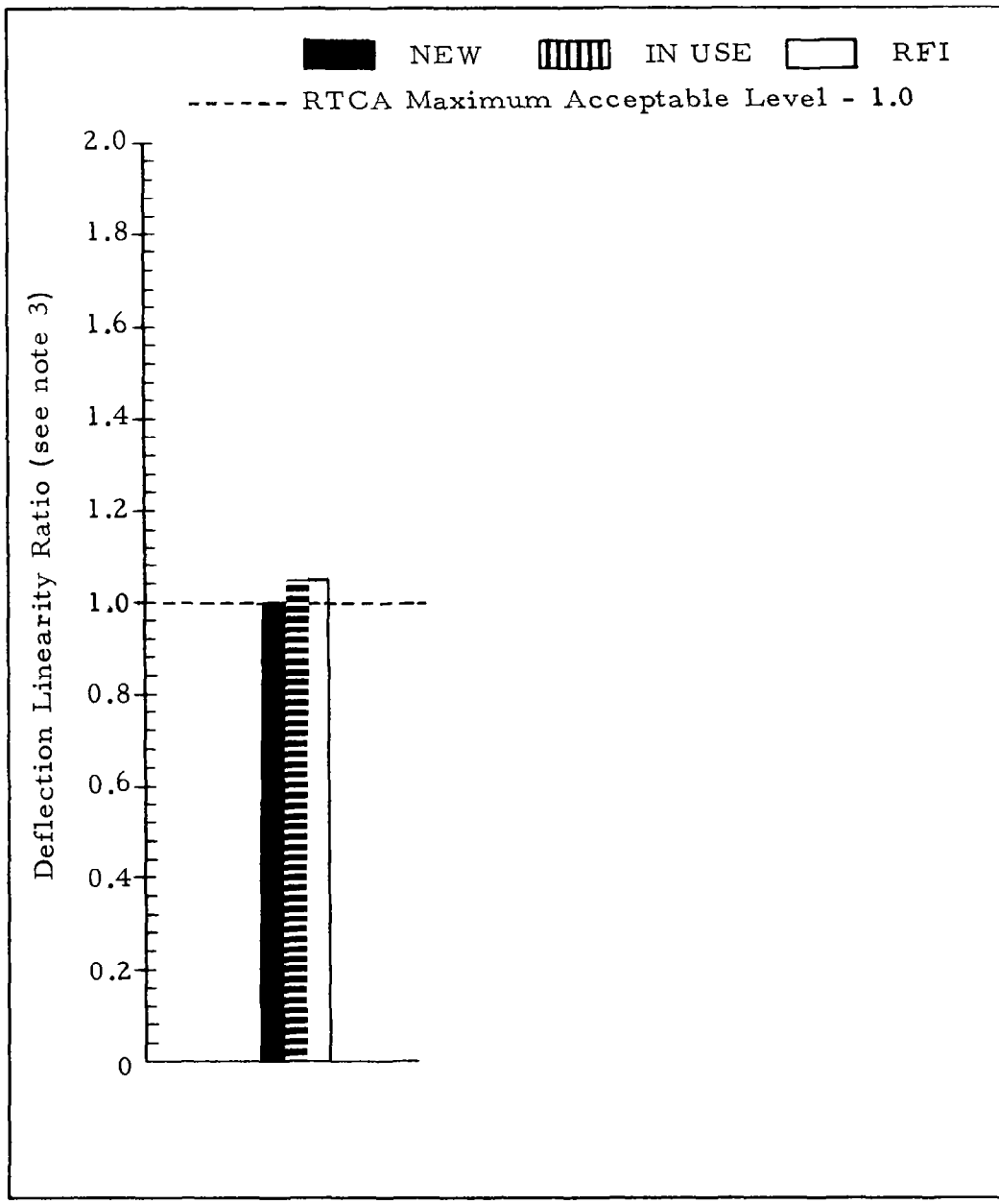
Test	New	In Use	RFI
f_c -530	2.90	—	—
f_c -450	2.90	1.8	2.0
f_c -230	1.20	16.5	9.0
f_c -60	3.34	1.5	1.2
f_c +60	1.60	2.9	1.5
f_c +230	9.20	3.5	1.2
f_c +450	3.00	18.0	2.0
f_c +530	2.70	1.7	2.0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. No data for "In Use" and "RFI" units - crystals not available at field facilities.

Figure C-4(c)

SELECTIVITY - GLIDE SLOPE RECEIVER - GS-3



DEFLECTION LINEARITY

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.5

Standard Deviation

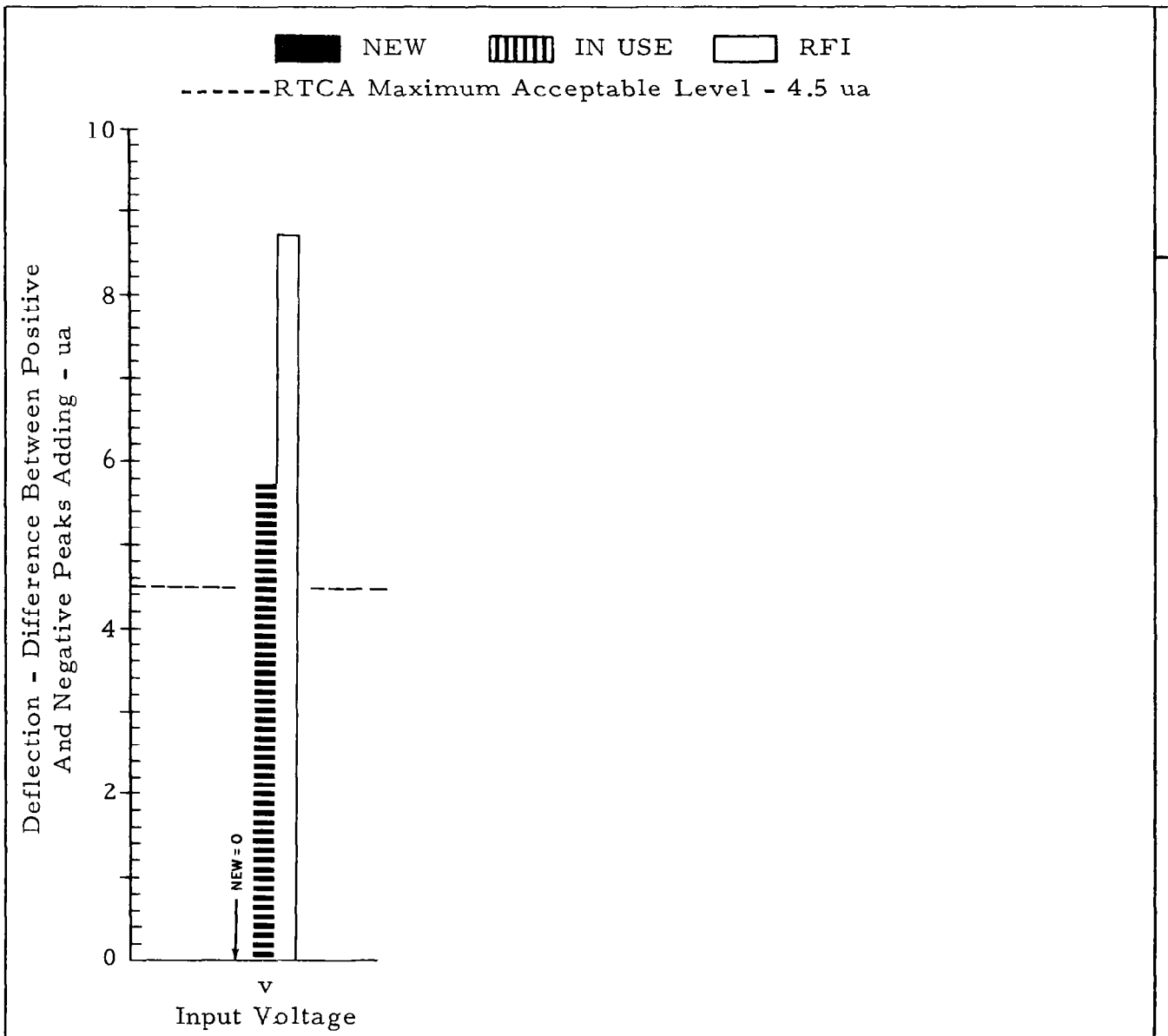
New	In Use	RFI
.76	1.0	.1

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 1.0.
3. Deflection linearity ratio is defined as: the maximum measured error normalized with respect to the RTCA maximum acceptable error.

DEFLECTION LINEARITY - GLIDE SLOPE RECEIVER - GS-3

Figure C-4(c)



90 AND 150 cps PHASE CHARACTERISTIC

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.17

LEGEND

v - 1000 uv

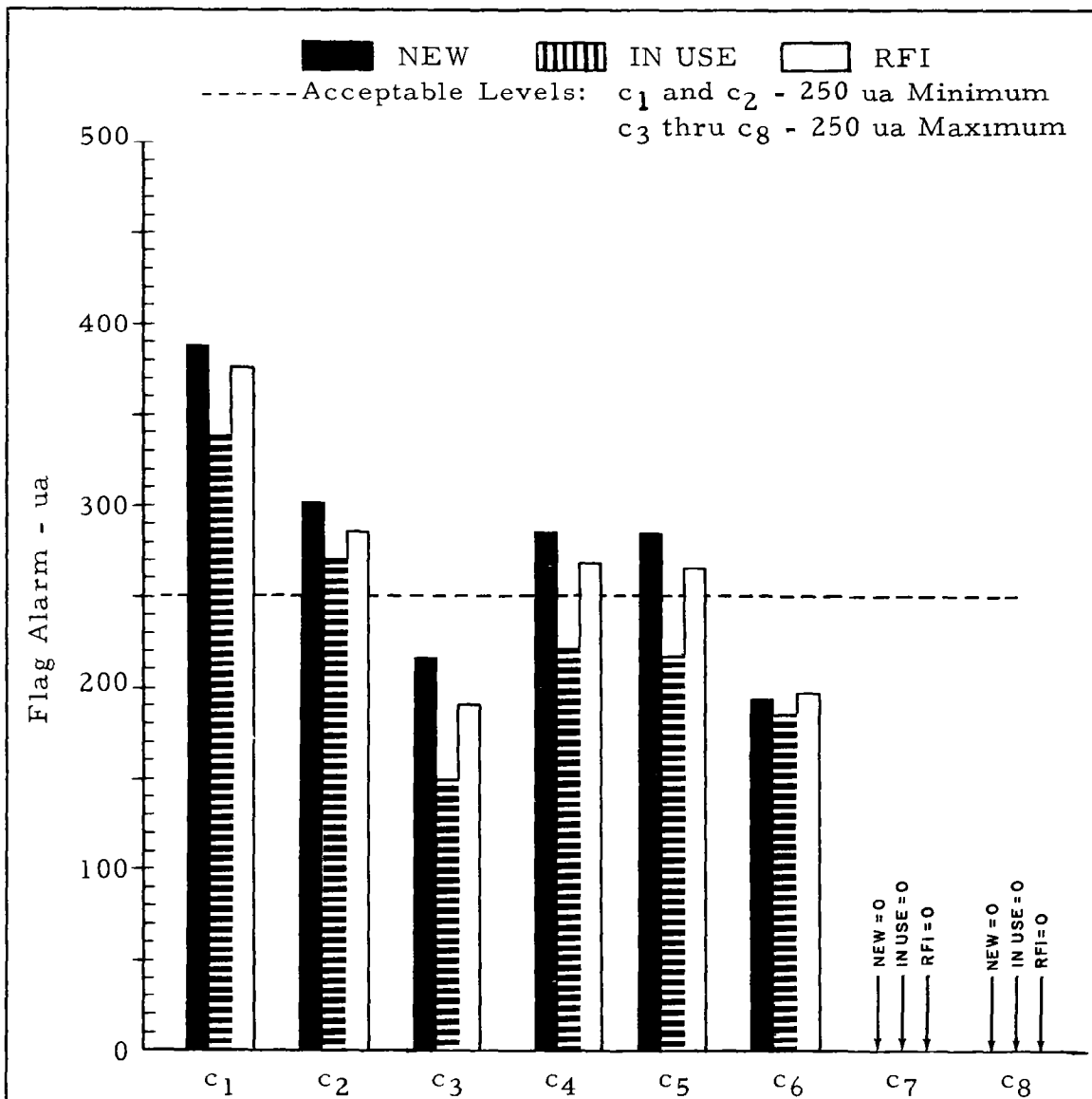
Standard Deviation

New	In Use	RFI
0	2.03	1.52

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 4.5 ua.

90 AND 150 cps PHASE CHARACTERISTIC - GLIDE SLOPE RECEIVER - GS-3

Figure C-4(c)



ALARM SIGNAL

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.9

LEGEND

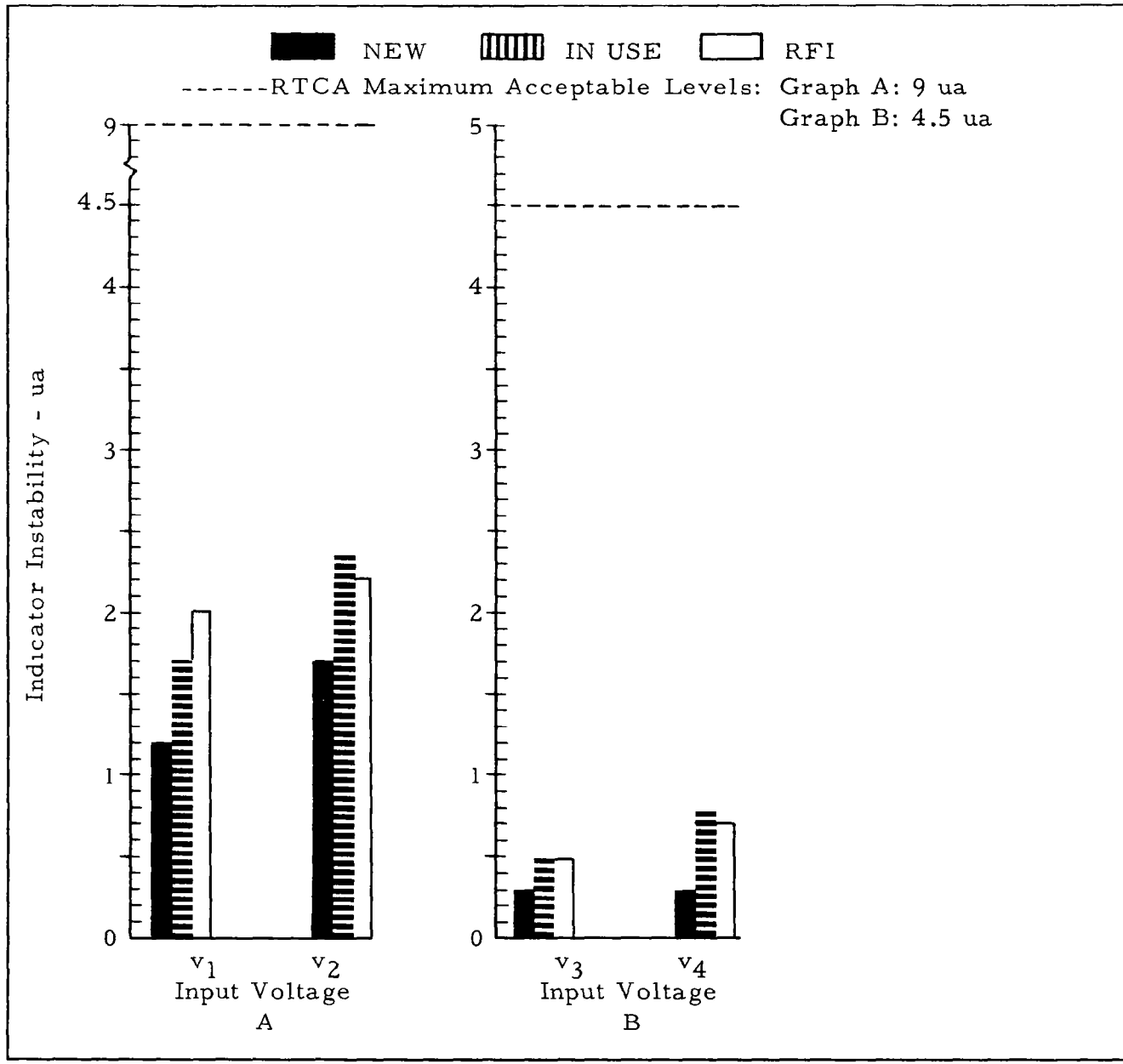
c_1 - std. test sig. @ 40 uv
c_2 - std. test sig. @ min. alarm current
c_3 - std. dev. sig. @ 50% deflection
c_4 - mod. 0% - 150 cps & 45% - 90 cps
c_5 - mod. 0% - 90 cps & 45% - 150 cps
c_6 - mod. 22.5% of 90 & 150 cps
c_7 - absence of R. F.
c_8 - absence of modulation

Test	Standard Deviation New	In Use	RFI
c_1	23.7	21.6	47.5
c_2	12.1	10.7	11.3
c_3	5.0	50.9	25.6
c_4	26.5	12.6	18.9
c_5	22.8	18.9	26.1
c_6	11.5	20.3	22.6
c_7	0	0	0
c_8	0	0	0

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. Acceptable levels were determined by using RTCA paper as a guide.

ALARM SIGNAL - GLIDE SLOPE RECEIVER - GS-3



INDICATOR STABILITY

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 2.16

LEGEND

v_1 - 40 uv centering signal
v_2 - 40 uv deviation signal
v_3 - 200 uv centering signal
v_4 - 200 uv deviation signal

Standard Deviation

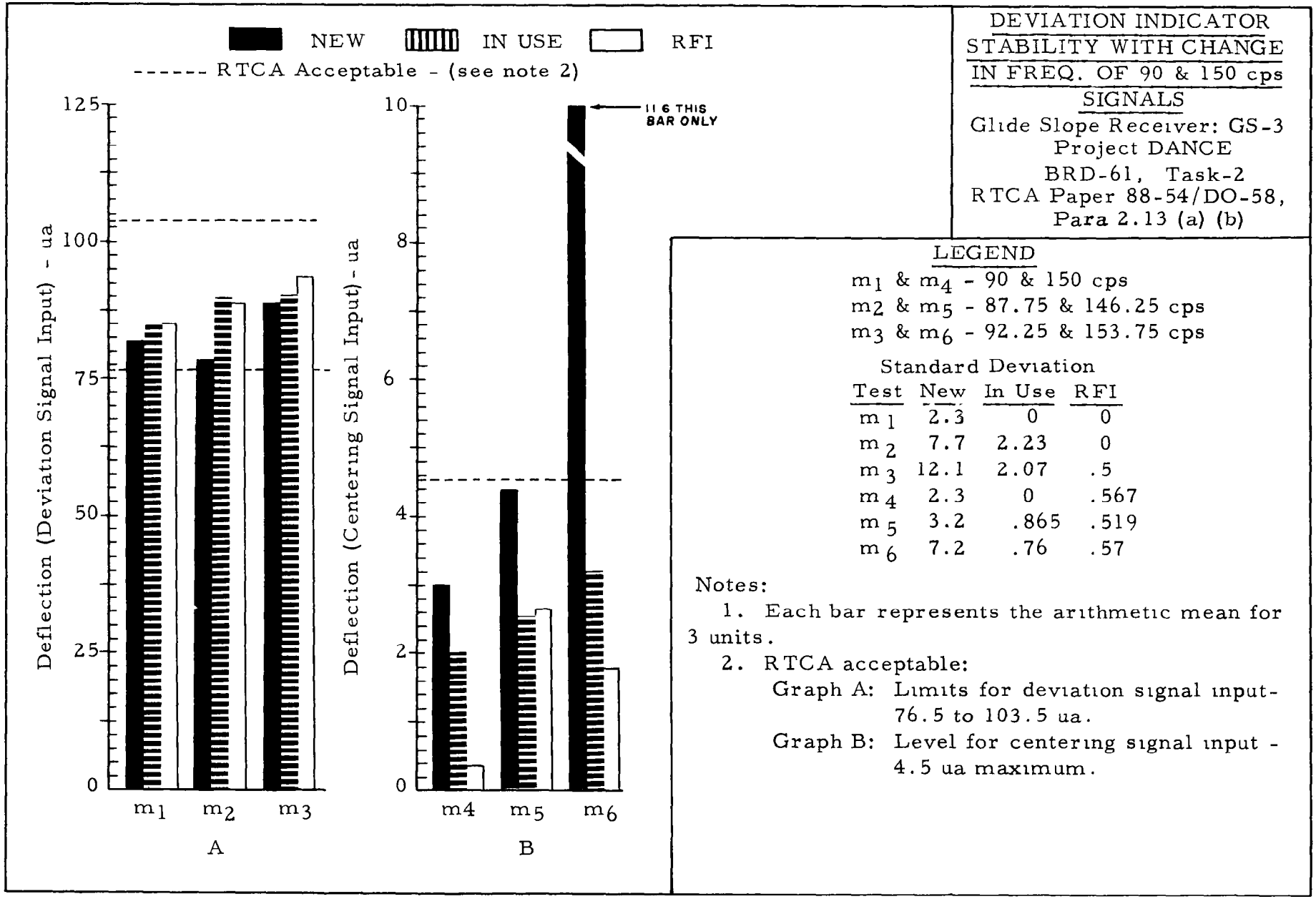
Test	New	In Use	RFI
v_1	.76	.56	0
v_2	.56	.56	1.20
v_3	.80	0	0
v_4	.80	.30	0.26

Notes:

1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable levels:
Graph A: v_1 and v_2 - 9 ua
Graph B: v_3 and v_4 - 4.5 ua.

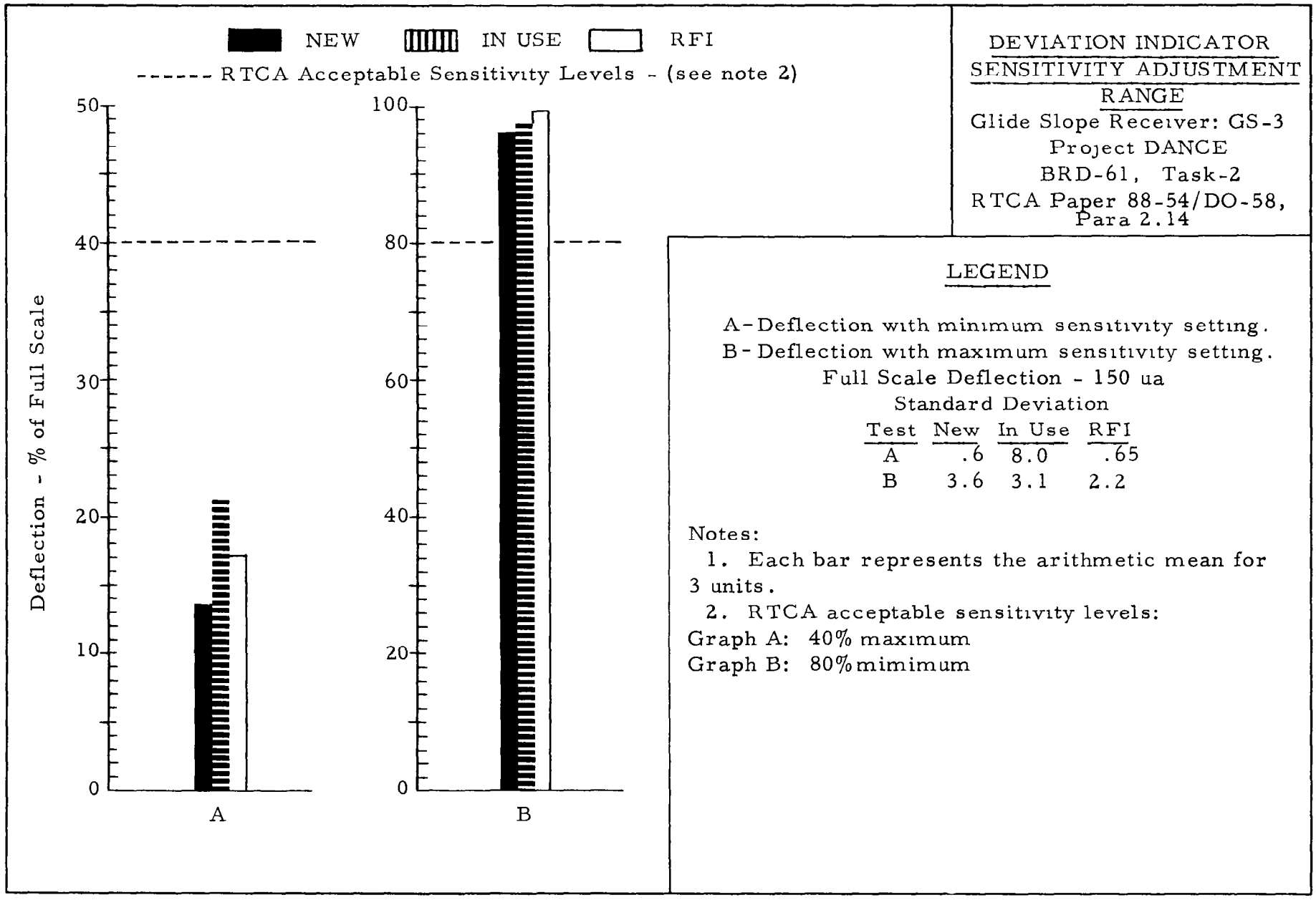
Figure C-4(c)

INDICATOR STABILITY - GLIDE SLOPE RECEIVER - GS-3



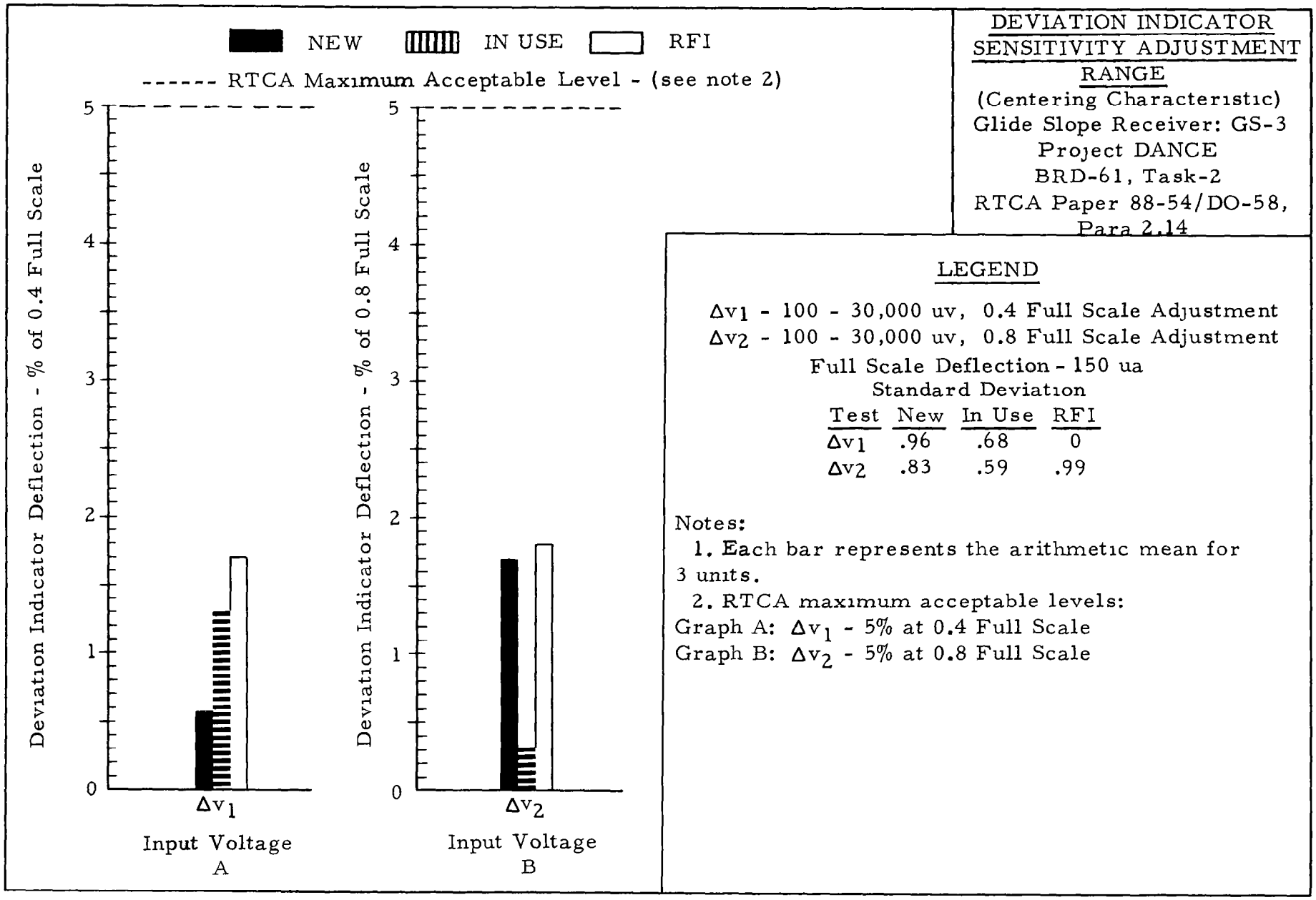
DEVIATION INDICATOR STABILITY WITH CHANGE IN FREQUENCY OF 90 & 150 cps SIGNAL
GLIDE SLOPE RECEIVER - GS-3

Figure C-4(c)



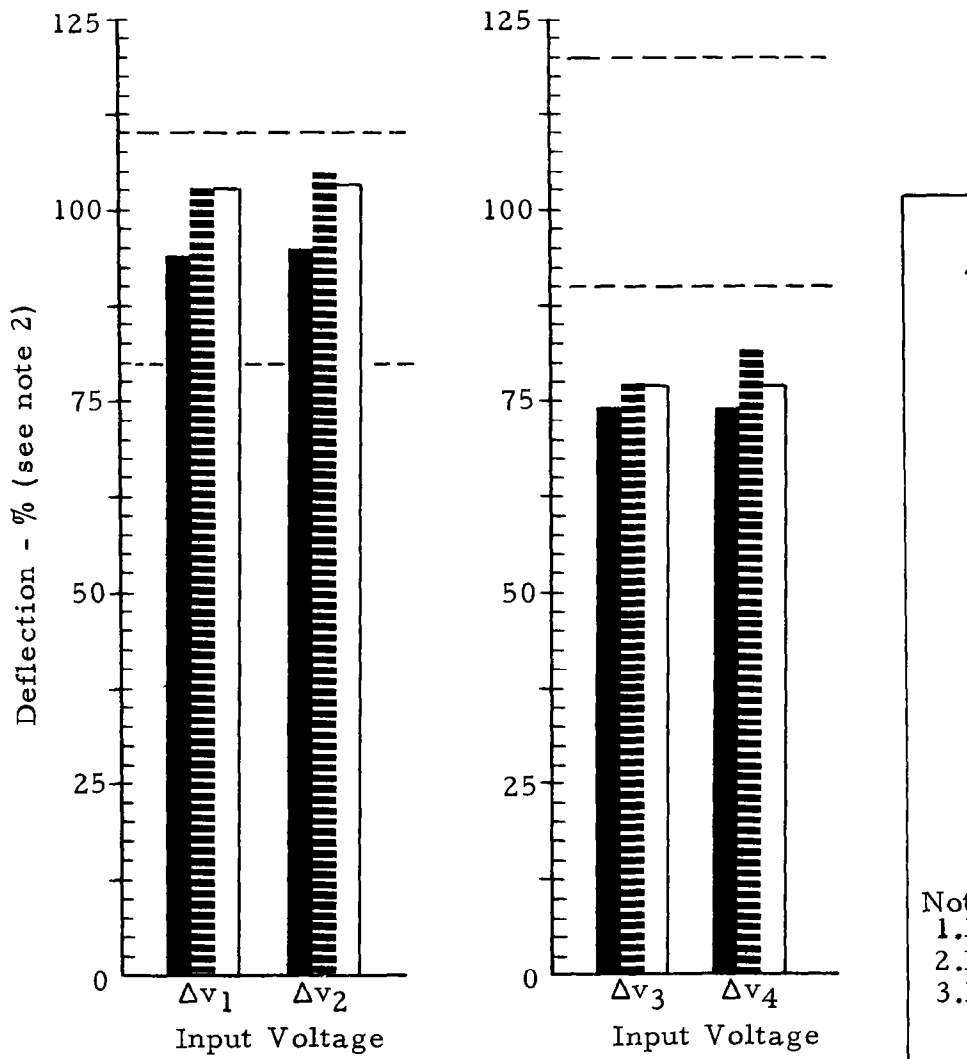
DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-3

Figure C-4(c)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-3
(Centering Characteristic)

Figure C-4(c)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE
(Sensitivity and Deflection)
Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.14

LEGEND

Δv_1 - Input between 40 - 200 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_2 - Input between 40 - 200 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

Δv_3 - Input between 200 - 30,000 uv which produced maximum indicator variation, sensitivity at 0.4 Full Scale.

Δv_4 - Input between 200 - 30,000 uv which produced maximum indicator variation, sensitivity at 0.8 Full Scale.

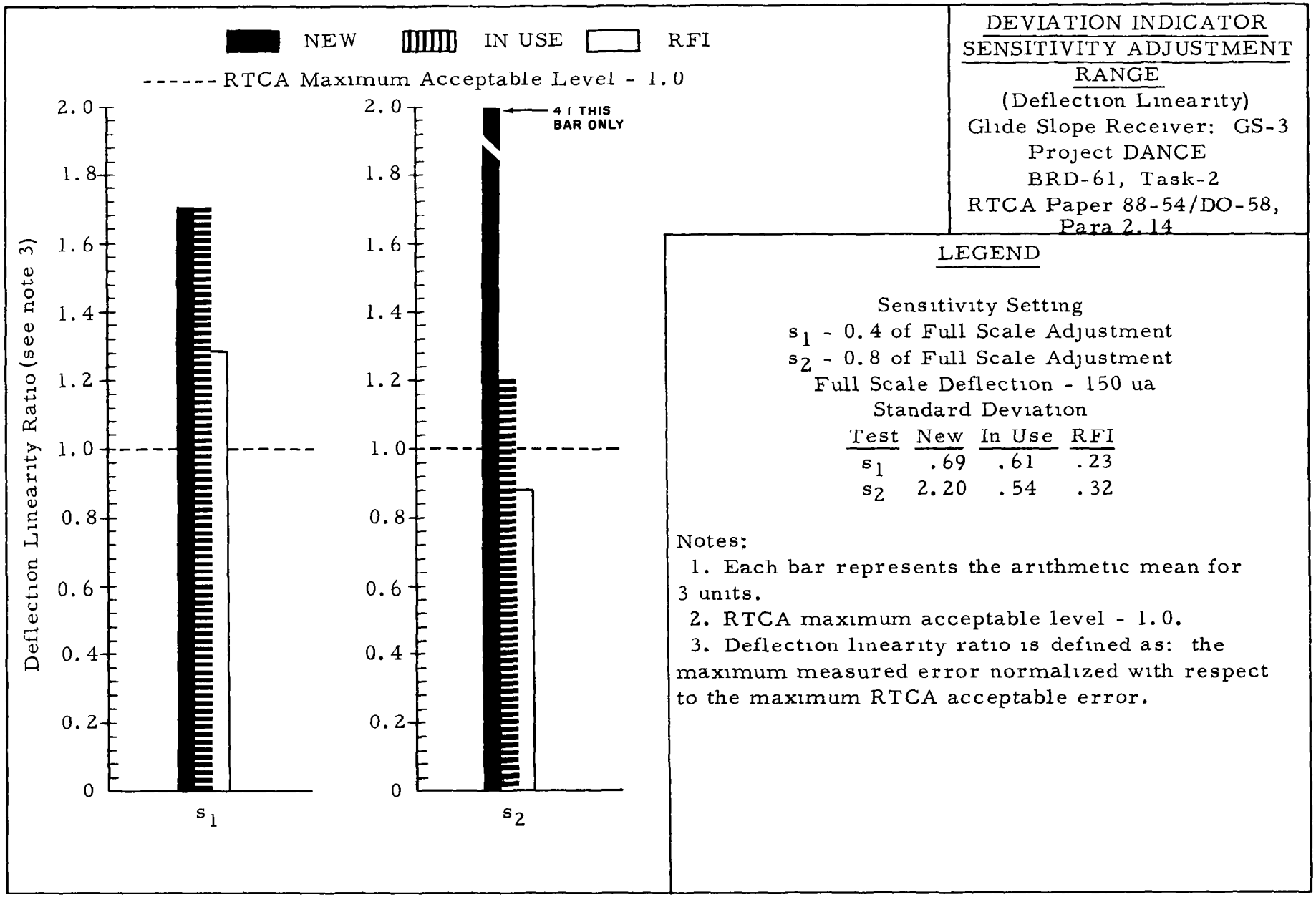
Standard Deviation

Test	New	In Use	RFI
Δv_1	5.1	0	1.7
Δv_2	2.9	2.0	1.9
Δv_3	3.9	10.6	10.8
Δv_4	4.2	4.0	10.7

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. Percentage of deflection obtained with 200 uv input.
3. RTCA acceptable limits:
   Δv_1 & Δv_2 - 100% [+10% / -20%]
   Δv_3 & Δv_4 - 100% [+20% / -10%]

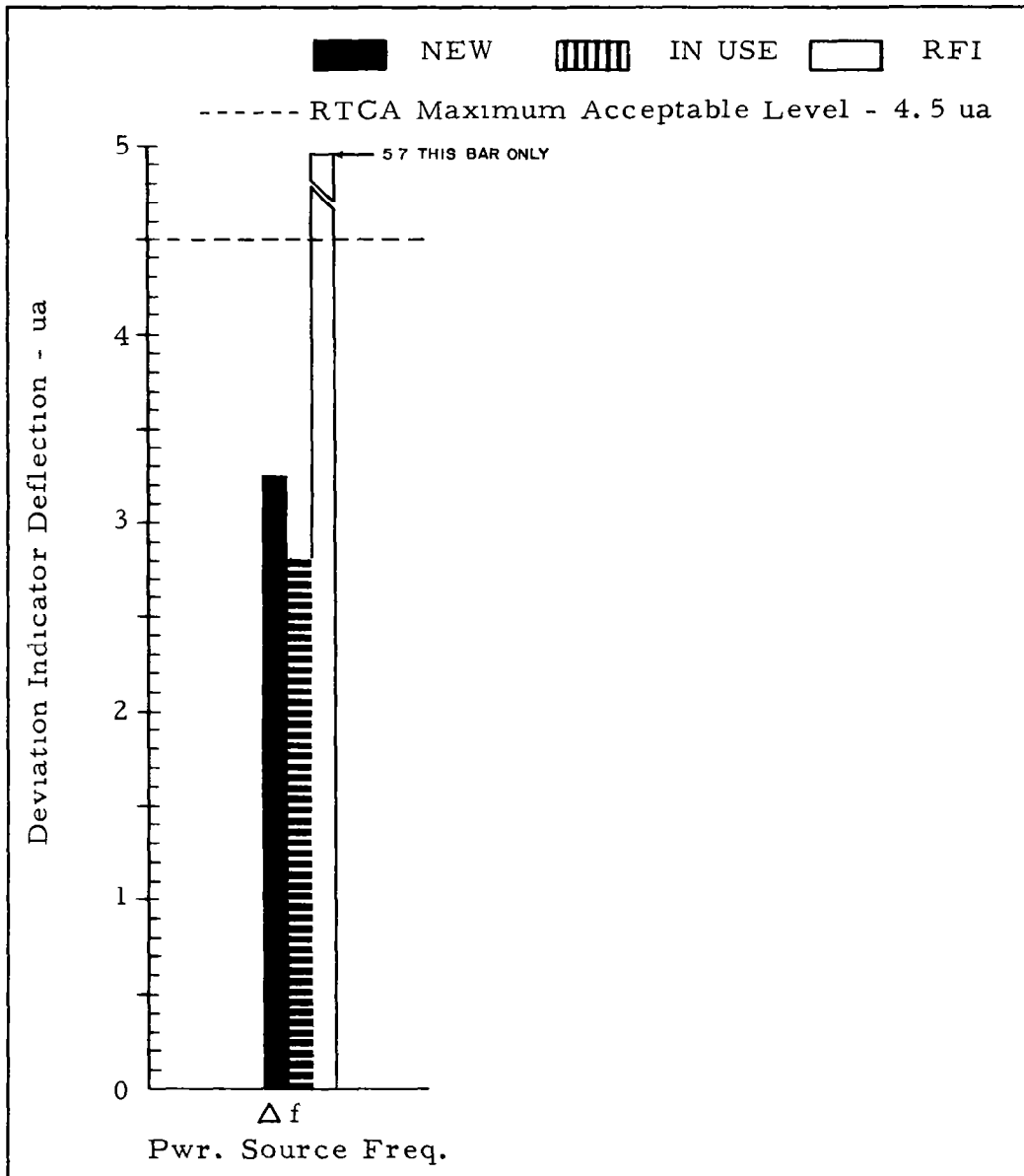
DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE RECEIVER - GS-3
(Sensitivity & Deflection)

Figure C-4(c)



DEVIATION INDICATOR SENSITIVITY ADJUSTMENT RANGE - GLIDE SLOPE - GS-3
(Deflection Linearity)

Figure C-4(c)



POWER SOURCE FREQUENCY VARIATION
Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58, Para 2.12

LEGEND

Δf - 320 - 1,000 cps

Standard Deviation

New	In Use	RFI
5.2	1.4	2.3

Notes:
1. Each bar represents the arithmetic mean for 3 units.
2. RTCA maximum acceptable level - 4.5 ua.

Figure C-4(c)

POWER SOURCE FREQUENCY VARIATION - GLIDE SLOPE RECEIVER - GS-3

INTERFERENCE TESTS

Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Spurious Response RTCA Para: 2.7	0.19 to 1500	332.0	Acceptable level excluding the band 328.77 to 335.53 mc: ≥60 db.	Actual Level: ≥60 db. All frequencies within performance standards.	Yes
Cross Modulation RTCA Para: 2.8	329 to 335.3	332.0	Acceptable level excluding the band within $F_c \pm 300$ kc: ≤ 9 microamps.	Actual Level: 0 microamps. All frequencies within performance standards.	Yes
Cable Conducted Interference RTCA Para: 2.10a	0.15 to 25	332.0	Acceptable Emission: ≤200 microvolts.	Actual Emission: +28 v line: <200 microvolts except at 11.5 mc 115 v., 400 cycle line: <200 microvolts except at 11.5mc. All other frequencies within performance standards.	Partially
Antenna Conducted Interference RTCA Para: 2.10b	0.19 to 1500	332.0	Acceptable Emission: ≤400 micro-microwatts.	Actual Emission: <400 micro-microwatts except at 1233 mc. All other frequencies within performance standards	Partially

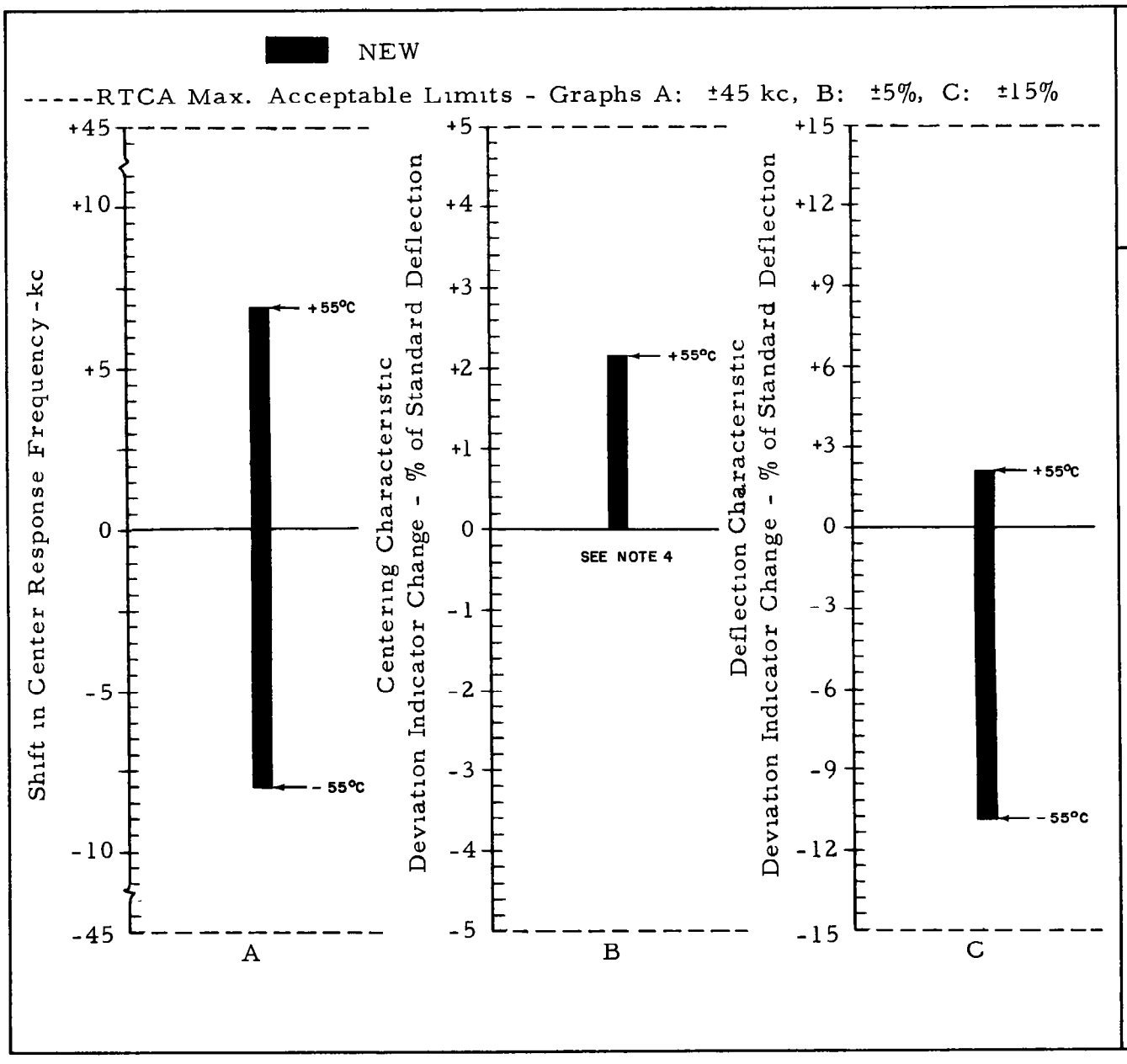
INTERFERENCE TESTS - GLIDE SLOPE RECEIVER - GS-3

(continued on Page C-352)

Test	Frequency (mc)	F_c (mc)	RTCA Performance Standards	Results	Performance Standards Met
Operation of two receivers from same antenna. RTCA Para: 2.15	329.3 to 335.0	Varied over Glide-Slope band	Acceptable Operation: Deviation indication shall not exceed 5% of standard deflection.	Actual Operation: No change in deviation indication.	Yes

Test	RTCA Para.	F_c (mc)	Probable Susceptibility	Relation to Frequency Synthesis
Susceptibility to Radar Type Signals.	None	332.0	None	(Not Applicable)

INTERFERENCE TESTS - GLIDE SLOPE RECEIVER - GS-3



TEMPERATURE VARIATION TEST
Glide Slope Receiver: GS-3
Project DANCE
BRD-61, Task-2
RTCA Paper 88-54/DO-58,
Para 3.3(a)(b)(c)

Notes:

1. Each bar represents one "New" unit.
2. RTCA maximum acceptable limits:
   Graph A: ±45 kc
   Graph B: ±5%
   Graph C: ±15%
3. This unit is designed to operate above 15,000 feet.
4. -55°C standard deflection - 0. %

Figure C-4(c)

TEMPERATURE VARIATION TEST - GLIDE SLOPE RECEIVER - GS-3

SECTION C

AIRBORNE NAVIGATION
EQUIPMENT CHARACTERISTICS

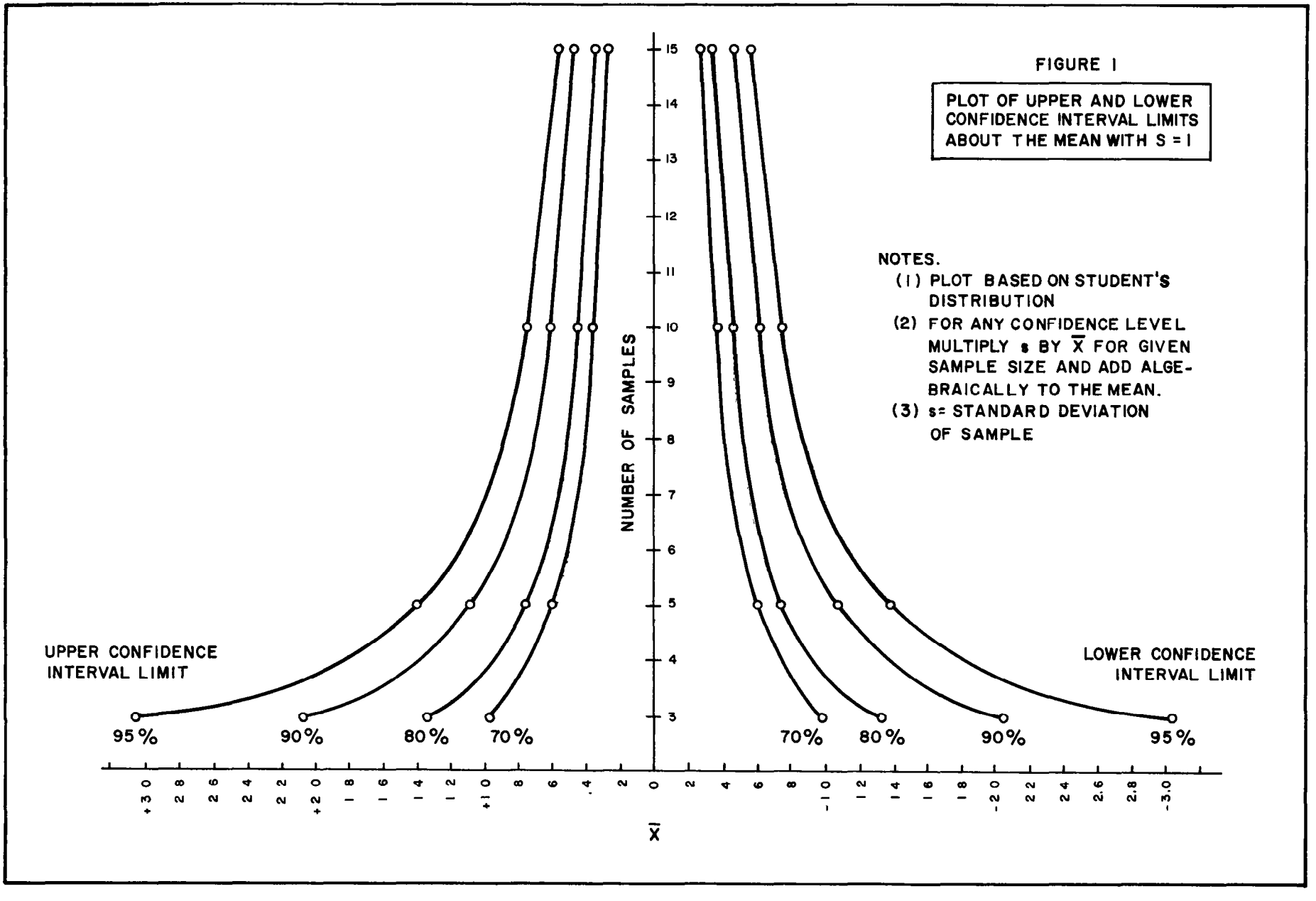
(Task 10)

Sub-Section — Page

6. Tables

a. Confidence Limit Intervals for Navigation Equipment (Table 1) 356-440

b. Facility Maintenance Data (Table 2) 441-443



PLOT OF CONFIDENCE INTERVAL LIMITS

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Audio Frequency Response Page C-46 (db)								
(New)	0.70	0.1	2.04	0.20	1.34	0.13	1.0	0.1
(In Use)	0.60	0.2	2.04	0.41	1.34	0.27	1.0	0.2
(RFI)	0.61	0.1	2.04	0.20	1.34	0.13	1.0	0.1
Lamp Frequency Response Page C-47 (db)								
(New)	2.70	0.8	2.04	1.61	1.34	1.07	1.0	0.8
(In Use)	2.50	2.0	2.04	4.08	1.34	2.68	1.0	2.0
(RFI)	3.40	2.1	2.04	4.29	1.34	2.82	1.0	2.1
Audio Level Characteristic Page C-48 (db)								
(New)	3.4	0.2	2.04	0.41	1.34	0.27	1.0	0.2
(In Use)	3.1	0.6	2.04	1.22	1.34	0.80	1.0	0.6
(RFI)	2.4	1.0	2.04	2.04	1.34	1.34	1.0	1.0

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Mean	Ord. Val.	Mean	Ord. Val.	Mean
Rated Audio Power Output								
Page C-49								
(mw)								
f1 (New)	90.0	7.90	2.04	16.0	1.34	10.60	1.0	7.90
f1 (In Use)	82.0	8.70	2.04	17.7	1.34	11.60	1.0	8.70
f1 (RFI)	70.0	9.10	2.04	18.5	1.34	12.20	1.0	9.10
f2 (New)	82.0	5.44	2.04	11.1	1.34	7.31	1.0	5.44
f2 (In Use)	78.0	9.72	2.04	19.8	1.34	13.00	1.0	9.72
f2 (RFI)	62.0	8.19	2.04	16.6	1.34	10.90	1.0	8.19
f3 (New)	80.0	7.94	2.04	16.2	1.34	10.60	1.0	7.94
f3 (In Use)	78.0	6.82	2.04	13.9	1.34	9.15	1.0	6.82
f3 (RFI)	62.0	8.34	2.04	17.0	1.34	11.20	1.0	8.34
Audio Noise Level W/O Signal								
Page C-50								
(db)								
(New)	50.5	17.0	2.04	34.70	1.34	22.80	1.0	17.0
(In Use)	22.5	1.4	2.04	2.86	1.34	1.88	1.0	1.4
(RFI)	34.2	10.9	2.04	22.30	1.34	14.60	1.0	10.9

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Distortion								
Page C-52								
(%)								
v1 (New)	13.2	1.5	2.04	3.06	1.34	2.000	1.0	1.5
v1 (In Use)	14.5	3.0	2.04	6.10	1.34	4.000	1.0	3.0
v1 (RFI)	12.1	2.6	2.04	5.30	1.34	3.490	1.0	2.6
v2 (New)	25.5	0.4	2.04	0.82	1.34	0.536	1.0	0.4
v2 (In Use)	26.8	3.1	2.04	6.31	1.34	4.150	1.0	3.1
v2 (RFI)	24.5	1.0	2.04	2.04	1.34	1.340	1.0	1.0
v3 (New)	25.9	2.0	2.04	4.16	1.34	2.680	1.0	2.0
v3 (In Use)	27.7	2.5	2.04	5.10	1.34	3.350	1.0	2.5
v3 (RFI)	25.1	0.6	2.04	1.22	1.34	0.800	1.0	0.6
Nose Bandwidth								
Page C-54								
(db)								
(New)	0.4	0.5	2.04	1.02	1.34	0.67	1.0	0.5
(In Use)	0.1	0.2	2.04	0.42	1.34	0.27	1.0	0.2
(RFI)	2.0	1.9	2.04	3.88	1.34	2.55	1.0	1.9
End of Tabulation - MB-1								

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Audio Frequency Response Page C-62 (db)								
(New)	2.38	0.4	2.04	0.82	1.34	0.54	1.0	0.40
(In Use)	2.12	0.52	2.04	1.06	1.34	0.70	1.0	0.52
(RFI)	2.95	1.85	2.04	3.78	1.34	2.43	1.0	1.85
Lamp Frequency Response Page C-63 (db)								
(New)	6.0	1.39	2.04	2.84	1.34	1.87	1.0	1.39
(In Use)	4.9	0.31	2.04	0.63	1.34	0.41	1.0	0.31
(RFI)	18.8	18.90	2.04	38.60	1.34	25.40	1.0	18.90
Audio Level Characteristic Page C-64 (db)								
(New)	4.15	0.32	2.04	0.65	1.34	0.43	1.0	0.32
(In Use)	4.30	0.40	2.04	0.82	1.34	0.54	1.0	0.40
(RFI)	3.50	1.00	2.04	2.04	1.34	1.34	1.0	1.00

Table 1

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Rated Audio Power Output Page C-65 (mw)								
f1 (New)	141.0	38.5	2.04	78.6	1.34	51.70	1.0	38.5
f1 (In Use)	131.0	16.1	2.04	32.8	1.34	21.60	1.0	16.1
f1 (RFI)	120.0	6.6	2.04	13.4	1.34	8.90	1.0	6.6
f2 (New)	129.0	38.5	2.04	78.6	1.34	51.70	1.0	38.5
f2 (In Use)	132.5	11.6	2.04	23.6	1.34	15.60	1.0	11.6
f2 (RFI)	126.0	6.0	2.04	12.2	1.34	8.05	1.0	6.0
f3 (New)	109.0	29.3	2.04	59.9	1.34	39.20	1.0	29.3
f3 (In Use)	110.0	10.0	2.04	20.4	1.34	13.40	1.0	10.0
f3 (RFI)	86.0	31.4	2.04	64.0	1.34	42.00	1.0	31.4
Audio Noise Level Page C-66 (db)								
(New)	53.0	3.1	2.04	6.30	1.34	4.16	1.0	3.1
(In Use)	37.3	3.8	2.04	7.75	1.34	5.10	1.0	3.8
(RFI)	43.0	6.0	2.04	12.20	1.34	8.01	1.0	6.0

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Distortion								
Page C-68								
(%)								
v1 (New)	14.5	0.3	2.04	0.62	1.34	0.42	1.0	0.3
v1 (In Use)	12.6	1.4	2.04	2.84	1.34	1.88	1.0	1.4
v1 (RFI)	13.7	1.8	2.04	3.76	1.34	2.41	1.0	1.8
v2 (New)	18.9	0.8	2.04	1.63	1.34	1.07	1.0	0.8
v2 (In Use)	18.2	0.6	2.04	1.22	1.34	0.81	1.0	0.6
v2 (RFI)	17.5	0.4	2.04	0.83	1.34	0.54	1.0	0.4
v3 (New)	15.0	0.9	2.04	1.83	1.34	1.21	1.0	0.9
v3 (In Use)	16.9	1.4	2.04	2.85	1.34	1.88	1.0	1.4
v3 (RFI)	15.4	1.0	2.04	2.04	1.34	1.34	1.0	1.0
Nose Bandwidth								
Page C-70								
(db)								
(New)	2.21	1.6	2.04	3.26	1.34	2.15	1.0	1.6
(In Use)	1.00	1.3	2.04	2.64	1.34	1.74	1.0	1.3
(RFI)	15.8	10.9	2.04	22.20	1.34	14.65	1.0	10.9

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Lamp Operate Selectivity								
Page C-71								
(Ratio - %)								
m1 (New)	14.7	3.40	2.04	6.95	1.34	4.57	1.0	3.40
m1 (In Use)	23.8	1.80	2.04	3.68	1.34	2.42	1.0	1.80
m1 (RFI)	22.0	4.80	2.04	9.80	1.34	6.46	1.0	4.80
m2 (New)	28.5	2.00	2.04	4.10	1.34	2.68	1.0	2.00
m2 (InUse)	29.0	1.20	2.04	2.45	1.34	1.61	1.0	1.20
m2 (RFI)	27.5	3.70	2.04	7.60	1.34	4.96	1.0	3.70
m3 (New)	15.5	0.38	2.04	0.78	1.34	5.10	1.0	0.38
m3 (InUse)	14.8	1.43	2.04	2.92	1.34	1.92	1.0	1.43
m3 (RFI)	21.4	11.70	2.04	23.90	1.34	15.70	1.0	11.70
End of Tabulation - MB-2								

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Audio Frequency Response Page C-80 (db)								
(New)	2.85	0.57	2.04	1.16	1.34	0.77	1.0	0.57
(In Use)	1.99	0.21	2.04	0.42	1.34	0.28	1.0	0.21
(RFI)	1.67	0.33	2.04	0.67	1.34	0.44	1.0	0.33
Lamp Frequency Response Page C-81 (db)								
(New)	3.9	2.1	2.04	4.17	1.34	2.81	1.0	2.10
(In Use)	7.2	3.0	2.04	6.30	1.34	4.02	1.0	3.00
(RFI)	4.7	1.73	2.04	3.52	1.34	2.32	1.0	1.73
Audio Level Characteristic Page C-82 (db)								
(New)	4.5	0.36	2.04	0.73	1.34	0.48	1.0	0.36
(In Use)	2.7	0.63	2.04	1.28	1.34	0.85	1.0	0.63
(RFI)	5.0	0.49	2.04	1.00	1.34	0.66	1.0	0.49

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-3

Table 1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Rated Audio Power Output								
Page C-83								
(mw)								
f1 (New)	165.0	5.73	2.04	11.7	1.34	7.65	1.0	5.73
f1 (In Use)	56.0	72.20	2.04	147.5	1.34	97.00	1.0	72.20
f1 (RFI)	151.0	22.60	2.04	46.1	1.34	30.40	1.0	22.60
f2 (New)	152.0	10.10	2.04	20.5	1.34	13.56	1.0	10.10
f2 (In Use)	53.0	73.00	2.04	149.0	1.34	98.00	1.0	73.00
f2 (RFI)	121.0	10.20	2.04	20.7	1.34	13.65	1.0	10.20
f3 (New)	124.0	10.10	2.04	20.5	1.34	13.55	1.0	10.10
f3 (In Use)	56.0	69.20	2.04	141.0	1.34	93.00	1.0	69.20
f3 (RFI)	130.0	15.00	2.04	30.6	1.34	20.10	1.0	15.00
Audio Noise Level W/Signal								
Page C-84								
(db)								
(New)	54.4	5.2	2.04	10.60	1.34	7.00	1.0	5.2
(In Use)	41.0	1.3	2.04	2.65	1.34	1.75	1.0	1.3
(RFI)	42.0	2.8	2.04	5.71	1.34	3.75	1.0	2.8

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Distortion Page C-86 (%)								
v1 (New)	12.8	1.30	2.04	2.65	1.34	1.75	1.0	1.30
v1 (In Use)	11.8	2.10	2.04	4.29	1.34	2.82	1.0	2.10
v1 (RFI)	13.2	2.20	2.04	4.50	1.34	2.95	1.0	2.20
v2 (New)	19.4	0.26	2.04	0.53	1.34	0.35	1.0	2.26
v2 (In Use)	15.7	1.60	2.04	3.26	1.34	2.25	1.0	1.60
v2 (RFI)	20.1	1.20	2.04	2.45	1.34	1.61	1.0	1.20
v3 (New)	14.9	0.20	2.04	4.08	1.34	2.68	1.0	0.20
v3 (In Use)	17.8	2.50	2.04	5.10	1.34	3.36	1.0	2.50
v3 (RFI)	18.1	0.42	2.04	0.86	1.34	0.56	1.0	0.42
Nose Bandwidth Page C-88 (db)								
(New)	2.5	1.30	2.04	2.65	1.34	1.74	1.0	1.30
(In Use)	2.5	0.12	2.04	0.25	1.34	0.16	1.0	0.12
(RFI)	3.5	1.80	2.04	3.66	1.34	2.41	1.0	1.80

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Lamp Operate Selectivity								
Page C-89								
(Ratio - %)								
m1 (New)	14.5	1.60	2.04	3.26	1.34	2.14	1.0	1.60
m1 (In Use)	16.6	1.00	2.04	2.04	1.34	1.34	1.0	1.00
m1 (RFI)	24.5	3.40	2.04	6.20	1.34	4.56	1.0	3.40
m2 (New)	27.9	1.50	2.04	3.06	1.34	2.01	1.0	1.50
m2 (InUse)	25.9	1.10	2.04	2.24	1.34	1.48	1.0	1.10
m2 (RFI)	31.9	4.50	2.04	9.20	1.34	6.04	1.0	4.50
m3 (New)	16.2	0.87	2.04	1.77	1.34	1.16	1.0	0.87
m3 (InUse)	13.4	1.20	2.04	2.45	1.34	1.61	1.0	1.20
m3 (RFI)	13.3	0.65	2.04	1.32	1.34	0.87	1.0	0.65
End of Tabulation - MB-3								

CONFIDENCE LIMIT INTERVAL - MARKER BEACON RECEIVER - MB-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord.Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Bearing Accuracy								
Page C-98								
(Degrees)								
Plus (New)	2.10	0.5	2.04	1.02	1.34	0.67	1.0	0.5
(In Use)	2.60	2.6	2.04	5.30	1.34	3.48	1.0	2.6
(RFI)	0.95	0.9	2.04	1.83	1.34	1.21	1.0	0.9
Minus (New)	1.80	0.8	2.04	1.63	1.34	1.07	1.0	0.8
(In Use)	3.00	0.5	2.04	1.02	1.34	0.67	1.0	0.5
(RFI)	2.60	2.0	2.04	4.08	1.34	2.68	1.0	2.0
Deflection Linearity I								
Page C-99								
(Ratio)								
v1 (New)	4.9	0.78	--------	Only	Two	Samples	Tested --	--------
v1 (In Use)	6.2	0.65	2.04	1.32	1.34	0.87	1.0	0.65
v1 (RFI)	4.4	0.51	2.04	1.05	1.34	0.69	1.0	0.51
v2 (New)	4.9	0.32	2.04	0.65	1.34	0.43	1.0	0.32
v2 (In Use)	6.7	3.50	2.04	7.14	1.34	4.69	1.0	3.50
v2 (RFI)	4.3	0.73	2.04	1.47	1.34	0.97	1.0	0.73
v3 (New)	5.1	0.11	2.04	0.22	1.34	0.14	1.0	0.11
v3 (In Use)	5.1	2.51	2.04	5.12	1.34	3.36	1.0	2.51
v3 (RFI)	9.3	0.44	--------	Only	Two	Samples	Tested --	--------

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Linearity II								
Page C-101								
(Ratio)								
v1 (New)	9.60	1.23	-------- Only		Two	Samples	Tested --	--------
v1 (In Use)	12.45	1.03	2.04	2.10	1.34	1.38	1.0	1.03
v1 (RFI)	8.40	0.79	2.04	1.62	1.34	1.06	1.0	0.79
v2 (New)	9.70	0.94	2.04	1.91	1.34	1.25	1.0	0.94
v2 (In Use)	13.50	7.12	2.04	14.50	1.34	9.54	1.0	7.12
v2 (RFI)	8.4	1.45	2.04	2.98	1.34	1.94	1.0	1.45
v3 (New)	10.2	0.11	2.04	2.16	1.34	0.14	1.0	0.11
v3 (In Use)	10.45	5.19	2.04	10.60	1.34	6.95	1.0	5.19
v3 (RFI)	16.90	1.69	-------- Only		Two	Samples	Tested --	--------
Deflection Linearity III								
Page C-103								
(Ratio)								
v1 (New)	10.9	7.60	--------- Only		Two	Samples	Tested --	--------
v1 (In Use)	20.1	6.47	2.04	13.20	1.34	8.66	1.0	6.47
v1 (RFI)	14.0	1.40	2.04	2.86	1.34	1.87	1.0	1.40
v2 (New)	16.1	1.55	2.04	3.16	1.34	2.08	1.0	1.55
v2 (In Use)	23.0	12.40	2.04	25.30	1.34	16.60	1.0	12.40
v2 (RFI)	14.0	2.60	2.04	5.30	1.34	3.48	1.0	2.60
v3 (New)	16.8	0.14	2.04	0.29	1.34	0.19	1.0	0.14
v3 (In Use)	17.8	0.92	2.04	1.87	1.34	1.23	1.0	0.92
v3 (RFI)	31.7	2.12	--------- Only		Two	Samples	Tested --	--------

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Sensitivity								
Page C-105								
Degrees (New)	6.2	0.510	2.04	1.04	1.34	0.69	1.0	0.51
(In Use)	5.7	0.480	2.04	0.93	1.34	0.65	1.0	0.48
(RFI)	6.0	0.270	2.04	0.54	1.34	0.36	1.0	0.27
ua (New)	95.0	0.705	2.04	1.44	1.34	0.94	1.0	0.71
(In Use)	86.0	3.000	2.04	6.12	1.34	4.02	1.0	3.00
(RFI)	87.0	1.730	2.04	3.52	1.34	2.32	1.0	1.73
Selectivity								
Page C-107								
(kc)								
b1 (New)	49.0	12.8	2.04	26.1	1.34	17.2	1.0	12.8
b1 (In Use)	36.0	11.3	2.04	23.1	1.34	15.1	1.0	11.3
b1 (RFI)	35.5	12.3	2.04	25.1	1.34	16.5	1.0	12.3
b2 (New)	96.0	22.4	2.04	45.7	1.34	30.0	1.0	22.4
b2 (In Use)	69.0	15.1	2.04	30.4	1.34	20.2	1.0	15.1
b2 (RFI)	72.5	14.4	2.04	29.4	1.34	19.3	1.0	14.4

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal Page C-109 (ua)								
c1 (New)	4.0	2.90	2.04	5.42	1.34	3.88	1.0	2.90
c1 (In Use)	8.0	3.50	2.04	7.15	1.34	4.69	1.0	3.50
c1 (RFI)	5.0	3.60	2.04	7.35	1.34	4.82	1.0	3.60
c2 (New)	200.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
c2 (In Use)	252.0	69.90	2.04	142.00	1.34	93.50	1.0	69.90
c2 (RFI)	221.0	24.60	2.04	50.20	1.34	33.00	1.0	24.60
c3 (New)	209.0	4.05	2.04	8.26	1.34	5.43	1.0	4.05
c3 (In Use)	289.0	24.00	2.04	49.00	1.34	32.20	1.0	24.00
c3 (RFI)	214.0	6.40	2.04	13.00	1.34	8.57	1.0	6.40
c4 (New)	222.0	8.25	2.04	16.80	1.34	11.00	1.0	8.25
c4 (In Use)	327.0	20.40	2.04	41.60	1.34	27.20	1.0	20.40
c4 (RFI)	227.0	30.20	2.04	61.60	1.34	40.50	1.0	30.20
c5 (New)	227.0	17.50	2.04	35.70	1.34	23.40	1.0	17.50
c5 (In Use)	252.0	112.00	2.04	228.00	1.34	150.00	1.0	112.00
c5 (RFI)	151.0	43.60	2.04	89.00	1.34	58.40	1.0	43.60
c6 (New)	288.0	7.66	2.04	15.60	1.34	10.30	1.0	7.66
c6 (In Use)	411.0	7.47	2.04	15.00	1.34	10.00	1.0	7.47
c6 (RFI)	298.0	10.40	2.04	20.80	1.34	13.70	1.0	10.40

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Audio Frequency Response								
Page C-111								
(db)								
(New)	2.8	0.78	2.04	1.58	1.34	1.04	1.0	0.78
(In Use)	2.9	0.87	2.04	1.78	1.34	1.16	1.0	0.87
(RFI)	4.9	3.07	2.04	6.26	1.34	4.12	1.0	3.07
AVC Characteristics								
Page C-112								
(db)								
(New)	0.71	0.69	2.04	1.41	1.34	0.92	1.0	0.69
(In Use)	0.83	0.60	2.04	1.23	1.34	0.81	1.0	0.60
(RFI)	1.40	0.55	2.04	1.11	1.34	0.73	1.0	0.55
Gain								
Page C-113								
(uv)								
(New)	1.7	0.52	2.04	1.05	1.34	0.69	1.0	0.52
(In Use)	1.4	0.57	2.04	1.16	1.34	0.76	1.0	0.57
(RFI)	1.8	0.22	----------	Only	Two	Samples	Tested--	----------
Noise Level								
Page C-114								
(db)								
(New)	29.8	4.70	2.04	9.59	1.34	6.30	1.0	4.70
(In Use)	34.7	5.25	2.04	10.70	1.34	7.03	1.0	5.25
(RFI)	35.8	4.14	2.04	8.43	1.34	5.55	1.0	4.14
End of Tabulation - VO-1	----------	----------	----------	----------	----------	----------	----------	----------

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Bearing Accuracy								
Page C-122								
(Degrees)								
Plus (New)	0.13	1.01	2.04	2.06	1.34	1.35	1.0	1.01
(In Use)	4.10	2.32	2.04	4.74	1.34	3.10	1.0	2.32
(RFI)	2.90	1.65	2.04	3.37	1.34	2.21	1.0	1.65
Minus (New)	3.60	0.25	2.04	0.51	1.34	0.34	1.0	0.25
(In Use)	0.90	1.94	2.04	3.96	1.34	2.60	1.0	1.94
(RFI)	1.85	1.68	2.04	3.43	1.34	2.23	1.0	1.68
Deflection Linearity I								
Page C-123								
(Ratio)								
v1 (New)	5.10	1.48	2.04	3.03	1.34	1.98	1.0	1.48
v1 (In Use)	5.40	4.14	2.04	8.45	1.34	5.55	1.0	4.14
v1 (RFI)	3.80	0.20	2.04	0.41	1.34	0.27	1.0	0.20
v2 (New)	4.66	3.14	2.04	6.40	1.34	4.40	1.0	3.14
v2 (In Use)	3.90	1.69	2.04	3.45	1.34	2.27	1.0	1.69
v2 (RFI)	3.60	0.38	2.04	0.78	1.34	0.51	1.0	0.38
v3 (New)	4.70	0.16	2.04	0.32	1.34	0.21	1.0	0.16
v3 (In Use)	3.00	0.39	2.04	0.79	1.34	0.51	1.0	0.39
v3 (RFI)	4.00	0.91	2.04	1.86	1.34	1.22	1.0	0.91

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Linearity II								
Page C-124								
(Ratio)								
v1 (New)	9.90	1.86	2.04	3.78	1.34	2.50	1.0	1.86
v1 (In Use)	10.90	10.30	2.04	21.00	1.34	13.80	1.0	10.30
v1 (RFI)	7.60	0.33	2.04	0.67	1.34	0.44	1.0	0.33
v2 (New)	9.20	1.45	2.04	3.95	1.34	1.95	1.0	1.45
v2 (In Use)	8.20	3.79	2.04	7.70	1.34	5.10	1.0	3.79
v2 (RFI)	7.50	0.74	2.04	1.50	1.34	0.99	1.0	0.74
v3 (New)	9.30	0.28	2.04	0.53	1.34	0.33	1.0	0.28
v3 (In Use)	6.20	0.78	2.04	1.58	1.34	0.10	1.0	0.78
v3 (RFI)	9.35	3.20	2.04	6.51	1.34	4.30	1.0	3.20
Deflection Linearity III								
Page C-125								
(Ratio)								
v1 (New)	15.9	3.47	2.04	7.10	1.34	4.96	1.0	3.47
v1 (In Use)	16.6	11.10	2.04	22.60	1.34	14.90	1.0	11.10
v1 (RFI)	12.4	0.50	2.04	1.02	1.34	0.67	1.0	0.50
v2 (New)	14.2	1.59	2.04	3.24	1.34	2.14	1.0	1.59
v2 (In Use)	13.0	6.14	2.04	12.50	1.34	8.25	1.0	6.14
v2 (RFI)	11.8	0.74	2.04	1.50	1.34	0.99	1.0	0.74
v3 (New)	15.0	0.16	2.04	0.32	1.34	0.21	1.0	0.16
v3 (In Use)	9.9	1.27	2.04	2.60	1.34	1.71	1.0	1.27
v3 (RFI)	14.3	5.24	2.04	10.65	1.34	7.03	1.0	5.24

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-2

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Sensitivity									
Page C-126									
Degrees	(New)	5.8	0.70	2.04	1.42	1.34	0.93	1.0	0.70
	(In Use)	6.1	0.80	2.04	1.59	1.34	1.07	1.0	0.80
	(RFI)	6.4	0.23	2.04	0.47	1.34	0.31	1.0	0.23
ua	(New)	91.0	1.78	2.04	3.63	1.34	2.39	1.0	1.78
	(In Use)	90.5	0.57	2.04	1.16	1.34	0.77	1.0	0.57
	(RFI)	88.0	1.00	2.04	2.04	1.34	1.34	1.0	1.00
Selectivity									
Page C-127									
(kc)									
	b1 (New)	48.0	5.89	2.04	11.90	1.34	7.90	1.0	5.89
	b1 (In Use)	17.0	10.00	2.04	20.40	1.34	13.40	1.0	10.00
	b1 (RFI)	41.0	13.00	2.04	26.50	1.34	17.40	1.0	13.00
	b2 (New)	68.0	4.61	2.04	9.45	1.34	6.15	1.0	4.61
	b2 (In Use)	57.0	14.20	2.04	29.10	1.34	19.00	1.0	14.20
	b2 (RFI	61.0	2.14	2.04	4.46	1.34	2.86	1.0	2.14

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal								
Page C-128								
(ua)								
c1 (New)	25.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
c1 (In Use)	40.0	42.50	2.04	87.50	1.34	59.60	1.0	42.50
c1 (RFI)	57.0	5.77	2.04	11.30	1.34	7.72	1.0	5.77
c2 (New)	194.0	8.41	2.04	17.20	1.34	11.30	1.0	8.41
c2 (In Use)	262.0	17.40	2.04	35.50	1.34	23.40	1.0	17.40
c2 (RFI)	270.0	10.00	2.04	20.40	1.34	13.40	1.0	10.00
c3 (New)	198.0	8.70	2.04	17.70	1.34	11.70	1.0	8.70
c3 (In Use)	275.0	20.60	2.04	42.20	1.34	27.60	1.0	20.60
c3 (RFI)	267.0	5.78	2.04	11.70	1.34	7.70	1.0	5.78
c4 (New)	241.0	7.26	2.04	14.40	1.34	9.72	1.0	7.26
c4 (In Use)	302.0	15.20	2.04	31.00	1.34	20.40	1.0	15.20
c4 (RFI)	298.0	5.78	2.04	11.70	1.34	7.73	1.0	5.78
c5 (New)	213.0	77.50	2.04	158.00	1.34	104.00	1.0	77.50
c5 (In Use)	262.0	11.30	2.04	23.00	1.34	15.15	1.0	11.30
c5 (RFI)	242.0	5.78	2.04	11.70	1.34	7.72	1.0	5.78
c6 (New)	266.0	10.60	2.04	21.60	1.34	14.20	1.0	10.60
c6 (In Use)	362.0	4.35	2.04	8.89	1.34	5.82	1.0	4.35
c6 (RFI)	352.0	5.78	2.04	11.70	1.34	7.71	1.0	5.78
Audio Frequency Response								
Page C-129								
(db)								
(New)	2.15	1.43	2.04	2.92	1.34	1.92	1.0	1.43
(In Use)	2.50	0.67	2.04	1.34	1.34	0.90	1.0	0.67
(RFI)	1.88	0.50	2.04	1.02	1.34	0.67	1.0	0.50

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
AVC Characteristic								
Page C-130								
(db)								
(New)	1.67	0.12	2.04	0.24	1.34	0.16	1.0	0.12
(In Use)	0.79	0.92	2.04	1.88	1.34	1.23	1.0	0.92
(RFI)	0.67	0.15	2.04	0.32	1.34	0.21	1.0	0.15
Gain								
Page C-131								
(uv)								
(New)	49.0	20.30	2.04	41.40	1.34	26.00	1.0	20.30
(In Use)	8.5	9.30	2.04	18.60	1.34	12.40	1.0	9.30
(RFI)	4.5	1.89	2.04	3.86	1.34	2.54	1.0	1.89
Noise Level								
Page C-132								
(db)								
(New)	32.4	0.66	2.04	1.34	1.34	0.88	1.0	0.66
(In Use)	36.5	1.85	2.04	3.78	1.34	2.48	1.0	1.85
(RFI)	34.0	1.82	2.04	3.71	1.34	2.24	1.0	1.82
End of Tabulation - VO-2								

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-2

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Bearing Accuracy									
Page C-140									
(Degrees)									
Plus	(New)	14.3	0.62	2.04	1.27	1.34	0.84	1.0	0.61
	(In Use)	8.5	3.40	2.04	6.93	1.34	4.56	1.0	3.40
	(RFI)	9.3	4.28	2.04	8.74	1.34	5.75	1.0	4.28
Minus	(New)	10.5	3.92	2.04	8.00	1.34	5.26	1.0	3.92
	(In Use)	15.0	8.80	2.04	17.95	1.34	11.80	1.0	8.80
	(RFI)	10.6	4.96	2.04	10.20	1.34	6.67	1.0	4.96
Deflection Linearity I									
Page C-141									
(Ratio)									
	(New)	3.48	0.2	2.04	0.41	1.34	0.27	1.0	0.2
	(In Use)	10.50	11.4	2.04	20.32	1.34	15.70	1.0	11.4
	(RFI)	7.10	1.7	2.04	3.47	1.34	2.28	1.0	1.7
Deflection Linearity II									
Page C-142									
(Ratio)									
	(New)	4.00	0.41	2.04	0.84	1.34	0.55	1.0	0.41
	(In Use)	6.25	0.95	2.04	1.94	1.34	1.25	1.0	0.95
	(RFI)	4.70	5.70	2.04	11.60	1.34	7.65	1.0	5.70
Deflection Linearity III									
Page C-143									
(Ratio)									
	(New)	4.5	2.75	2.04	0.56	1.34	3.69	1.0	2.75
	(In Use)	7.2	5.90	2.04	12.10	1.34	7.90	1.0	5.90
	(RFI)	5.7	3.00	2.04	0.61	1.34	4.02	1.0	3.00

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Sensitivity								
Page C-144								
Degrees								
(New)	6.75	0.48	2.04	0.98	1.34	0.63	1.0	0.48
(In Use)	8.50	1.46	2.04	2.98	1.34	1.95	1.0	1.46
(RFI)	7.25	2.53	2.04	5.16	1.34	3.39	1.0	2.53
ua (New)	9.00	10.60	2.04	21.60	1.34	14.20	1.0	10.60
(In Use)	9.00	1.73	2.04	2.53	1.34	2.32	1.0	1.73
(RFI)	9.00	5.67	2.04	11.50	1.34	7.60	1.0	5.67
Selectivity								
Page C-145								
(kc)								
b1 (New)	37.5	7.03	2.04	14.3	1.34	9.42	1.0	7.02
b1 (In Use)	75.0	30.20	2.04	61.6	1.34	40.70	1.0	30.20
b1 (RFI)	87.0	14.55	2.04	29.7	1.34	19.50	1.0	14.55
b2 (New)	317.0	13.60	2.04	27.7	1.34	18.20	1.0	13.60
b2 (In Use)	487.0	57.40	2.04	117.0	1.34	77.00	1.0	57.40
b2 (RFI)	510.0	22.60	2.04	45.0	1.34	30.30	1.0	22.60
Audio Frequency Response								
Page C-146								
(db)								
(New)	8.75	3.35	2.04	6.84	1.34	4.50	1.0	3.35
(In Use)	9.25	2.61	2.04	5.32	1.34	3.50	1.0	2.61
(RFI)	9.50	4.26	2.04	8.70	1.34	5.72	1.0	4.26

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
AVC Characteristic								
Page C-147								
(db)								
(New)	0.85	0.19	2.04	3.92	1.34	2.58	1.0	0.19
(In Use)	5.60	5.56	2.04	11.30	1.34	7.45	1.0	5.56
(RFI)	9.48	1.27	2.04	2.59	1.34	1.70	1.0	1.27
Gain								
Page C-148								
(uv)								
(New)	2.5	0.95	2.04	1.94	1.34	1.25	1.0	0.95
(In Use)	97.0	143.00	2.04	292.00	1.34	194.00	1.0	143.00
(RFI)	190.0	197.00	2.04	401.00	1.34	264.00	1.0	197.00
End of Tabulation - VO-3								

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Bearing Accuracy								
Page C-158								
(Degrees)								
Plus (New)	2.72	0.42	2.04	0.86	1.34	0.56	1.0	0.42
(In Use)	2.74	0.85	2.04	1.74	1.34	1.14	1.0	0.85
(RFI)	3.28	0.64	2.04	0.13	1.34	0.86	1.0	0.64
Minus (New)	1.72	2.20	2.04	4.50	1.34	2.95	1.0	2.20
(In Use)	3.30	0.99	2.04	2.00	1.34	1.32	1.0	0.99
(RFI)	3.80	0.48	2.04	0.98	1.34	0.64	1.0	0.48
Deflection Linearity I								
Page C-159								
(Ratio)								
v1 (New)	4.9	0.28	2.04	0.57	1.34	0.38	1.0	0.28
v1 (In Use)	4.7	0.60	2.04	1.22	1.34	0.81	1.0	0.60
v1 (RFI)	5.2	0.30	2.04	0.62	1.34	0.40	1.0	0.30
v2 (New)	4.8	0.17	2.04	0.35	1.34	0.23	1.0	0.17
v2 (In Use)	5.5	0.40	2.04	0.81	1.34	0.54	1.0	0.40
v2 (RFI)	5.8	1.70	2.04	3.47	1.34	2.28	1.0	1.70
v3 (New)	4.6	0.10	2.04	0.20	1.34	0.13	1.0	0.10
v3 (In Use)	4.5	0.28	2.04	0.57	1.34	0.38	1.0	0.28
v3 (RFI)	6.0	0.80	2.04	1.63	1.34	1.07	1.0	0.80

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-4

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Linearity II								
Page C-160								
(Ratio)								
v1 (New)	9.6	0.45	2.04	0.92	1.34	0.60	1.0	0.45
v1 (In Use)	8.9	1.10	2.04	2.25	1.34	1.48	1.0	1.10
v1 (RFI)	10.2	0.18	2.04	0.37	1.34	0.24	1.0	0.18
v2 (New)	9.5	0.26	2.04	0.53	1.34	0.35	1.0	0.26
v2 (In Use)	11.0	0.25	2.04	0.51	1.34	0.34	1.0	0.25
v2 (RFI)	11.5	3.50	2.04	7.15	1.34	4.70	1.0	3.50
v3 (New)	8.9	0.26	2.04	0.53	1.34	0.35	1.0	0.26
v3 (In Use)	9.2	0.14	2.04	0.29	1.34	0.19	1.0	0.14
v3 (RFI)	8.2	6.20	2.04	12.60	1.34	3.30	1.0	6.20
Deflection Linearity III								
Page C-161								
(Ratio)								
v1 (New)	16.0	1.00	2.04	2.04	1.34	1.34	1.0	1.00
v1 (In Use)	15.2	1.80	2.04	3.67	1.34	2.42	1.0	1.80
v1 (RFI)	17.6	0.52	2.04	1.06	1.34	0.70	1.0	0.52
v2 (New)	15.2	1.30	2.04	2.56	1.34	1.75	1.0	1.30
v2 (In Use)	19.2	1.45	2.04	2.96	1.34	1.95	1.0	1.45
v2 (RFI)	19.1	5.60	2.04	11.40	1.34	7.50	1.0	5.60
v3 (New)	14.9	0.25	2.04	0.51	1.34	0.34	1.0	0.25
v3 (In Use)	15.6	0.64	2.04	1.30	1.34	0.86	1.0	0.64
v3 (RFI)	27.2	11.60	2.04	23.60	1.34	15.55	1.0	11.60

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-4

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Sensitivity									
Page C-162									
Degrees	(New)	6.4	0.50	2.04	1.02	1.34	0.67	1.0	0.5
	(In Use)	6.0	0.74	2.04	1.50	1.34	0.97	1.0	0.7
	(RFI)	6.2	0.26	2.04	5.30	1.34	0.35	1.0	0.3
ua	(New)	92.0	2.40	2.04	4.90	1.34	3.22	1.0	2.4
	(In Use)	88.0	3.60	2.04	7.30	1.34	4.80	1.0	3.6
	(RFI)	91.0	4.60	2.04	9.40	1.34	6.20	1.0	4.6
Selectivity									
Page C-163									
(kc)									
	b1 (New)	123.0	1.54	2.04	3.1	1.34	2.06	1.0	1.5
	b1 (In Use)	93.0	15.90	2.04	32.4	1.34	21.40	1.0	15.9
	b1 (RFI)	92.0	32.80	2.04	67.0	1.34	44.00	1.0	32.8
	b2 (New)	321.0	32.60	2.04	66.5	1.34	43.80	1.0	32.6
	b2 (In Use)	288.0	139.00	2.04	383.0	1.34	187.00	1.0	139.0
	b2 (RFI)	322.0	72.60	2.04	146.8	1.34	96.50	1.0	72.6

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-4

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal								
Page C-164								
(ua)								
c1 (New)	10.0	17.30	2.04	35.2	1.34	22.90	1.0	17.30
c1 (In Use)	5.0	0.00	2.04	0.0	1.34	0.00	1.0	0.00
c1 (RFI)	0.0	0.00	2.04	0.0	1.34	0.00	1.0	0.00
c2 (New)	266.0	29.40	2.04	60.0	1.34	39.40	1.0	29.40
c2 (In Use)	261.0	10.60	2.04	21.6	1.34	14.20	1.0	10.60
c2 (RFI)	241.0	3.64	2.04	7.4	1.34	4.88	1.0	3.64
c3 (New)	328.0	33.50	2.04	68.3	1.34	45.00	1.0	33.50
c3 (In Use)	327.0	82.40	2.04	167.0	1.34	110.20	1.0	82.40
c3 (RFI)	300.0	34.80	2.04	71.0	1.34	46.90	1.0	34.80
c4 (New)	345.0	39.00	2.04	79.6	1.34	52.50	1.0	39.00
c4 (In Use)	341.0	61.00	2.04	124.2	1.34	82.00	1.0	61.00
c4 (RFI)	315.0	30.40	2.04	62.0	1.34	40.80	1.0	30.40
c5 (New)	258.0	55.50	2.04	113.0	1.34	74.60	1.0	55.50
c5 (In Use)	250.0	81.00	2.04	165.0	1.34	108.50	1.0	81.00
c5 (RFI)	316.0	20.20	2.04	41.2	1.34	27.20	1.0	20.20
c6 (New)	349.0	63.20	2.04	128.0	1.34	85.00	1.0	63.20
c6 (In Use)	336.0	44.50	2.04	91.0	1.34	59.80	1.0	44.50
c6 (RFI)	249.0	40.00	2.04	83.5	1.34	53.70	1.0	40.00
Audio Frequency Response								
Page C-166								
(db)								
(New)	3.27	0.47	2.04	0.96	1.34	6.30	1.0	0.47
(In Use)	3.17	1.10	2.04	2.24	1.34	1.47	1.0	1.10
(RFI)	2.18	0.57	2.04	1.16	1.34	0.77	1.0	0.57

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-4

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
AVC Characteristic								
Page C-167								
(db)								
(New)	3.5	1.92	2.04	3.9	1.34	2.60	1.0	1.9
(In Use)	4.6	1.93	2.04	3.9	1.34	2.60	1.0	1.9
(RFI)	6.1	2.42	2.04	4.9	1.34	3.25	1.0	2.4
Gain								
Page C-168								
(uv)								
(New)	94.0	134.0	2.04	264.0	1.34	1.80	1.0	134.0
(In Use)	346.0	565.0	2.04	1150.0	1.34	744.00	1.0	565.0
(RFI)	46.0	28.1	2.04	57.6	1.34	37.80	1.0	28.1
Noise Level								
Page C-169								
(db)								
(New)	34.4	3.04	2.04	6.20	1.34	4.06	1.0	3.04
(In Use)	35.2	0.70	2.04	1.42	1.34	0.94	1.0	0.70
(RFI)	36.6	1.13	2.04	2.30	1.34	1.51	1.0	1.13
End of Tabulation - VO-4								

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-4

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Bearing Accuracy								
Page C-178								
(Degrees)								
Plus (New)	5.8	2.75	2.04	5.6	1.34	3.69	1.0	2.75
Minus (New)	5.8	4.20	2.04	8.56	1.34	5.65	1.0	4.20
Deflection Linearity I								
Page C-179								
(Ratio)								
v1 (New)	4.10	1.36	2.04	2.88	1.34	1.82	1.0	1.36
v2 (New)	4.35	0.51	2.04	1.04	1.34	0.69	1.0	0.51
v3 (New)	3.75	0.59	2.04	1.21	1.34	0.79	1.0	0.59
Deflection Linearity II								
Page C-180								
(Ratio)								
v1 (New)	8.5	2.31	2.04	4.70	1.34	3.10	1.0	2.31
v2 (New)	8.2	1.18	2.04	2.40	1.34	1.58	1.0	1.18
v3 (New)	7.3	1.38	2.04	2.81	1.34	1.85	1.0	1.38
Deflection Linearity III								
Page C-181								
(Ratio)								
v1 (New)	14.1	4.15	2.04	8.45	1.34	5.56	1.0	4.15
v2 (New)	14.1	2.16	2.04	4.40	1.34	2.90	1.0	2.16
v3 (New)	11.9	2.51	2.04	5.11	1.34	3.37	1.0	2.51

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-5

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Sensitivity								
Page C-182								
Degrees (New)	8.8	0.55	2.04	1.12	1.34	0.74	1.0	0.55
ua (New)	80.3	5.60	2.04	11.40	1.34	7.50	1.0	5.60
Selectivity								
Page C-183								
(kc)								
b1 (New)	55.0	12.5	2.04	25.5	1.34	16.7	1.0	12.5
b2 (New)	409.0	34.1	2.04	70.0	1.34	45.7	1.0	34.1
Audio Frequency Response								
Page C-184								
(db)								
(New)	7.2	0.91	2.04	1.86	1.34	1.24	1.0	0.91
AVC Characteristic								
Page C-185								
(db)								
(New)	3.0	3.35	2.04	6.85	1.34	4.5	1.0	3.35
Gain								
Page C-186								
(uv)								
(New)	4.49	3.35	2.04	6.84	1.34	4.5	1.0	3.35
Noise Level								
Page C-187								
(db)								
(New)	35.8	4.2	2.04	8.56	1.34	5.64	1.0	4.2
End of Tabulation - VO-5								

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-5

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Bearing Accuracy								
Page C-196								
(Degrees)								
Plus (New)	20.0	37.63	---------	- Only	Two	Samples	Tested -	---------
(In Use)	37.5	3.04	---------	- Only	Two	Samples	Tested -	---------
(RFI)	49.8	28.90	2.04	59.0	1.34	38.8	1.0	28.9
Minus (New)	3.9	30.20	----------	- Only	Two	Samples	Tested-	---------
(In Use)	41.0	16.20	---------	- Only	Two	Samples	Tested-	---------
(RFI)	16.5	47.00	2.04	95.9	1.34	63.0	1.0	47.0
Deflection Linearity I								
Page C-197								
(Ratio)								
v1 (New)	---------	---------	---------	--- Not Applicable -------			---------	---------
v1 (In Use)	---------	---------	---------	--- Not Applicable -------			---------	---------
v1 (RFI)	8.5	6.99	2.04	14.2	1.34	9.35	1.0	6.99
v2 (New)	---------	---------	---------	--- Not Applicable ----------			---------	---------
v2 (In Use)	---------	---------	---------	--- Not Applicable ----------			---------	---------
v2 (RFI)	7.5	1.40	2.04	2.86	1.34	1.88	1.0	1.40
v3 (New)	---------	---------	---------	--- Not Applicable ----------			---------	---------
v3 (In Use)	---------	---------	---------	--- Not Applicable ----------			---------	---------
v3 (RFI)	4.5	0.79	2.04	1.61	1.34	1.06	1.0	0.79

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-6

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Linearity II Page C-198 (Ratio)								
v1 (New)	-------	-------	-------	------ Not Applicable ------			-------	-------
v1 (In Use)	-------	-------	-------	------ Not Applicable ------			-------	-------
v1 (RFI)	14.2	12.14	2.04	24.8	1.34	16.3	1.0	12.14
v2 (New)	-------	-------	-------	------ Not Applicable ------			-------	-------
v2 (In Use)	-------	-------	-------	------ Not Applicable ------			-------	-------
v2 (RFI)	16.1	2.69	2.04	5.48	1.34	3.61	1.0	2.69
v3 (New)	-------	-------	-------	------ Not Applicable ------			-------	-------
v3 (In Use)	-------	-------	-------	------ Not Applicable ------			-------	-------
v3 (RFI)	8.7	1.02	2.04	2.08	1.34	1.37	1.0	1.02
Deflection Linearity III Page C-199 (Ratio)								
v1 (New)	-------	-------	-------	------ Not Applicable ------			-------	-------
v1 (In Use)	-------	-------	-------	------ Not Applicable ------			-------	-------
v1 (RFI)	24.8	23.05	2.04	47.0	1.34	30.9	1.0	23.05
v2 (New)	-------	-------	-------	------ Not Applicable ------			-------	-------
v2 (In Use)	-------	-------	-------	------ Not Applicable ------			-------	-------
v2 (RFI)	27.8	4.79	2.04	9.75	1.34	6.40	1.0	4.79
v3 (New)	-------	-------	-------	------ Not Applicable ------			-------	-------
v3 (In Use)	-------	-------	-------	------ Not Applicable ------			-------	-------
v3 (RFI)	13.7	7.24	2.04	14.7	1.34	9.68	1.0	7.24

Table 1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-6

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Sensitivity								
Page C-200								
Degrees (New)	----------	----------	----------	------Not Applicable	--------		----------	----------
(In Use)	----------	----------	----------	------Not Applicable	--------		----------	----------
(RFI)	7.3	1.0	2.04	2.04	1.34	1.34	1.0	1.0
ua (New)	----------	----------	----------	------Not Applicable	--------		----------	----------
(In Use)	----------	----------	----------	------Not Applicable	--------		----------	---------
(RFI)	88.0	2.5	2.04	5.10	1.34	3.34	1.0	2.5
Selectivity								
Page C-201								
(kc)								
b1 (New)	147.0	1.98	----------	- Only	Two	Samples	Tested--	---------
b1 (In Use)	128.0	10.80	2.04	22.1	1.34	14.50	1.0	10.80
b1 (RFI)	142.0	7.00	2.04	14.3	1.34	9.36	1.0	7.00
b2 (New)	367.0	122.30	----------	- Only	Two	Samples	Tested--	---------
b2 (In Use)	388.0	107.65	2.04	219.0	1.34	144.00	1.0	107.70
b2 (RFI)	429.0	4.97	2.04	10.1	1.34	6.65	1.0	4.97
Audio Frequency Response								
Page C-202								
(db)								
(New)	2.4	0.99	----------	-- Only	Two	Samples	Tested--	---------
(In Use)	5.4	1.70	2.04	3.470	1.34	2.280	1.0	1.7
(RFI)	3.2	0.10	2.04	0.204	1.34	0.134	1.0	0.1

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-6

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
AVC Characteristic Page C-203 (db)								
(New)	5.3	4.1	----------	Only	Two	Samples	Tested--	----------
(In Use)	6.5	6.9	2.04	14.10	1.34	9.24	1.0	6.9
(RFI)	8.2	4.7	2.04	9.58	1.34	6.30	1.0	4.7
Gain Page C-204 (uv)								
(New)	2500.0	3489.0	----------	Only	Two	Samples	Tested--	----------
(In Use)	10000.0	2140.0	2.04	4360.0	1.34	2870.0	1.0	2140.0
(RFI)	1100.0	804.0	2.04	1640.0	1.34	1075.0	1.0	804.0
Noise Level Page C-205 (db)								
(New)	23.6	1.32	----------	Only	Two	Samples	Tested--	----------
(In Use)	35.1	4.18	2.04	8.53	1.34	5.60	1.0	4.18
(RFI)	28.0	1.95	2.04	3.98	1.34	2.62	1.0	1.95
End of Tabulation - VO-6	----------	----------	----------	----------	----------	----------	----------	----------

CONFIDENCE LIMIT INTERVAL - VOR RECEIVER - VO-6

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Centering Characteristic Page C-214 (ua)								
(New)	1.64	2.04	2.04	4.15	1.34	2.73	1.0	2.04
(In Use)	4.68	2.89	2.04	5.90	1.34	3.86	1.0	2.89
(RFI)	0.34	0.19	2.04	0.39	1.34	0.26	1.0	0.19
Selectivity Page C-215 (kc)								
b1 (New)	51.0	3.4	2.04	6.92	1.34	4.55	1.0	3.4
b1 (In Use)	51.0	6.3	2.04	12.85	1.34	8.45	1.0	6.3
b1 (RFI)	50.5	4.5	2.04	9.20	1.34	6.02	1.0	4.5
b2 (New)	158.0	6.4	2.04	13.00	1.34	8.58	1.0	6.4
b2 (In Use)	135.0	8.9	2.04	18.15	1.34	11.90	1.0	8.9
b2 (RFI)	122.0	22.7	2.04	46.30	1.34	30.50	1.0	22.7
Sensitivity & Deflection Page C-216 (%)								
(New)	5.5	5.90	2.04	12.00	1.34	7.90	1.0	5.90
(In Use)	5.0	2.36	2.04	4.81	1.34	3.17	1.0	2.36
(RFI)	8.9	4.85	2.04	9.89	1.34	6.50	1.0	4.85
Deflection Linearity Page C-217 (Ratio)								
(New)	1.16	0.7	2.04	1.430	1.34	0.94	1.0	0.7
(In Use)	1.70	0.4	2.04	0.815	1.34	0.54	1.0	0.4
(RFI)	0.96	0.1	2.04	0.204	1.34	0.13	1.0	0.1

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal								
Page C-218								
(ua)								
c1 (New)	312.0	12.6	2.04	25.70	1.34	16.90	1.0	12.6
c1 (In Use)	315.0	64.2	2.04	126.00	1.34	86.00	1.0	64.2
c1 (RFI)	340.0	17.3	2.04	35.30	1.34	23.20	1.0	17.3
c2 (New)	159.0	5.1	2.04	10.40	1.34	6.82	1.0	5.1
c2 (In Use)	170.0	53.0	2.04	108.00	1.34	71.00	1.0	53.0
c2 (RFI)	179.0	13.9	2.04	28.30	1.34	18.70	1.0	13.9
c3 (New)	185.0	6.0	2.04	12.20	1.34	8.04	1.0	6.0
c3 (In Use)	198.0	59.7	2.04	12.10	1.34	80.00	1.0	59.7
c3 (RFI)	172.0	66.4	2.04	135.00	1.34	89.00	1.0	66.4
c4 (New)	157.0	12.7	2.04	25.80	1.34	17.00	1.0	12.7
c4 (In Use)	128.0	75.4	2.04	154.00	1.34	101.00	1.0	75.4
c4 (RFI)	132.0	42.4	2.04	86.00	1.34	56.80	1.0	42.4
c5 (New)	166.0	31.4	2.04	63.90	1.34	42.00	1.0	31.4
c5 (In Use)	150.0	43.6	2.04	88.70	1.34	58.50	1.0	43.6
c5 (RFI)	132.0	37.4	2.04	76.00	1.34	50.00	1.0	37.4
c6 (New)	0.7	1.2	2.04	2.44	1.34	1.61	1.0	1.2
c6 (In Use)	0.0	0.0	2.04	0.00	1.34	0.00	1.0	0.0
c6 (RFI)	0.0	0.0	2.04	0.00	1.34	0.00	1.0	0.0
c7 (New)	1.7	2.9	2.04	5.90	1.34	3.89	1.0	2.9
c7 (In Use)	6.7	7.6	2.04	15.40	1.34	10.20	1.0	7.6
c7 (RFI)	15.0	15.0	2.04	30.50	1.34	20.10	1.0	15.0

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-1

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deviation Indicator Stability									
Page C-220									
(ua)									
Centering	f1 (New)	0.00	0.0	2.04	0.00	1.34	0.000	1.0	0.0
	f1 (In Use)	7.00	7.8	2.04	15.90	1.34	10.200	1.0	7.8
	f1 (RFI)	0.00	0.0	2.04	0.00	1.34	0.000	1.0	0.0
	f2 (New)	1.20	0.8	2.04	1.63	1.34	1.070	1.0	0.8
	f2 (In Use)	6.20	5.1	2.04	10.40	1.34	6.800	1.0	5.1
	f2 (RFI)	1.45	1.0	2.04	2.04	1.34	1.340	1.0	1.0
	f3 (New)	0.60	0.6	2.04	1.22	1.34	0.803	1.0	0.6
	f3 (In Use)	6.30	6.8	2.04	13.80	1.34	9.100	1.0	6.8
	f3 (RFI)	2.10	0.4	2.04	0.82	1.34	0.540	1.0	0.4
Deflection	f1 (New)	84.00	1.0	2.04	2.04	1.34	1.340	1.0	1.0
	f1 (In Use)	81.60	14.4	2.04	29.30	1.34	19.300	1.0	14.4
	f1 (RFI)	84.20	2.3	2.04	4.59	1.34	3.080	1.0	2.3
	f2 (New)	82.20	8.3	2.04	16.90	1.34	11.100	1.0	8.3
	f2 (In Use)	80.20	13.0	2.04	26.50	1.34	17.400	1.0	13.0
	f2 (RFI)	82.20	4.4	2.04	8.95	1.34	5.900	1.0	4.4
	f3 (New)	84.00	8.7	2.04	17.70	1.34	11.700	1.0	8.7
	f3 (In Use)	81.20	9.6	2.04	19.50	1.34	12.900	1.0	9.6
	f3 (RFI)	84.20	6.1	2.04	12.40	1.34	8.150	1.0	6.1
Percent Mod. Characteristic									
Page C-221									
(ua)									
	m1 (New)	0.00	0.0	2.04	0.00	1.34	0.00	1.0	0.0
	m1 (In Use)	0.00	0.0	2.04	0.00	1.34	0.00	1.0	0.0
	m1 (RFI)	0.00	0.0	2.04	0.00	1.34	0.00	1.0	0.0
	m2 (New)	1.30	1.5	2.04	3.05	1.34	2.01	1.0	1.5
	m2 (In Use)	12.30	12.8	2.04	26.00	1.34	17.20	1.0	12.8
	m2 (RFI)	1.70	2.0	2.04	4.08	1.34	2.68	1.0	2.0

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER -LO-1

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.									
Page C-222									
(ua)									
Centering	s1 (New)	1.00	1.0	2.04	2.04	1.34	1.34	1.0	1.0
Input 40 uv	s1 (In Use)	6.10	6.1	2.04	12.40	1.34	8.18	1.0	6.1
	s1 (RFI)	0.39	0.5	2.04	1.02	1.34	0.67	1.0	0.5
	s2 (New)	2.00	2.6	2.04	5.30	1.34	3.48	1.0	2.6
	s2 (In Use)	9.30	9.3	2.04	18.90	1.34	12.40	1.0	9.3
Centering	s2 (RFI)	0.70	1.1	2.04	2.24	1.34	1.48	1.0	1.1
Input 20, 000 uv	s1 (New)	1.00	1.0	2.04	2.04	1.34	1.34	1.0	1.0
	s1 (In Use)	6.50	8.2	2.04	16.70	1.34	11.00	1.0	8.2
	s1 (RFI)	0.20	0.3	2.04	0.61	1.34	0.40	1.0	0.3
	s2 (New)	1.30	2.3	2.04	4.68	1.34	3.08	1.0	2.3
	s2 (In Use)	9.00	10.4	2.04	21.30	1.34	13.90	1.0	10.4
	s2 (RFI)	1.00	1.0	2.04	2.04	1.34	1.34	1.0	1.0
Dev. Ind.Sensitivity Adjust.									
Page C-223									
(ua)									
Deflection	s1 (New)	59.0	3.0	2.04	6.12	1.34	4.02	1.0	3.0
Input 40 uv	s1 (In Use)	57.6	5.7	2.04	11.60	1.34	7.62	1.0	5.7
	s1 (RFI)	62.0	0.6	2.04	1.22	1.34	0.80	1.0	0.6
	s2 (New)	118.0	4.0	2.04	8.15	1.34	5.35	1.0	4.0
	s2 (In Use)	113.0	10.0	2.04	20.40	1.34	13.40	1.0	10.0
	s2 (RFI)	124.0	1.0	2.04	2.04	1.34	1.34	1.0	1.0
Deflection	s1 (New)	58.0	1.5	2.04	3.06	1.34	2.02	1.0	1.5
Input 20, 000 uv	s1 (In Use)	55.0	4.5	2.04	9.15	1.34	6.02	1.0	4.5
	s1 (RFI)	56.0	4.0	2.04	8.16	1.34	5.36	1.0	4.0
	s2 (New)	117.7	3.6	2.04	7.70	1.34	4.83	1.0	3.6
	s2 (In Use)	107.7	11.6	2.04	23.60	1.34	15.50	1.0	11.6
	s2 (RFI)	112.3	9.6	2.04	19.5	1.34	12.90	1.0	9.6

Table 1

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.								
Page C-224								
(Ratio)								
Linearity s1 (New)	1.07	0.4	2.04	0.82	1.34	0.54	1.0	0.4
s1 (In Use)	2.60	1.6	2.04	3.26	1.34	2.13	1.0	1.6
s1 (RFI)	0.99	0.2	2.04	0.41	1.34	0.27	1.0	0.2
s2 (New)	1.07	0.4	2.04	0.82	1.34	0.54	1.0	0.4
s2 (In Use)	2.90	2.9	2.04	5.92	1.34	3.89	1.0	2.9
s2 (RFI)	0.85	0.1	2.04	0.20	1.34	0.13	1.0	0.1
Audio Frequency Response								
Page C-225								
(db)								
(New)	2.90	0.7	2.04	1.41	1.34	0.938	1.0	0.7
(In Use)	3.42	1.3	2.04	2.64	1.34	1.74	1.0	1.3
(RFI)	5.20	3.2	2.04	6.51	1.34	4.29	1.0	3.2
End of Tabulation - LO-1 ---	---	---	---	---	---	---	---	---

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Centering Characteristic								
Page C-234								
(ua)								
(New)	0.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00
(In Use)	2.50	2.20	2.04	4.49	1.34	2.95	1.0	2.20
(RFI)	0.83	1.02	2.04	2.08	1.34	1.37	1.0	1.02
Selectivity								
Page C-235								
(kc)								
b1 (New)	52.0	10.4	2.04	21.20	1.34	13.90	1.0	10.4
b1 (In Use)	34.0	4.1	2.04	8.39	1.34	5.50	1.0	4.1
b1 (RFI)	32.0	1.5	2.04	3.06	1.34	2.01	1.0	1.5
b2 (New)	131.0	8.3	2.04	16.98	1.34	11.10	1.0	8.3
b2 (In Use)	114.0	59.2	2.04	120.00	1.34	79.40	1.0	59.2
b2 (RFI)	101.0	48.5	2.04	99.90	1.34	65.00	1.0	48.5
Sensitivity & Deflection								
Page C-236								
(%)								
(New)	12.2	1.10	2.04	2.24	1.34	1.48	1.0	1.10
(In Use)	4.3	1.18	2.04	2.41	1.34	1.58	1.0	1.18
(RFI)	5.2	0.74	2.04	1.51	1.34	0.99	1.0	0.74
Deflection Linearity								
Page C-237								
(Ratio)								
(New)	0.66	0.10	2.04	0.20	1.34	0.13	1.0	0.10
(In Use)	1.15	0.31	2.04	0.62	1.34	0.42	1.0	0.31
(RFI)	5.50	0.15	2.04	0.31	1.34	0.20	1.0	0.15

Table 1

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal Page C-238 (ua)								
c1 (New)	255.0	8.7	2.04	17.70	1.34	11.65	1.0	8.7
c1 (In Use)	325.0	36.1	2.04	73.50	1.34	48.40	1.0	36.1
c1 (RFI)	295.0	31.4	2.04	63.90	1.34	44.00	1.0	31.4
c2 (New)	10.8	11.0	2.04	22.40	1.34	14.70	1.0	11.0
c2 (In Use)	203.0	30.4	2.04	61.70	1.34	47.00	1.0	30.4
c2 (RFI)	184.0	13.5	2.04	27.50	1.34	18.10	1.0	13.5
c3 (New)	170.0	10.0	2.04	20.40	1.34	13.40	1.0	10.0
c3 (In Use)	202.0	25.3	2.04	51.50	1.34	33.90	1.0	25.3
c3 (RFI)	183.0	11.5	2.04	23.40	1.34	15.40	1.0	11.5
c4 (New)	126.0	15.1	2.04	30.50	1.34	20.25	1.0	15.1
c4 (In Use)	138.0	22.6	2.04	46.00	1.34	30.40	1.0	22.6
c4 (RFI)	132.0	5.8	2.04	11.80	1.34	7.78	1.0	5.8
c5 (New)	134.0	4.5	2.04	9.15	1.34	6.02	1.0	4.5
c5 (In Use)	157.0	20.8	2.04	44.40	1.34	27.90	1.0	20.8
c5 (RFI)	157.0	20.8	2.04	44.40	1.34	27.90	1.0	20.8
c6 (New)	000.0	00.0	2.04	00.00	1.34	00.00	1.0	00.0
c6 (In Use)	000.0	00.0	2.04	00.00	1.34	00.00	1.0	00.0
c6 (RFI)	18.0	29.2	2.04	59.30	1.34	39.00	1.0	29.2
c7 (New)	00.0	00.0	2.04	00.00	1.34	00.00	1.0	00.0
c7 (In Use)	00.0	00.0	2.04	00.00	1.34	00.00	1.0	00.0
c7 (RFI)	33.4	29.9	2.04	58.80	1.34	38.60	1.9	28.9

Table 1

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-2

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val	Limits
Deviation Indicator Stability									
Page C-239									
(ua)									
Centering	f1 (New)	0.4	0.58	2.04	1.18	1.34	0.78	1.0	0.58
	f1 (In Use)	2.0	1.00	2.04	2.04	1.34	1.34	1.0	1.00
	f1 (RFI)	0.4	0.58	2.04	1.18	1.34	0.78	1.0	0.58
	f2 (New)	0.6	1.20	2.04	2.45	1.34	1.61	1.0	1.20
	f2 (In Use)	2.0	2.00	2.04	4.08	1.34	2.64	1.0	2.00
	f2 (RFI)	0.8	1.00	2.04	2.04	1.34	1.34	1.0	1.00
	f3 (New)	1.7	0.58	2.04	1.18	1.34	0.78	1.0	0.58
	f3 (In Use)	2.3	2.10	2.04	4.18	1.34	2.68	1.0	2.10
	f3 (RFI)	1.3	0.28	2.04	0.57	1.34	0.38	1.0	0.28
Deflection	f1 (New)	90.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	f1 (In Use)	91.0	9.80	2.04	20.00	1.34	13.10	1.0	9.80
	f1 (RFI)	82.0	0.00	2.04	00.00	1.34	0.00	1.0	9.80
	f2 (New)	87.0	1.20	2.04	2.45	1.34	1.61	1.0	1.20
	f2 (In Use)	88.0	9.90	2.04	20.25	1.34	13.20	1.0	9.90
	f2 (RFI)	75.0	4.10	2.04	8.36	1.34	5.50	1.0	4.10
	f3 (New)	91.0	1.20	2.04	2.45	1.34	1.61	1.0	1.20
	f3 (In Use)	92.0	10.60	2.04	21.60	1.34	14.20	1.0	10.60
	f3 (RFI)	83.0	0.58	2.04	1.18	1.34	0.78	1.0	0.58
Percent Mod. Characteristic									
Page C-240									
(ua)									
	m1 (New)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	m1 (In Use)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	m1 (RFI)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	m2 (New)	1.5	1.30	2.04	2.65	1.34	1.75	1.0	1.30
	m2 (In Use)	2.8	1.60	2.04	3.27	1.34	2.15	1.0	1.60
	m2 (RFI)	2.3	0.58	2.04	1.18	1.34	0.78	1.0	0.58

Table 1

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-2

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.									
Page C-241									
(ua)									
Centering	s1 (New)	2.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00
Input 40 uv	s1 (In Use)	1.65	0.58	2.04	1.18	1.34	0.78	1.0	0.58
	s1 (RFI)	1.20	0.72	2.04	1.47	1.34	0.97	1.0	0.72
	s2 (New)	2.00	1.52	2.04	3.10	1.34	2.04	1.0	1.52
	s2 (In Use)	2.30	3.60	2.04	7.35	1.34	4.84	1.0	3.60
	s2 (RFI)	1.20	1.10	2.04	2.25	1.34	1.48	1.0	1.10
Centering	s1 (New)	2.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00
Input 20,000 uv	s1 (In Use)	2.30	1.10	2.04	2.25	1.34	1.48	1.0	1.10
	s1 (RFI)	1.20	0.47	2.04	0.96	1.34	0.63	1.0	0.47
	s2 (New)	1.70	1.50	2.04	3.06	1.34	2.01	1.0	1.50
	s2 (In Use)	3.30	2.30	2.04	4.70	1.34	3.09	1.0	2.30
	s2 (RFI)	4.60	1.00	2.04	2.04	1.34	1.34	1.0	1.00
Dev. Ind. Sensitivity Adjust.									
Page C-242									
(ua)									
Deflection	s1 (New)	54.00	0.58	2.04	1.18	1.34	0.78	1.0	0.58
Input 40 uv	s1 (In Use)	57.50	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	s1 (RFI)	58.00	1.20	2.04	2.45	1.34	1.60	1.0	1.20
	s2 (New)	110.00	2.10	2.04	4.30	1.34	2.81	1.0	2.10
	s2 (In Use)	117.00	1.00	2.04	2.04	1.34	1.34	1.0	1.00
	s2 (RFI)	114.00	7.40	2.04	15.10	1.34	9.90	1.0	7.40
Deflection	s1 (New)	62.00	1.00	2.04	2.04	1.34	1.34	1.0	1.00
Input 20,000 uv	s1 (In Use)	61.00	1.00	2.04	2.04	1.34	1.34	1.0	1.00
	s1 (RFI)	61.50	0.58	2.04	1.18	1.34	0.78	1.0	0.58
	s2 (New)	125.00	1.50	2.04	3.06	1.34	2.00	1.0	1.50
	s2 (In Use)	121.00	2.10	2.04	4.30	1.34	2.81	1.0	2.10
	s2 (RFI)	123.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.								
Page C-243								
(Ratio)								
Linearity s1 (New)	1.55	0.18	2.04	0.37	1.34	0.24	1.0	0.18
s1 (In Use)	1.32	0.57	2.04	1.16	1.34	0.77	1.0	0.57
s1 (RFI)	1.12	0.23	2.04	0.47	1.34	0.31	1.0	0.23
s2 (New)	1.07	0.35	2.04	0.73	1.34	0.47	1.0	0.35
s2 (In Use)	0.95	0.70	2.04	1.43	1.34	0.94	1.0	0.70
s2 (RFI)	1.18	0.19	2.04	0.39	1.34	0.26	1.0	0.19
Audio Frequency Response								
Page C-244								
(db)								
(New)	1.9	0.12	2.04	0.25	1.34	0.17	1.0	0.12
(In Use)	2.4	0.54	2.04	1.10	1.34	0.73	1.0	0.54
(RFI)	1.5	0.43	2.04	.58	1.34	0.58	1.0	0.43
End of Tabulation - LO-2								

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Centering Characteristic Page C-252 (%)								
(New)	1.00	0.71	2.04	1.42	1.34	0.95	1.0	0.71
(In Use)	2.33	1.15	2.04	2.34	1.34	1.54	1.0	1.15
(RFI)	1.17	0.77	2.04	1.57	1.34	1.03	1.0	0.77
Selectivity Page C-253 (kc)								
b1 (New)	1.07	13.7	2.04	28.0	1.34	18.4	1.0	13.7
b1 (In Use)	80.00	81.4	2.04	166.0	1.34	109.0	1.0	81.4
b1 (RFI)	68.00	103.0	2.04	21.0	1.34	13.8	1.0	10.3
b2 (New)	208.00	23.7	2.04	48.4	1.34	31.9	1.0	23.7
b2 (In Use)	187.00	28.6	2.04	58.4	1.34	38.4	1.0	28.6
b2 (RFI)	236.00	182.6	2.04	371.0	1.34	244.0	1.0	182.6
Sens. & Defl. Characteristic Page C-254 (%)								
(New)	35.2	9.0	2.04	18.40	1.34	12.10	1.0	9.0
(In Use)	32.4	1.8	2.04	3.68	1.34	2.41	1.0	1.8
(RFI)	35.7	4.5	2.04	9.19	1.34	6.01	1.0	4.5
Deflection Linearity Page C-255 (Ratio)								
(New)	0.77	0.2	2.04	0.41	1.34	0.27	1.0	0.2
(In Use)	1.44	0.5	2.04	1.02	1.34	0.67	1.0	0.5
(RFI)	0.42	0.3	2.04	0.61	1.34	0.40	1.0	0.3

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal Page C-256 (ua)								
c1 (New)	390.0	21.8	2.04	44.50	1.34	29.20	1.0	21.8
c1 (In Use)	391.0	10.4	2.04	21.20	1.34	13.90	1.0	10.4
c1 (RFI)	388.0	23.0	2.04	46.90	1.34	30.80	1.0	23.0
c2 (New)	300.0	13.2	2.04	26.90	1.34	17.70	1.0	13.2
c2 (In Use)	295.0	10.0	2.04	20.40	1.34	13.40	1.0	10.0
c2 (RFI)	308.0	17.3	2.04	35.30	1.34	23.20	1.0	17.3
c3 (New)	292.0	12.6	2.04	25.70	1.34	16.90	1.0	12.6
c3 (In Use)	289.0	2.9	2.04	5.91	1.34	3.89	1.0	2.9
c3 (RFI)	302.0	16.7	2.04	34.10	1.34	2.24	1.0	16.7
c4 (New)	239.0	10.4	2.04	21.20	1.34	13.90	1.0	10.4
c4 (In Use)	225.0	4.6	2.04	9.40	1.34	6.15	1.0	4.6
c4 (RFI)	200.0	63.2	2.04	129.00	1.34	84.50	1.0	63.2
c5 (New)	240.0	18.9	2.04	38.60	1.34	25.30	1.0	18.9
c5 (In Use)	230.0	1.2	2.04	24.40	1.34	1.61	1.0	1.2
c5 (RFI)	220.0	11.5	2.04	23.40	1.34	15.40	1.0	11.5
c6 (New)	5.3	4.0	2.04	8.15	1.34	5.35	1.0	4.0
c6 (In Use)	3.7	3.3	2.04	6.74	1.34	4.41	1.0	3.3
c6 (RFI)	10.0	0.0	2.04	0.00	1.34	0.00	1.0	0.0
c7 (New)	1.7	2.9	2.04	5.91	1.34	3.89	1.0	2.9
c7 (In Use)	2.4	2.5	2.04	5.10	1.34	3.34	1.0	2.5
c7 (RFI)	6.6	2.9	2.04	5.91	1.34	3.89	1.0	2.9

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-3

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deviation Indicator Stability									
Page C-257									
(ua)									
Centering	f1 (New)	2.00	1.0	2.04	2.040	1.34	1.34	1.0	1.0
	f1 (In Use)	0.90	1.3	2.04	2.650	1.34	1.74	1.0	1.3
	f1 (RFI)	0.10	0.3	2.04	0.612	1.34	0.40	1.0	0.3
	f2 (New)	3.50	0.5	2.04	1.020	1.34	0.67	1.0	0.5
	f2 (In Use)	1.00	1.0	2.04	2.040	1.34	1.34	1.0	1.0
	f2 (RFI)	1.25	1.1	2.04	2.240	1.34	1.47	1.0	1.1
	f3 (New)	2.90	1.6	2.04	3.260	1.34	2.14	1.0	1.6
	f3 (In Use)	0.50	0.5	2.04	1.020	1.34	0.67	1.0	0.5
	f3 (RFI)	1.60	1.6	2.04	3.260	1.34	2.14	1.0	1.6
Deflection	f1 (New)	92.00	5.0	2.04	1.020	1.34	6.70	1.0	5.0
	f1 (In Use)	82.00	5.2	2.04	10.600	1.34	6.95	1.0	5.2
	f1 (RFI)	92.00	6.1	2.04	12.400	1.34	8.16	1.0	6.1
	f2 (New)	90.00	2.8	2.04	5.710	1.34	3.75	1.0	2.8
	f2 (In Use)	76.50	2.6	2.04	4.280	1.34	2.82	1.0	2.1
	f2 (RFI)	86.00	3.5	2.04	7.150	1.34	4.69	1.0	3.5
	f3 (New)	94.00	2.9	2.04	5.920	1.34	3.88	1.0	2.9
	f3 (In Use)	81.00	4.2	2.04	8.560	1.34	5.62	1.0	4.2
	f3 (RFI)	93.00	3.8	2.04	7.250	1.34	5.15	1.0	3.8
Percent Mod. Characteristic									
Page C-258									
(ua)									
	m1 (New)	0.00	0.0	2.04	0.00	1.34	0.00	1.0	0.0
	m1 (In Use)	0.70	1.1	2.04	2.24	1.34	1.47	1.0	1.1
	m1 (RFI)	0.00	0.0	2.04	0.00	1.34	0.00	1.0	0.0
	m2 (New)	2.70	2.3	2.04	4.70	1.34	3.08	1.0	2.3
	m2 (In Use)	1.45	2.2	2.04	4.50	1.34	2.95	1.0	2.2
	m2 (RFI)	0.50	0.5	2.04	1.02	1.34	0.67	1.0	0.5

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-3

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.									
Page C-259									
(ua)									
Centering	s1 (New)	0.68	1.2	2.04	2.44	1.34	1.61	1.0	1.2
Input 40 uv	s1 (In Use)	0.32	0.6	2.04	0.12	1.34	0.80	1.0	0.6
	s1 (RFI)	0.82	0.3	2.04	0.61	1.34	0.40	1.0	0.3
	s2 (New)	0.68	0.6	2.04	1.22	1.34	0.80	1.0	0.6
	s2 (In Use)	0.20	2.0	2.04	4.08	1.34	2.68	1.0	2.0
	s2 (RFI)	1.25	1.1	2.04	2.24	1.34	1.48	1.0	1.1
Centering	s1 (New)	0.68	0.6	2.04	0.12	1.34	0.80	1.0	0.6
Input 20, 000 uv	s1 (In Use)	1.18	0.8	2.04	1.63	1.34	1.07	1.0	0.8
	s1 (RFI)	0.68	1.2	2.04	2.44	1.34	1.61	1.0	1.2
	s2 (New)	3.00	0.0	2.04	0.00	1.34	0.00	1.0	0.0
	s2 (In Use)	4.00	1.0	2.04	2.04	1.34	1.34	1.0	1.0
	s2 (RFI)	1.00	1.7	2.04	3.48	1.34	2.28	1.0	1.7
Dev. Ind. Sensitivity Adjust.									
Page C-260									
(ua)									
Deflection	s1 (New)	50.0	0.0	2.04	0.00	1.34	0.00	1.0	0.0
Input 40 uv	s1 (In Use)	51.0	2.2	2.04	4.49	1.34	2.95	1.0	2.2
	s1 (RFI)	48.0	1.6	2.04	3.26	1.34	2.14	1.0	1.6
	s2 (New)	107.0	2.0	2.04	4.08	1.34	2.68	1.0	2.0
	s2 (In Use)	102.0	2.5	2.04	5.10	1.34	3.35	1.0	2.5
	s2 (RFI)	100.0	2.5	2.04	5.10	1.34	3.35	1.0	2.5
Deflection	s1 (New)	72.0	1.0	2.04	2.04	1.34	1.34	1.0	1.0
Input 20, 000 uv	s1 (In Use)	72.0	2.1	2.04	4.39	1.34	4.82	1.0	2.1
	s1 (RFI)	72.0	1.0	2.04	2.04	1.34	1.34	1.0	1.0
	s2 (New)	146.0	6.1	2.04	12.40	1.34	8.16	1.0	6.1
	s2 (In Use)	138.0	4.0	2.04	8.15	1.34	5.36	1.0	4.0
	s2 (RFI)	139.0	3.1	2.04	6.32	1.34	4.15	1.0	3.1

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Ord. Val.	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.								
Page C-261								
(Ratio)								
Linearity s1 (New)	0.88	0.4	2.04	0.82	1.34	0.54	1.0	0.4
s1 (In Use)	1.00	0.1	2.04	0.20	1.34	0.13	1.0	0.1
s1 (RFI)	1.30	0.5	2.04	1.02	1.34	0.62	1.0	0.5
s2 (New)	1.00	0.3	2.04	0.61	1.34	0.40	1.0	0.3
s2 (In Use)	1.39	0.1	2.04	0.20	1.34	0.13	1.0	0.1
s2 (RFI)	0.65	0.1	2.04	0.20	1.34	0.13	1.0	0.1
Audio Frequency Response								
Page C-262								
(db)								
(New)	3.2	0.3	2.04	0.61	1.34	4.02	1.0	0.3
(In Use)	4.5	2.4	2.04	4.90	1.34	6.56	1.0	2.4
(RFI)	2.4	0.6	2.04	12.24	1.34	0.80	1.0	0.6
End of Tabulation - LO-3								

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-3

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Centering Characteristic Page C-270 (ua)									
	(New)	1.78	3.08	2.04	4.24	1.34	4.12	1.0	3.08
Selectivity Page C-271 (kc)									
	b1 (New)	70.0	11.7	2.04	23.7	1.34	15.6	1.0	11.7
	b2 (New)	413.0	23.8	2.04	48.5	1.34	31.9	1.0	23.8
Sensitivity & Deflection Page C-272 (%)									
	(New)	31.3	14.4	2.04	29.6	1.34	19.2	1.0	14.4
Deflection Linearity Page C-273 (Ratio)									
	(New)	1.89	0.49	2.04	0.995	1.34	0.66	1.0	0.49
Dev. Indicator Stability Page C-274 (ua)									
Centering	f1 (New)	4.05	3.35	2.04	6.80	1.34	4.48	1.0	3.35
	f2 (New)	3.76	3.58	2.04	7.26	1.34	4.80	1.0	3.58
	f3 (New)	4.40	4.15	2.04	8.43	1.34	5.55	1.0	4.15
Deflection	f1 (New)	118.00	4.52	2.04	9.20	1.34	6.05	1.0	4.52
	f2 (New)	114.50	8.52	2.04	17.20	1.34	11.40	1.0	8.52
	f3 (New)	122.50	3.30	2.04	6.70	1.34	4.42	1.0	3.30

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-4

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Percent Mod. Characteristic								
Page C-275								
(ua)								
m1 (New)	0.25	0.57	2.04	1.17	1.34	0.77	1.0	0.57
m2 (New)	5.10	8.60	2.04	17.50	1.34	11.50	1.0	8.60
Audio Frequency Response								
Page C-276								
(db)								
(New)	6.9	0.73	2.04	1.50	1.34	0.99	1.0	0.73
End of Tabulation - LO-4								

CONFIDENCE LIMIT INTERVAL - LOCALIZER RECEIVER - LO-4

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Centering Characteristic								
Page C-285								
(%)								
(New)	2.6	0.63	2.04	1.28	1.34	0.85	1.0	0.63
(In Use)	1.7	0.92	2.04	1.88	1.34	1.23	1.0	0.92
(RFI)	1.5	0.63	2.04	1.28	1.34	0.85	1.0	0.63
Frequency Channel Selection								
Page C-286								
(kc - Minus Deviations)								
(New)	23.0	11.9	2.04	24.20	1.34	16.3	1.0	11.9
(In Use)	27.0	26.5	2.04	54.00	1.34	36.0	1.0	26.5
(RFI)	29.0	15.4	2.04	3.14	1.34	20.9	1.0	15.4
Sensitivity & Deflection Char.								
Page C-287								
(%)								
Δ v1 (New)	93.5	3.9	2.04	7.95	1.34	5.23	1.0	3.9
Δ v1 (In Use)	90.1	16.4	2.04	33.40	1.34	21.90	1.0	16.4
Δ v1 (RFI)	88.5	11.0	2.04	22.50	1.34	14.80	1.0	11.0
Δ v2 (New)	72.0	4.5	2.04	9.19	1.34	6.02	1.0	4.5
Δ v2 (In Use)	74.0	5.2	2.04	10.60	1.34	6.98	1.0	5.2
Δ v2 (RFI)	75.1	8.9	2.04	18.20	1.34	11.90	1.0	8.9

CONFIDENCE LIMIT INTERVAL - GLIDESLOPE RECEIVER - GS-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Selectivity Page C-289 (kc)								
fc (-530 kc) (New)	79.0	7.90	2.04	16.10	1.34	10.60	1.0	7.90
(In Use)	91.0	2.20	2.04	4.50	1.34	2.95	1.0	2.20
(RFI)	89.0	5.00	2.04	10.20	1.34	6.70	1.0	5.00
fc (-450 kc) (New)	81.5	10.40	2.04	21.20	1.34	13.90	1.0	10.40
(In Use)	93.2	4.60	2.04	9.40	1.34	6.40	1.0	4.60
(RFI)	89.2	5.00	2.04	10.20	1.34	6.70	1.0	5.00
fc (-230 kc) (New)	64.0	5.90	2.04	12.00	1.34	7.90	1.0	5.90
(In Use)	70.0	20.00	2.04	40.80	1.34	26.80	1.0	20.00
(RFI)	89.0	5.50	2.04	11.20	1.34	7.40	1.0	5.50
fc (-60 kc) (New)	3.0	2.30	2.04	4.70	1.34	3.10	1.0	2.30
(In Use)	1.0	0.36	2.04	0.74	1.34	0.48	1.0	0.36
(RFI)	3.5	4.30	2.04	8.80	1.34	5.75	1.0	4.30
fc (+60 kc) (New)	4.5	0.96	2.04	1.95	1.34	1.28	1.0	0.96
(In Use)	5.0	6.90	2.04	14.00	1.34	9.25	1.0	6.90
(RFI)	5.0	5.60	2.04	11.40	1.34	7.50	1.0	5.60
fc (+230 kc) (New)	57.5	2.20	2.04	4.50	1.34	2.95	1.0	2.20
(In Use)	55.8	5.40	2.04	11.00	1.34	7.25	1.0	5.40
(RFI)	63.2	20.00	2.04	40.90	1.34	26.80	1.0	20.00
fc (+450 kc) (New)	75.0	22.30	2.04	45.40	1.34	29.80	1.0	22.30
(In Use)	91.0	3.10	2.04	6.30	1.34	4.15	1.0	3.10
(RFI)	81.0	14.30	2.04	29.10	1.34	19.20	1.0	14.30
fc (+55 kc) (New)	81.5	6.30	2.04	12.80	1.34	8.4	1.0	6.30
(In Use)	91.0	2.20	2.04	4.50	1.34	2.95	1.0	2.20
(RFI)	89.0	5.00	2.04	10.20	1.34	6.70	1.0	5.00

Table 1

CONFIDENCE LIMIT INTERVAL - GLIDESLOPE RECEIVER - GS-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Linearity Page C-290 (Ratio)								
(New)	1.50	0.28	2.04	0.57	1.34	0.37	1.0	0.28
(In Use)	1.02	0.36	2.04	0.74	1.34	0.48	1.0	0.36
(RFI)	1.26	0.22	2.04	0.45	1.34	0.29	1.0	0.22
90 & 150 cps Phase Char. Page C-291 (ua)								
(New)	0.70	1.15	2.04	2.34	1.34	1.54	1.0	1.15
(In Use)	3.00	1.74	2.04	3.55	1.34	2.34	1.0	1.74
(RFI)	4.85	2.85	2.04	5.81	1.34	3.82	1.0	2.85

CONFIDENCE LIMIT INTERVAL - GLIDESLOPE RECEIVER - GS-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal Page C-292 (ua)								
c1 (New)	398.0	41.80	2.04	85.00	1.34	56.00	1.0	41.80
c1 (In Use)	450.0	86.60	2.04	176.00	1.34	116.00	1.0	86.60
c1 (RFI)	319.0	15.70	2.04	32.00	1.34	21.00	1.0	15.70
c2 (New)	295.0	15.40	2.04	31.30	1.34	20.60	1.0	15.40
c2 (In Use)	435.0	115.50	2.04	226.50	1.34	149.00	1.0	115.50
c2 (RFI)	285.0	7.32	2.04	14.95	1.34	9.80	1.0	7.32
c3 (New)	198.0	24.60	2.04	50.20	1.34	33.00	1.0	24.60
c3 (In Use)	312.0	152.00	2.04	310.00	1.34	204.00	1.0	152.00
c3 (RFI)	180.0	61.40	2.04	124.30	1.34	82.50	1.0	61.40
c4 (New)	292.0	38.60	2.04	78.80	1.34	51.80	1.0	38.60
c4 (In Use)	435.0	115.50	2.04	226.50	1.34	149.00	1.0	115.50
c4 (RFI)	278.0	28.30	2.04	57.50	1.34	37.90	1.0	28.30
c5 (New)	299.0	30.00	2.04	61.00	1.34	40.20	1.0	30.00
c5 (In Use)	435.0	114.00	2.04	232.00	1.34	153.00	1.0	114.00
c5 (RFI)	378.0	20.00	2.04	40.60	1.34	26.80	1.0	20.00
c6 (New)	190.0	55.60	2.04	112.60	1.34	74.50	1.0	55.60
c6 (In Use)	258.0	184.00	2.04	375.00	1.34	246.00	1.0	184.00
c6 (RFI)	222.0	19.00	2.04	38.60	1.34	25.50	1.0	19.00
c7 (New)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
c7 (In Use)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
c7 (RFI)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
c8 (New)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
c8 (In Use)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
c8 (RFI)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00

CONFIDENCE LIMIT INTERVAL - GLIDESLOPE RECEIVER - GS-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Indicator Stability								
Page C-294								
(ua)								
v1 (New)	1.3	0.58	2.04	1.190	1.34	0.78	1.0	0.580
v1 (In Use)	2.3	0.58	2.04	1.190	1.34	0.78	1.0	0.580
v1 (RFI)	2.0	1.00	2.04	2.040	1.34	1.34	1.0	1.000
v2 (New)	1.3	0.58	2.04	1.190	1.34	0.78	1.0	0.580
v2 (In Use)	2.7	0.58	2.04	1.185	1.34	0.78	1.0	0.580
v2 (RFI)	2.3	3.66	2.04	7.470	1.34	4.90	1.0	3.660
v3 (New)	0.8	0.04	2.04	0.076	1.34	0.05	1.0	0.370
v3 (In Use)	0.8	0.04	2.04	0.076	1.34	0.05	1.0	0.037
v3 (RFI)	0.8	0.37	2.04	0.760	1.34	0.50	1.0	0.370
v4 (New)	0.8	0.37	2.04	0.760	1.34	0.50	1.0	0.370
v4 (In Use)	0.8	0.38	2.04	0.730	1.34	0.51	1.0	0.380
v4 (RFI)	1.0	0.87	2.04	1.770	1.34	1.17	1.0	0.870

CONFIDENCE LIMIT INTERVAL - GLIDESLOPE RECEIVER - GS-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deviation Indicator Stability								
Page C-296								
(ua)								
m1 (New)	1.32	1.54	2.04	3.15	1.34	2.06	1.0	1.54
m1 (In Use)	3.00	3.00	2.04	6.12	1.34	4.01	1.0	3.00
m1 (RFI)	.67	1.20	2.04	2.45	1.34	1.60	1.0	1.20
m2 (New)	5.67	4.70	2.04	9.60	1.34	6.29	1.0	4.70
m2 (In Use)	3.17	1.60	2.04	3.27	1.34	2.14	1.0	1.60
m2 (RFI)	2.00	2.00	2.04	4.08	1.34	2.68	1.0	2.00
m3 (New)	1.67	1.50	2.04	3.07	1.34	2.01	1.0	1.50
m3 (In Use)	6.00	2.00	2.04	40.80	1.34	2.68	1.0	2.00
m3 (RFI)	8.30	6.70	2.04	13.70	1.34	8.96	1.0	6.70
m4 (New)	88.60	1.50	2.04	3.06	1.34	2.01	1.0	1.50
m4 (In Use)	120.30	25.50	2.04	52.00	1.34	69.80	1.0	25.50
m4 (RFI)	89.00	1.70	2.04	3.47	1.34	2.27	1.0	1.70
m5 (New)	88.60	6.20	2.04	12.70	1.34	8.30	1.0	6.20
m5 (In Use)	101.70	18.50	2.04	37.80	1.34	24.80	1.0	18.50
m5 (RFI)	85.70	5.10	2.04	10.40	1.34	6.81	1.0	5.10
m6 (New)	88.30	2.50	2.04	5.13	1.34	3.35	1.0	2.50
m6 (In Use)	98.00	28.40	2.04	58.00	1.34	37.90	1.0	28.40
m6 (RFI)	90.00	7.20	2.04	14.70	1.34	9.65	1.0	7.20
Dev. Ind. Sensitivity Adjust.								
Page C-298								
(%)								
a1 (New)	15.0	5.5	2.04	11.40	1.34	7.38	1.0	5.5
a1 (In Use)	18.0	7.0	2.04	14.28	1.34	9.38	1.0	7.0
a1 (RFI)	19.0	13.3	2.04	27.20	1.34	17.80	1.0	13.3
b1 (New)	97.0	5.8	2.04	11.80	1.34	7.78	1.0	5.8
b1 (In Use)	100.0	0.0	2.04	0.00	1.34	0.00	1.0	0.0
b1 (RFI)	94.0	6.8	2.04	12.40	1.34	9.10	1.0	6.8

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-1

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.									
Page C-300									
(%)									
Centering	v1 (New)	0.0	0.00	2.04	0.000	1.34	0.000	1.0	0.00
	v1 (In Use)	1.7	1.52	2.04	3.100	1.34	2.030	1.0	1.52
	v1 (RFI)	1.3	2.32	2.04	4.740	1.34	3.110	1.0	2.32
	v2 (New)	0.3	0.58	2.04	1.180	1.34	0.776	1.0	0.58
	v2 (In Use)	4.3	3.05	2.04	6.200	1.34	4.150	1.0	3.05
	v2 (RFI)	3.0	2.65	2.04	5.400	1.34	3.550	1.0	2.65
	v3 (New)	2.7	1.15	2.04	2.340	1.34	1.540	1.0	1.15
	v3 (In Use)	2.7	0.58	2.04	1.180	1.34	0.766	1.0	0.58
	v3 (RFI)	0.5	0.22	2.04	0.449	1.34	0.295	1.0	0.22
	v4 (New)	4.3	2.08	2.04	4.450	1.34	2.780	1.0	2.08
	v4 (In Use)	4.3	1.53	2.04	3.120	1.34	2.050	1.0	1.53
	v4 (RFI)	1.3	1.03	2.04	2.100	1.34	1.360	1.0	1.03
Dev. Ind. Sensitivity Adjust.									
Page C-301									
(%)									
Deflection	v1 (New)	60.0	1.70	2.04	3.46	1.34	2.28	1.0	1.70
	v1 (In Use)	62.0	1.15	2.04	2.34	1.34	1.54	1.0	1.15
	v1 (RFI)	62.0	1.15	2.04	2.34	1.34	1.54	1.0	1.15
	v2 (New)	120.0	0.58	2.04	1.18	1.34	0.78	1.0	0.58
	v2 (In Use)	122.0	4.04	2.04	8.24	1.34	5.41	1.0	4.04
	v2 (RFI)	121.0	2.30	2.04	4.69	1.34	3.08	1.0	2.30
	v3 (New)	59.0	1.00	2.04	2.04	1.34	1.34	1.0	1.00
	v3 (RFI)	60.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	v3 (RFI)	60.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	v4 (New)	121.0	0.58	2.04	1.18	1.34	0.70	1.0	0.58
	v4 (In Use)	122.0	1.16	2.04	2.36	1.34	1.56	1.0	1.16
	v4 (RFI)	120.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.								
Page C-303								
(Ratio)								
Linearity s1 (New)	1.48	0.35	2.04	0.720	1.34	0.42	1.0	0.35
s1 (In Use)	2.39	3.12	2.04	6.360	1.34	4.18	1.0	3.12
s1 (RFI)	1.30	0.98	2.04	2.000	1.34	1.31	1.0	0.98
s2 (New)	1.40	0.26	2.04	0.530	1.34	0.35	1.0	0.26
s2 (In Use)	1.30	1.00	2.04	2.040	1.34	1.34	1.0	1.00
s2 (RFI)	1.28	0.38	2.04	0.775	1.34	0.51	1.0	0.38
Power Source Frequency								
Variation								
Page C-305								
(ua)								
(New)	1.0	1.00	2.04	2.04	1.34	1.34	1.0	1.00
(In Use)	0.7	0.36	2.04	0.73	1.34	0.48	1.0	0.36
(RFI)	7.0	4.60	2.04	9.36	1.34	6.16	1.0	4.60
End of Tabulation - GS-1								

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-1

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Centering Characteristic								
Page C-313								
(%)								
(New)	2.38	1.92	2.04	3.92	1.34	2.57	1.0	1.92
(In Use)	2.90	0.13	2.04	0.27	1.34	0.17	1.0	0.13
(RFI)	0.38	0.15	2.04	1.31	1.34	0.20	1.0	0.15
Frequency Channel Selection								
Page C-314								
(kc - Minus Deviations)								
(New)	31.8	12.10	2.04	24.7	1.34	16.2	1.0	12.10
(In Use)	14.0	10.15	2.04	20.7	1.34	13.6	1.0	10.15
(RFI)	8.5	20.9	2.04	42.5	1.34	28.0	1.0	20.90
Sensitivity & Deflection Char								
Page C-315								
(%)								
Δ v1 (New)	98.0	1.01	2.04	2.06	1.34	1.35	1.0	1.01
Δ v1 (In Use)	102.0	1.50	2.04	3.06	1.34	2.01	1.0	1.50
Δ v1 (RFI)	96.5	1.16	2.04	2.36	1.34	1.55	1.0	1.16
Δ v2 (New)	100.3	1.09	2.04	2.22	1.34	1.46	1.0	1.09
Δ v2 (In Use)	102.0	1.97	2.04	4.02	1.34	2.64	1.0	1.97
Δ v2 (RFI)	90.2	1.91	2.04	3.89	1.34	2.56	1.0	1.91

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Selectivity								
Page C-316								
(db)								
fc (-530 kc) (New)	93.50	1.82	2.04	3.70	1.34	2.44	1.0	1.82
(In Use)	94.00	---	--Only	One	Sample	Tested	---	---
(RFI)	---	---	---	--No	Data	---	---	---
fc (-450 kc) (New)	93.50	1.82	2.04	3.70	1.34	2.44	1.0	1.82
(In Use)	99.90	12.40	2.04	25.20	1.34	16.60	1.0	12.40
(RFI)	86.50	6.75	2.04	13.70	1.34	9.05	1.0	6.75
fc (-230 kc) (New)	67.00	14.80	2.04	30.20	1.34	19.90	1.0	14.80
(In Use)	99.90	12.40	2.04	25.20	1.34	16.60	1.0	12.40
(RFI)	86.10	6.75	2.04	13.70	1.34	9.05	1.0	6.75
fc (-60 kc) (New)	0.75	0.68	2.04	1.38	1.34	0.91	1.0	0.68
(In Use)	3.00	5.40	2.04	11.00	1.34	7.22	1.0	5.40
(RFI)	1.50	1.62	2.04	3.30	1.34	2.17	1.0	1.62
fc (+60 kc) (New)	6.20	1.15	2.04	2.34	1.34	1.52	1.0	1.15
(In Use)	4.70	6.90	2.04	14.00	1.34	9.25	1.0	6.90
(RFI)	1.50	2.37	2.04	4.83	1.34	3.18	1.0	2.37
fc (+230 kc) (New)	67.00	14.00	2.04	28.50	1.34	18.80	1.0	14.00
(In Use)	85.00	38.00	2.04	77.50	1.34	50.90	1.0	38.00
(RFI)	73.00	21.00	2.04	42.80	1.34	28.20	1.0	21.00
fc (+450 kc) (New)	80.50	25.50	2.04	51.90	1.34	34.20	1.0	25.50
(In Use)	99.90	12.40	2.04	25.20	1.34	16.60	1.0	12.40
(RFI)	86.50	6.75	2.04	13.70	1.34	9.05	1.0	6.75
fc (+530 kc) (New)	93.50	1.82	2.04	3.70	1.34	2.44	1.0	1.82
(In Use)	99.90	12.40	2.04	25.20	1.34	16.60	1.0	12.40
(RFI)	86.00	6.75	2.04	13.70	1.34	9.05	1.0	6.75

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Linearity Page C-317 (Ratio)								
(New)	1.30	0.00	2.04	0.00	1.34	0.00	1.0	0.00
(In Use)	2.00	0.70	2.04	1.42	1.34	0.94	1.0	0.70
(RFI)	1.02	0.16	2.04	0.33	1.34	0.22	1.0	0.16
90 & 150 cps Phase Char. Page C-318 (ua)								
(New)	0.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00
(In Use)	8.30	2.55	2.04	5.20	1.34	3.41	1.0	2.55
(RFI)	4.30	2.31	2.04	4.72	1.34	3.10	1.0	2.31

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal Page C-319 (ua)								
c1 (New)	360.0	8.0	2.04	16.3	1.34	10.7	1.0	8.0
c1 (In Use)	330.0	148.0	2.04	302.0	1.34	19.8	1.0	148.0
c1 (RFI)	369.0	45.0	2.04	91.9	1.34	60.1	1.0	45.0
c2 (New)	360.0	8.0	2.04	16.3	1.34	10.7	1.0	8.0
c2 (In Use)	284.0	192.0	2.04	391.0	1.34	257.0	1.0	192.0
c2 (RFI)	362.0	37.0	2.04	77.2	1.34	49.5	1.0	37.0
c3 (New)	170.0	17.6	2.04	35.9	1.34	23.6	1.0	17.6
c3 (In Use)	98.0	53.5	2.04	109.0	1.34	71.8	1.0	53.5
c3 (RFI)	140.0	45.5	2.04	92.8	1.34	61.0	1.0	45.5
c4 (New)	240.0	10.0	2.04	20.4	1.34	13.4	1.0	10.0
c4 (In Use)	171.0	124.0	2.04	253.0	1.34	166.0	1.0	124.0
c4 (RFI)	252.0	53.5	2.04	109.0	1.34	71.8	1.0	53.5
c5 (New)	240.0	10.0	2.04	20.4	1.34	134.0	1.0	10.0
c5 (In Use)	149.0	85.0	2.04	173.0	1.34	114.0	1.0	85.0
c5 (RFI)	252.0	49.2	2.04	100.0	1.34	65.9	1.0	49.2
c6 (New)	168.0	7.6	2.04	15.5	1.34	10.2	1.0	7.6
c6 (In Use)	120.0	95.2	2.04	194.0	1.34	128.0	1.0	95.2
c6 (RFI)	175.0	39.0	2.04	79.5	1.34	52.3	1.0	39.0
c7 (New)	00.0	00.0	2.04	00.0	1.34	00.0	1.0	00.0
c7 (In Use)	00.0	00.0	2.04	00.0	1.34	00.0	1.0	00.0
c7 (RFI)	00.0	00.0	2.04	00.0	1.34	00.0	1.0	00.0
c8 (New)	00.0	00.0	2.04	00.0	1.34	00.0	1.0	00.0
c8 (In Use)	00.0	00.0	2.04	00.0	1.34	00.0	1.0	00.0
c8 (RFI)	00.0	00.0	2.04	00.0	1.34	00.0	1.0	00.0

Table 1

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Indicator Stability								
Page C-321								
(ua)								
v1 (New)	0.58	0.91	2.04	1.86	1.34	1.22	1.0	0.91
v1 (In Use)	0.60	0.23	2.04	0.47	1.34	0.31	1.0	0.23
v1 (RFI)	1.50	1.30	2.04	2.65	1.34	1.74	1.0	1.30
v2 (New)	0.55	0.90	2.04	1.82	1.34	1.21	1.0	0.90
v2 (In Use)	1.30	0.58	2.04	1.18	1.34	0.78	1.0	0.58
v2 (RFI)	2.00	2.00	2.04	4.08	1.34	2.68	1.0	2.00
v3 (New)	0.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00
v3 (In Use)	0.50	0.50	2.04	10.20	1.34	0.67	1.0	0.50
v3 (RFI)	0.70	0.68	2.04	1.39	1.34	0.91	1.0	0.68
v4 (New)	0.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00
v4 (In Use)	0.69	0.60	2.04	1.22	1.34	0.80	1.0	0.60
v4 (RFI)	0.33	0.20	2.04	0.41	1.34	0.27	1.0	0.20

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deviation Indicator Stability								
Page C-322								
(ua)								
m1 (New)	89.00	1.15	2.04	2.34	1.34	1.52	1.0	1.15
m1 (In Use)	75.00	12.10	2.04	24.60	1.34	16.20	1.0	12.10
m1 (RFI)	90.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00
m2 (New)	84.80	2.08	2.04	4.24	1.34	2.79	1.0	2.08
m2 (In Use)	71.00	8.30	2.04	16.90	1.34	11.10	1.0	8.30
m2 (RFI)	97.00	15.90	2.04	32.40	1.34	21.30	1.0	15.90
m3 (New)	91.30	3.00	2.04	6.10	1.34	4.01	1.0	3.00
m3 (In Use)	73.20	11.70	2.04	23.80	1.34	15.60	1.0	11.70
m3 (RFI)	83.00	13.70	2.04	27.90	1.34	18.30	1.0	13.70
m4 (New)	1.00	1.00	2.04	2.04	1.34	1.34	1.0	1.00
m4 (In Use)	4.00	4.00	2.04	8.15	1.34	5.35	1.0	4.00
m4 (RFI)	0.00	0.00	2.04	0.00	1.34	0.00	1.0	0.00
m5 (New)	2.00	2.00	2.04	4.08	1.34	2.68	1.0	2.00
m5 (In Use)	3.25	1.15	2.04	2.34	1.34	1.52	1.0	1.15
m5 (RFI)	7.70	9.90	2.04	20.20	1.34	13.20	1.0	9.90
m6 (New)	1.70	2.08	2.04	4.24	1.34	2.79	1.0	2.08
m6 (In Use)	5.70	1.15	2.04	2.34	1.34	1.52	1.0	1.15
m6 (RFI)	7.80	10.50	2.04	21.40	1.34	14.00	1.0	10.50
Dev. Ind. Sensitivity Adjust.								
Page C-324								
(%)								
a1 (New)	0.0	0.0	2.04	0.0	1.34	0.0	1.0	0.0
a1 (In Use)	0.0	0.0	2.04	0.0	1.34	0.0	1.0	0.0
a1 (RFI)	0.0	0.0	2.04	0.0	1.34	0.0	1.0	0.0
b1 (New)	131.0	16.3	2.04	33.1	1.34	21.8	1.0	16.3
b1 (In Use)	144.0	9.2	2.04	18.7	1.34	12.3	1.0	9.2
b1 (RFI)	141.0	15.0	2.04	30.5	1.34	20.1	1.0	15.0

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-2

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.									
Page C-325									
(%)									
Centering	Δv1 (New)	1.10	1.91	2.04	3.89	1.34	2.55	1.0	1.91
	Δv1 (In Use)	1.68	1.31	2.04	2.67	1.34	1.75	1.0	1.31
	Δv1 (RFI)	0.93	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	Δv2 (New)	2.38	1.47	2.04	3.00	1.34	1.96	1.0	1.47
	Δv2 (In Use)	4.65	2.10	2.04	4.28	1.34	2.81	1.0	2.10
	Δv2 (RFI)	0.60	0.63	2.04	1.28	1.34	0.84	1.0	0.63
Dev. Ind. Sensitivity Adjust.									
Page C-326									
(%)									
Deflection	Δv1 (New)	100.0	3.3	2.04	6.72	1.34	4.40	1.0	3.3
	Δv1 (In Use)	99.0	2.4	2.04	4.90	1.34	3.21	1.0	2.4
	Δv1 (RFI)	97.0	3.8	2.04	7.75	1.34	5.08	1.0	3.8
	Δv2 (New)	98.0	2.9	2.04	5.92	1.34	3.88	1.0	2.9
	Δv2 (In Use)	101.0	2.2	2.04	4.48	1.34	2.94	1.0	2.2
	Δv2 (RFI)	102.0	7.0	2.04	14.30	1.34	9.45	1.0	7.0
	Δv3 (New)	99.0	2.5	2.04	5.09	1.34	3.34	1.0	2.5
	Δv3 (In Use)	99.0	2.9	2.04	5.92	1.34	3.88	1.0	2.9
	Δv3 (RFI)	99.5	2.9	2.04	5.92	1.34	3.88	1.0	2.9
	Δv4 (New)	98.0	2.2	2.04	4.48	1.34	2.94	1.0	2.2
	Δv4 (In Use)	103.0	2.5	2.04	5.09	1.34	3.34	1.0	2.5
	Δv4 (RFI)	97.0	4.3	2.04	8.76	1.34	5.75	1.0	4.3

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Defl. Ind. Sensitivity Adjust.								
Page C-328								
(Ratio)								
Linearity s1 (New)	1.20	0.158	2.04	0.32	1.34	0.210	1.0	0.16
s1 (In Use)	2.60	0.590	2.04	1.20	1.34	0.790	1.0	0.59
s1 (RFI)	1.40	0.600	2.04	1.22	1.34	0.801	1.0	0.60
s2 (New)	1.40	0.470	2.04	0.96	1.34	0.630	1.0	0.47
s2 (In Use)	2.00	0.620	2.04	1.28	1.34	0.830	1.0	0.68
s2 (RFI)	1.82	0.520	2.04	1.06	1.34	0.700	1.0	0.52
Power Source								
Frequency Variation								
Page C-329								
(%)								
(New)	----------	----------	----------	Not Applicable	----------	----------	----------	----------
(In Use)	1.75	.35	---Only	Two	Samples	Tested-	----------	----------
(RFI)	1.50	.71	---Only	Two	Samples	Tested-	----------	----------
End of Tabulation - GS-2 ---	----------	----------	----------	----------	----------	----------	----------	----------

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-2

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Centering Characteristic								
Page C-337								
(%)								
(New)	2.80	2.10	2.04	4.29	1.34	2.81	1.0	2.10
(In Use)	1.73	0.63	2.04	1.29	1.34	0.84	1.0	0.63
(RFI)	1.80	0.63	2.04	1.29	1.34	0.84	1.0	0.63
Frequency Channel Selection								
Page C-338								
(kc)								
(Plus Deviations) (New)	5.7	24.8	2.04	50.6	1.34	33.3	1.0	24.8
(Minus Deviations) (In Use)	4.6	12.2	2.04	24.8	1.34	16.3	1.0	12.2
(Minus Deviations) (RFI)	5.2	8.4	2.04	17.2	1.34	11.2	1.0	8.4
Sensitivity & Deflection Char.								
Page C-339								
(%) $\Delta v1$ (New)	104.5	7.1	2.04	14.50	1.34	9.51	1.0	7.1
$\Delta v2$ (In Use)	104.0	2.4	2.04	4.90	1.34	3.22	1.0	2.4
$\Delta v3$ (RFI)	103.5	1.1	2.04	2.25	1.34	1.48	1.0	1.1
$\Delta v4$ (New)	73.0	0.0	2.04	0.00	1.34	0.00	1.0	0.0
$\Delta v5$ (In Use)	89.5	3.6	2.04	7.70	1.34	4.83	1.0	3.6
$\Delta v6$ (RFI)	75.0	9.9	2.04	20.20	1.34	13.20	1.0	9.9

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Selectivity								
Page C-340								
(db)								
fc (-530 kc) (New)	85.20	2.90	2.04	5.90	1.34	3.88	1.0	2.90
(In Use)	--------	--------	--------	---No	Data--	--------	--------	--------
(RFI)	--------	--------	--------	---No	Data--	--------	--------	--------
fc (-450 kc) (New)	85.00	2.90	2.04	5.90	1.34	3.88	1.0	2.90
(In Use)	93.00	1.80	2.04	3.66	1.34	2.41	1.0	1.80
(RFI)	89.50	2.00	2.04	4.08	1.34	2.68	1.0	2.00
fc (-230 kc) (New)	69.00	1.20	2.04	2.44	1.34	1.60	1.0	1.20
(In Use)	73.80	16.50	2.04	33.60	1.34	22.10	1.0	16.50
(RFI)	57.00	9.00	2.04	18.30	1.34	12.00	1.0	9.00
fc (-60 kc) (New)	0.35	3.34	2.04	6.80	1.34	4.46	1.0	3.34
(In Use)	0.48	1.50	2.04	3.06	1.34	2.01	1.0	1.50
(RFI)	0.22	1.20	2.04	2.44	1.34	1.60	1.0	1.20
fc (+60 kc) (New)	0.22	1.60	2.04	3.26	1.34	2.14	1.0	1.60
(In Use)	0.50	2.90	2.04	5.90	1.34	3.88	1.0	2.90
(RFI)	0.55	1.50	2.04	3.06	1.34	2.01	1.0	1.50
fc (+230 kc) (New)	59.80	9.20	2.04	18.70	1.34	12.30	1.0	9.20
(In Use)	59.70	3.50	2.04	7.15	1.34	4.69	1.0	3.50
(RFI)	59.60	1.20	2.04	2.44	1.34	1.60	1.0	1.20
fc (+450 kc) (New)	85.70	3.00	2.04	6.10	1.34	4.01	1.0	3.00
(In Use)	82.00	18.00	2.04	36.60	1.34	24.10	1.0	18.00
(RFI)	87.90	2.00	2.04	4.08	1.34	2.64	1.0	2.00
fc (+530 kc) (New)	85.00	2.70	2.04	5.50	1.34	3.61	1.0	2.70
(In Use)	93.70	1.70	2.04	3.47	1.34	2.28	1.0	1.70
(RFI)	89.80	2.00	2.04	4.08	1.34	2.68	1.0	2.00

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Deflection Linearity								
Page C-341								
(Ratio)								
(New)	1.00	0.76	2.04	1.55	1.34	1.02	1.0	0.76
(In Use)	1.05	1.00	2.04	2.04	1.34	1.34	1.0	1.00
(RFI)	1.05	0.10	2.04	2.04	1.34	1.34	1.0	0.10
90 & 150 cps Phase Char.								
Page C-342								
(ua)								
(New)	0.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
(In Use)	5.7	2.03	2.04	4.14	1.34	2.72	1.0	2.03
(RFI)	8.7	1.52	2.04	3.10	1.34	2.04	1.0	1.52

Table 1

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Alarm Signal Page C-343 (ua)								
c1 (New)	388.0	23.7	2.04	48.7	1.34	31.80	1.0	23.7
c1 (In Use)	338.0	21.6	2.04	44.4	1.34	29.00	1.0	21.6
c1 (RFI)	273.0	47.5	2.04	97.5	1.34	63.70	1.0	47.5
c2 (New)	302.0	12.1	2.04	24.8	1.34	16.30	1.0	12.1
c2 (In Use)	271.0	10.7	2.04	22.0	1.34	14.40	1.0	10.7
c2 (RFI)	282.0	11.3	2.04	23.2	1.34	15.20	1.0	11.3
c3 (New)	215.0	5.0	2.04	10.2	1.34	6.70	1.0	5.0
c3 (In Use)	150.0	50.9	2.04	10.4	1.34	67.90	1.0	50.9
c3 (RFI)	289.0	25.6	2.04	52.6	1.34	34.50	1.0	25.6
c4 (New)	285.0	26.5	2.04	54.3	1.34	35.50	1.0	26.5
c4 (In Use)	222.0	12.6	2.04	25.9	1.34	16.90	1.0	12.6
c4 (RFI)	267.0	18.9	2.04	38.9	1.34	25.40	1.0	18.9
c5 (New)	282.0	22.8	2.04	46.8	1.34	30.50	1.0	22.8
c5 (In Use)	218.0	18.9	2.04	38.9	1.34	25.40	1.0	18.9
c5 (RFI)	262.0	26.1	2.04	53.6	1.34	35.00	1.0	26.1
c6 (New)	192.0	11.5	2.04	23.6	1.34	15.20	1.0	11.5
c6 (In Use)	185.0	20.3	2.04	41.7	1.34	27.20	1.0	20.3
c6 (RFI)	198.0	22.6	2.04	46.5	1.34	30.40	1.0	22.6
c7 (New)	0.0	0.0	2.04	0.0	1.34	0.00	1.0	0.0
c7 (In Use)	0.0	0.0	2.04	0.0	1.34	0.00	1.0	0.0
c7 (RFI)	0.0	0.0	2.04	0.0	1.34	0.00	1.0	0.0
c8 (New)	0.0	0.0	2.04	0.0	1.34	0.00	1.0	0.0
c8 (In Use)	0.0	0.0	2.04	0.0	1.34	0.00	1.0	0.0
c8 (RFI)	0.0	0.0	2.04	0.0	1.34	0.00	1.0	0.0

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Indicator Stability								
Page C-344								
(ua)								
v1 (New)	1.2	0.76	2.04	1.55	1.34	1.02	1.0	0.76
v1 (In Use)	1.7	0.56	2.04	1.12	1.34	0.75	1.0	0.56
v1 (RFI)	2.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
v2 (New)	1.7	0.56	2.04	1.12	1.34	0.75	1.0	0.56
v2 (In Use)	2.3	0.56	2.04	1.12	1.34	0.75	1.0	0.56
v2 (RFI)	2.2	1.20	2.04	2.45	1.34	1.62	1.0	1.20
v3 (New)	0.3	0.80	2.04	1.63	1.34	1.07	1.0	0.80
v3 (In Use)	0.5	0.00	2.04	0.00	1.34	0.00	1.0	0.00
v3 (RFI)	0.5	0.00	2.04	0.00	1.34	0.00	1.0	0.00
v4 (New)	0.3	0.80	2.04	1.63	1.34	1.07	1.0	0.80
v4 (In Use)	0.8	0.30	2.04	0.61	1.34	0.40	1.0	0.30
v4 (RFI)	0.7	0.26	2.04	0.53	1.34	0.35	1.0	0.26

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-3

	Mean	Standard Deviation	90%		80%		70%	
			Ord. Val.	Limits	Ord. Val	Limits	Ord. Val.	Limits
Deviation Indicator Stability								
Page C-345								
(ua)								
m1 (New)	82.8	2.40	2.04	4.89	1.34	3.21	1.0	2.40
m1 (In Use)	90.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
m1 (RFI)	90.0	0.58	2.04	1.18	1.34	0.78	1.0	0.58
m2 (New)	78.0	3.20	2.04	6.51	1.34	4.29	1.0	3.20
m2 (In Use)	89.0	0.87	2.04	1.77	1.34	1.16	1.0	0.87
m2 (RFI)	88.0	0.53	2.04	1.08	1.34	0.71	1.0	0.53
m3 (New)	88.0	7.70	2.04	15.70	1.34	10.30	1.0	7.70
m3 (In Use)	89.5	0.77	2.04	1.57	1.34	1.03	1.0	0.77
m3 (RFI)	92.8	0.58	2.04	1.18	1.34	0.78	1.0	0.58
m4 (New)	3.0	2.30	2.04	4.69	1.34	3.08	1.0	2.30
m4 (In Use)	2.0	0.00	2.04	0.00	1.34	0.00	1.0	0.00
m4 (RFI)	0.3	0.00	2.04	0.00	1.34	0.00	1.0	0.00
m5 (New)	4.3	7.7	2.04	15.70	1.34	10.30	1.0	7.70
m5 (In Use)	2.5	2.2	2.04	4.49	1.34	3.95	1.0	2.20
m5 (RFI)	2.6	0.0	2.04	0.00	1.34	0.00	1.0	0.00
m6 (New)	11.3	12.1	2.04	24.60	1.34	16.20	1.0	12.10
m6 (In Use)	3.2	2.0	2.04	2.08	1.34	2.68	1.0	2.00
m6 (RFI)	1.8	0.5	2.04	10.20	1.34	0.67	1.0	0.50
Dev. Ind. Sensitivity Adjust.								
Page C-346								
(%)								
a1 (New)	13.3	0.60	2.04	1.22	1.34	0.80	1.0	0.60
a1 (In Use)	21.0	8.00	2.04	16.30	1.34	10.70	1.0	8.00
a1 (RFI)	17.0	0.65	2.04	1.32	1.34	0.87	1.0	0.65
b1 (New)	96.0	3.60	2.04	7.68	1.34	4.82	1.0	3.60
b1 (In Use)	97.0	3.10	2.04	6.32	1.34	4.15	1.0	3.10
b1 (RFI)	99.5	2.20	2.04	4.48	1.34	2.95	1.0	2.20

Table 1

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-3

		Mean	Standard Deviation	90%		80%		70%	
				Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind. Sensitivity Adjust.									
Page C-347									
(%)									
Centering	Δv1 (New)	0.59	0.96	2.04	1.95	1.34	1.28	1.0	0.96
	Δv1 (In Use)	1.28	0.68	2.04	1.34	1.34	0.91	1.0	0.68
	Δv1 (RFI)	1.67	0.00	2.04	0.00	1.34	0.00	1.0	0.00
	Δv2 (New)	1.67	0.83	2.04	1.69	1.34	1.11	1.0	0.83
	Δv2 (In Use)	0.30	0.59	2.04	1.20	1.34	0.79	1.0	0.59
	Δv2 (RFI)	1.81	0.99	2.04	2.02	1.34	1.00	1.0	0.99
Dev. Ind. Sensitivity Adjust.									
Page C-348									
(%)									
Deflection	Δv1 (New)	94.0	5.1	2.04	10.40	1.34	6.81	1.0	5.1
	Δv1 (In Use)	103.0	0.0	2.04	00.00	1.34	0.00	1.0	0.0
	Δv1 (RFI)	103.0	1.7	2.04	3.47	1.34	2.27	1.0	1.7
	Δv2 (New)	95.0	2.9	2.04	5.92	1.34	3.88	1.0	2.9
	Δv2 (In Use)	105.0	2.0	2.04	4.08	1.34	2.68	1.0	2.0
	Δv2 (RFI)	103.0	1.9	2.04	3.88	1.34	2.54	1.0	1.9
	Δv3 (New)	74.0	3.9	2.04	7.96	1.34	5.22	1.0	3.9
	Δv3 (In Use)	78.0	10.6	2.04	21.60	1.34	14.20	1.0	10.6
	Δv3 (RFI)	76.5	10.8	2.04	22.00	1.34	14.40	1.0	10.8
	Δv4 (New)	74.0	4.2	2.04	8.59	1.34	5.62	1.0	4.2
	Δv4 (In Use)	81.8	4.0	2.04	8.16	1.34	5.45	1.0	4.0
	Δv4 (RFI)	77.0	10.7	2.04	21.80	1.34	14.20	1.0	10.7

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-3

	Mean	Standard Deviation	90%		70%		70%	
			Ord. Val.	Limits	Ord. Val.	Limits	Ord. Val.	Limits
Dev. Ind Sensitivity Adjust.								
Page C-349								
(Ratio)								
Linearity s1 (New)	1.70	0.69	2.04	1.41	1.34	0.92	1.0	0.69
s1 (In Use)	1.70	0.61	2.04	1.22	1.34	0.82	1.0	0.61
s1 (RFI)	1.29	0.23	2.04	0.47	1.34	0.31	1.0	0.23
s2 (New)	4.10	2.20	2.04	4.48	1.34	2.94	1.0	2.20
s2 (In Use)	1.19	0.54	2.04	1.21	1.34	0.72	1.0	0.54
s2 (RFI)	0.90	0.32	2.04	0.65	1.34	0.43	1.0	0.32
Power Source Frequency								
Variation								
Page C-350								
(ua)								
(New)	3.26	5.2	2.04	10.60	1.34	6.95	1.0	5.2
(In Use)	2.80	1.4	2.04	2.85	1.34	1.87	1.0	1.4
(RFI)	5.70	2.3	2.04	4.70	1.34	3.19	1.0	2.3

CONFIDENCE LIMIT INTERVAL - GLIDE SLOPE RECEIVER - GS-3

TABLE 2

FACILITY MAINTENANCE INFORMATION

Facility	1	2	3	4
1. Equipment Category Serviced	AL	MIL	MIL	MIL
2. Equipment Type	Comm.-Nav.	Comm.-Nav.	Comm.	Comm.-Nav.
3. Number of Maintenance Personnel	15	26	7	5
4. Type of Personnel	Civilian	Military	Civ.-Mil.	Civ.-Mil.
5. Average Experience	10 years	6 years		
6. Type of Test Equipment	Lab. Standard	Lab. Standard		
7. Test Equipment Calibrate	As needed	3-6 months (most overdue)		
8. Maintenance Capability	Overhaul	Major	Major	Major
9. Maintenance Records	Excellent	Very little	None	None
10. Equipment Serviced (pertinent to program)	MB-2 GS-2	VO-4 LO-1 LO-3	MB-1	LO-3
11. Causes of Failure	1. Tubes (50%) 2. None apparent 3. Miscellaneous	1. Est. Misalignment (80%) 2. Tubes		
12. Equipment Checks	Preflight ramp check every 30 hours overhaul (3 months)	"Periodic per AF T.O."	Failures only	Failures only
13. Specifications & Procedures	RTCA	AF T.O.'s	T.O.'s IB's	AF T.O.'s

FACILITY MAINTENANCE INFORMATION

TABLE 2

FACILITY MAINTENANCE INFORMATION

Facility	5	6	7	8
1. Equipment Category Serviced	MIL	AL	AL (Cargo)	MIL
2. Equipment Type	Comm.-Nav.	Comm.-Nav.	Comm.-Nav.	Comm.-Nav.
3. Number of Maintenance Personnel	49	61	11	12
4. Type of Personnel	Civ.-Mil.	Civilian	Civilian	
5. Average Experience		10 years		6 years
6. Type of Test Equipment	Unauthorized	Lab. Standard	Lab. Standard	Lab. Standard
7. Test Equipment Calibrate	6 months (most overdue)	Frequently	During use	Upon failure
8. Maintenance Capability	Major	Overhaul	Overhaul	Minor
9. Maintenance Records	Good	Very Good	Very Good	None
10. Equipment Serviced (pertinent to program)	MB-1	VO-2 LO-2	VO-2 LO-2	VO-1 LO-1 GS-1
11. Causes of Failure	1. Tubes (80%) 2. Mech. drive & blower motor	1. Tubes (60%) 2. None apparent (30%)	1. Tubes 2. None apparent	1. Tubes (60%) 2. Misalign-ment (40%)
12. Equipment Checks	Nav.-occasional Comm.-2 to 4 months	Preflight periodic time overhaul	Preflight periodic post-installation rampcheck	Preflight periodic bench check (failure only)
13. Specifications & Procedures	T.O.'s	T.O.'s	1. T.O.'s 2. RTCA	T.O.'s

FACILITY MAINTENANCE INFORMATION

TABLE 2

FACILITY MAINTENANCE INFORMATION

Facility	9	10	11	12
1. Equipment Category Serviced	G	AL-G	G	AL
2. Equipment Type	Comm.-Nav.	Comm.-Nav.	Comm.-Nav.	Comm.-Nav.
3. Number of Maintenance Personnel	1	8	5	7
4. Type of Personnel	Owner-repair-man	Civilian	Civilian	Civilian
5. Average Experience	5 years	10 years		10 years
6. Type of Test Equipment	Central service	Lab. Standard	Lab. Standard	Lab. Standard
7. Test Equipment Calibrate	In use	When needed	When needed	Monthly
8. Maintenance Capability	Major	Overhaul	Overhaul	Overhaul
9. Maintenance Records	None	Good (on contract work only)	None	Excellent (for overhaul records)
10. Equipment Serviced (pertinent to program)	All types	All types	All types	MB-3 GS-3
11. Causes of Failure				1. Tubes (30%) 2. Misc. (70%)
12. Equipment Checks	Bench check in shop operational after installation	Operational periodic and time overhaul on contract work	Failures only	Perodic operational
13. Specifications & Procedures	IB's	T.O.'s IB's	T.O.'s IB's	T.O.'s

FACILITY MAINTENANCE INFORMATION

SECTION D

REFERENCES

Sub-Section	Page
1. Glossary of Airborne Radio Navigation Equipment (1) (2). . .	D-1-38
2. Abbreviations	D-39-43
3. Extracts from RTCA Papers	D-45-70
4. Associated Publications.	D-71

NOTES

(1) Channels Available is defined as the number of discrete operating frequencies which the equipment can directly provide by general switching or tuning methods, including decade switched channels (indicated as manual) and variable tuned channels (indicated as continuously tuned). In addition, Channels Available is not intended to mean the number of 50 kc, 100 kc, 300 kc, etc., channels confined within the specified operating range.

(2) Channels Preset is defined as the number of discrete operating frequencies which can be directly provided by a single control selector or pushbutton, but excluding those frequencies provided by multi-control decade selectors.

SECTION D

REFERENCES

1. Glossary of Airborne Radio Navigation Equipment.

AM-609/ARN-30	Filter Amplifier LOC
Primary Use:	Airborne instrumentation unit which converts the audio output of a suitable VHF receiver into standard course deviation indicator currents. This is generally used with an R-445/ARN-30 receiver and a CV-217/ ARN-30 converter. The commercial designation is F-10A/Type 15C.
Audio Bandpass:	10 to 10000 cps (approx)
Output:	Visual: dc cross pointer and flag alarm currents Aural: None
Primary Power:	14 vdc
Typical Mfgr:	Aircraft Radio Corporation

AN/ARN-5, A, B, C, D	Radio Receiving Set Glide Slope
Primary Use:	Airborne reception of ILS vertical guidance signals. The receiver units used vary as follows: AN/ARN-5: R-57 AN/ARN-5A: R-89, R-89A, R-89B AN/ARN-5B: R-268, R-268A, R-268B AN/ARN-5C: R-430, R-430A, R-430B AN/ARN-5D: R-443, R-443A, R-443B Lateral guidance is generally provided by such companion equipment as the RC-103A or AN/ARN-14( ).
Frequency Range:	329.3 to 335 mc
Channels Available:	ARN-5, A, B: 3 ARN-5C, D: 6
Channels Preset:	3 / 6
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	28 vdc
Typical Mfgr:	Crosley Radio Corporation

AN/ARN-8	Radio Receiving Set Marker Beacon
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. The receiver unit is designated R-8/ARN-8.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: Dual at 10 mw each
Primary Power:	28 vdc
Typical Mfgr:	Unknown

AN/ARN-12, 12A	Radio Receiving Set Marker Beacon
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. The receiver unit is designated R-122/ ARN-12 or R-122A/ARN-12A.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Dual single light indicators Aural: 180 mw
Primary Power:	26.5 vdc
Typical Mfgr:	Trad Television Corporation

AN/ARN-14, A, B, C, D, E	Radio Receiving Set VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/ LOC navigation signals in air/air and air/ground service. The receiver unit is designated R-252A, B/ ARN-14, R-252C/ARN-14A, R-539/ARN-14B, R-540/ ARN-14C, R-541/ARN-14D or R-( )/ARN-14E. Full ILS instrumentation is provided when used with the AN/ARN-18. The commercial designation is 51R.
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote servo control
Output:	Visual: dc cross pointer currents Aural: 300 mw
Primary Power:	26.5 vdc / 26.5 vdc and 115 vac 400 cycle 1 phase
Typical Mfgr:	Collins Radio Company

AN/ARN-18 — Radio Receiving Set, Glide Slope

Primary Use:	Airborne reception of ILS vertical guidance signals. The receiver unit is designated R-322A/ARN-18. This is generally used with the AN/ARN-14( ).
Frequency Range:	329.3 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	Visual: dc cross pointer currents
Primary Power:	26.5 vdc and 115 vac 320 to 1700 cycle 1 phase
Typical Mfgr:	Unknown

AN/ARN-30 — Radio Receiving Set, VOR/LOC/VHF

Primary Use: Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This consists of a receiver unit, a converter unit and an amplifier unit. The receiver unit is designated R-445/ARN-30, the converter unit CV-217/ARN-30 and the filter amplifier AM-609/ARN-30. The commercial designation is Type 15C.

	Receiver	Converter & Amplifier
Frequency Range:	108 to 135 mc	30 to 10500 cps
Channels Available:	Continuously tuned	
Channels Preset:	None	
Channel Selection:	Remote manual tuning	
Output:	170 to 360 mw	150-0-150 microamperes dc cross pointer currents
Primary Power:	28 vdc	
Typical Mfgr:	Aircraft Radio Corporation	

AN/ARN-30A — Radio Receiving Set VOR/LOC/VHF

Primary Use: Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This consists of a receiver unit and a converter unit. The receiver unit is designated R-445/ARN-30A and the converter unit is designated CV-265/ARN-30A. The commercial designation is Type 15D.

	Receiver	Converter
Frequency Range:	108 to 135 mc	30 to 10500 cps
Channels Available:	Continuously tuned	
Channels Preset:	None	
Channel Selection:	Remote manual tuning	
Output:	170 to 360 mw	150-0-150 microamperes dc cross pointer currents
Primary Power:	14/28 vdc	
Typical Mfgr:	Aircraft Radio Corporation	

AN/ARN-31 — Radio Receiving Set Glide Slope and Localizer

Primary Use: Airborne reception of ILS vertical and lateral guidance signals. The glide slope receiver is designated R-626A/ARN-31 and the localizer receiver is designated R-625A/ARN-31.

	Glide Slope Receiver	Localizer Receiver
Frequency Range:	329.3 to 335 mc	108.1 to 111.9 mc
Channels Available:	20	20
Channels Preset:	20	20
Channel Selection:	Remote relay switch	Remote relay switch
Output:	Dc cross pointer and flag alarm currents	
Primary Power:	26.5 vdc and 115 vac 320 to 1700 cycle 1 phase	
Typical Mfgr:	Crosley Radio Corporation	

AN/ARN-32	Radio Receiving Set Marker Beacon
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. The receiver unit is designated R-666A/ ARN-32.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: 15 mw
Primary Power:	27.5 vdc
Typical Mfgr:	Stromberg Carlson

AN/ARN-36	Radio Receiving Set LOC
Primary Use:	Airborne navigation receiver providing lateral guidance. The receiver unit is designated R-603/ ARN-36 and is a Navy replacement for receiver unit BC-733F/RC-103A.
Frequency Range:	108.3 to 110.3 mc
Channels Available:	6
Channels Preset:	6
Channel Selection:	Remote relay switch
Output:	Visual: 150-0-150 microamperes dc cross pointer currents Aural:
Primary Power:	28 vdc
Typical Mfgr:	Unknown

AN/ARN-37	Radio Receiving Set Glide Slope
Primary Use:	Airborne reception of ILS vertical guidance signals. The receiver unit is designated R-604/ARN-37. Lateral guidance is provided by the AN/ARN-38.
Frequency Range:	329.3 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	Visual: dc cross pointer currents
Primary Power:	28 vdc
Typical Mfgr:	Unknown

AN/ARN-38	Radio Receiving Set VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. The receiver unit is designated R-605/ARN-38. Vertical guidance is provided by the AN/ARN-37.
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote motor control
Output:	Visual: dc cross pointer currents Aural: 300 mw
Primary Power:	27.5 vdc and 115 vac 400 cycle
Typical Mfgr:	Bendix Radio Div. of Bendix Aviation Company

AN/ARN-39	Radio Receiving Set Glide Slope
Primary Use:	Airborne reception of ILS vertical guidance signals. The receiver unit is designated R-606/ARN-39.
Frequency Range:	332.6 to 335 mc
Channels Available:	3
Channels Preset:	3
Channel Selection:	Remote relay switch
Output:	Visual: dc cross pointer currents
Primary Power:	28 vdc
Typical Mfgr:	Unknown

AN/ARN-56	Radio Receiving Set VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. The receiver unit is designated R-811/ARN-56.
Frequency Range:	108 to 135.9 mc
Channels Available:	20 LOC, 80 VOR and 180 COMM
Channels Preset:	None
Channel Selection:	Unknown
Output:	Visual: On VOR or ILS indicators ID-351, 387 or 250/ARN Aural:
Primary Power:	27.5 vdc and 115 vac 400 cycle 1 phase
Typical Mfgr:	Bendix Radio Div. of Bendix Aviation Company

AT-99-44-BH (Airliner)	Receiver-Transmitter LF/MF/HF/MKR-BN		
Primary Use:	Airborne two-way voice communications in air/air and air/ground service. This also provides marker beacon reception.		
	Transmitter	Receiver	MKR-BN
Frequency Range:	2 to 8 mc(approx)	200 to 400 kc and 550 to 1620 kc	75 mc fixed
Channels Available:	1	Continuously tuned	1
Channels Preset:	1(usually 3105 kc)	6	1
Channel Selection:	None	Local manual tuning and push button	Local switch
Output:	10 watts	3 watts	Aural only
Primary Power:	14 vdc		
Manufacturer:	Galvin Mfg. Corp., A Division of Motorola, Inc.		

AT-99-45, A; AT-91-47 (Avigator Senior)	Receiver-Transmitter LF/MF/VHF/MKR-BN/*VOR		
Primary Use:	Airborne two-way VHF voice communications and reception of L/MF and marker beacon signals in air/air and air/ground service. *VOR attachment was optional.		
	Transmitter	Receiver	MKR-BN
Frequency Range:	108 to 130 mc	108 to 130 mc, 195 to 405 kc & 540 to 1500 kc in 3 bands	75 mc fixed
Channels Available:	6	Continuously tuned	1
Channels Preset:	6	None	1
Channel Selection:	Local switch	Local manual tuning	Local switch
Output:	3 watts	4 watts (max)	Aural only
Primary Power:	12 vdc		
Manufacturer:	Mitchell Industries, Incorporated		

AVTR-116	Receiver-Transmitter LF/VHF/MKR-BN		
Primary Use:	Airborne two-way reception of mcw and voice communications in air/air and air/ground service.		
	Transmitter	Receiver	MKR-BN
Frequency Range:	121.5 to 122.9 mc	200 to 400 kc	75 mc fixed
Channels Available:	5	Continuously tuned	1
Channels Preset:	5	None	1
Channel Selection:	Local switch	Local switch	None
Output:	1 watt	50 to 250 mw	Aural only
Primary Power:	13 vdc		
Manufacturer:	Radio Corporation of America		

B-10, A/Type 15	Converter VOR
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is a part of the Type 15C NAV system and is generally used with the R-13/Type 15 VHF receiver and F-10A/Type 15 filter amplifier. The military designation is CV-217/ARN-30.
Audio Bandpass:	30 to 10500 cps
Output:	150-0-150 microamperes dc course deviation indicator currents
Primary Power:	14/28 vdc
Manufacturer:	Aircraft Radio Corporation

B-13A/Type 15	Converter VOR/LOC
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is a part of the Type 15D NAV system and is generally used with the R-13/Type 15 VHF receiver. The military designation is CV-265/ ARN-30A.
Audio Bandpass:	30 to 10500 cps
Output:	150-0-150 microamperes dc course deviation indicator currents
Primary Power:	14/28 vdc
Manufacturer:	Aircraft Radio Corporation

BC-357	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: None
Primary Power:	24 vdc
Typical Mfgr:	Air Communications, Incorporated

BC-733, A, B, C, D, E, F	Receiver LOC
Primary Use:	Airborne navigation receiver providing lateral guidance. This is the receiver unit of Radio Receiving Set RC-103( ).
Frequency Range:	108 to 110.3 mc
Channels Available:	6
Channels Preset:	6
Channel Selection:	Remote relay switch
Output:	Visual: 150-0-150 microamperes dc cross pointer currents Aural: 3 watts
Primary Power:	14/28 vdc
Typical Mfgr:	Philco Corporation

BC-1023A	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is the receiver unit of Radio Receiving Set RC-193-AZ.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: None
Primary Power:	13 vdc
Typical Mfgr:	Majestic Radio and Television Corporation

BC-1032	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 2.5 watts (approx)
Primary Power:	12 vdc
Manufacturer:	Flitetronics, Incorporated

BC-1033A, B	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is a receiver unit of Radio Receiving Set RC-193A.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: None
Primary Power:	26 vdc
Typical Mfgr:	Air Communications, Incorporated

BC-1333	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is a receiver unit of Radio Receiving Set RC-193A.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: None
Primary Power:	26 vdc
Typical Mfgr:	Bendix Radio Div. of Bendix Aviation Company

CV-217/ARN-30	Converter VOR
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is a part of the AN/ARN-30 NAV system and is generally used with the R-445/ARN-30 VHF receiver and the AM-609/ARN-30 filter amplifier. The commercial designation is B-10/Type 15.
Audio Bandpass:	30 to 10500 cps
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	14/28 vdc
Typical Mfgr:	Aircraft Radio Corporation

CV-265/ARN-30A	Converter VOR/LOC
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is a part of the AN/ARN-30A NAV system and is generally used with the R-445/ARN-30 VHF receiver. The commercial designation is B-13/Type 15.
Audio Bandpass:	30 to 10500 cps
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	14/28 vdc
Typical Mfgr:	Aircraft Radio Corporation

DGS-20	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals.
Frequency Range:	329.3 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote ledex switch
Output:	Visual: 150-0-150 microamperes dc cross pointer currents Aural: None
Primary Power:	14/28 vdc
Manufacturer:	Dare, Incorporated

DM-3	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 100 mw
Primary Power:	14/28 vdc
Manufacturer:	Dare, Incorporated

F-10A/Type 15	Filter Amplifier LOC
Primary Use:	Airborne instrumentation unit which converts the audio output of a suitable VHF receiver into standard course deviation indicator currents. It is generally used with an R-13/Type 15 VHF receiver and a B-10/Type 15C converter. The military designation is AM-609/ARN-30.
Audio Bandpass:	10 to 10000 cps (approx)
Output:	Visual: dc cross pointer and flag alarm currents Aural: None
Primary Power:	14 vdc
Manufacturer:	Aircraft Radio Corporation

GSA-8A	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals.
Frequency Range:	329.3 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote ledex switch
Output:	0 to 135 microamperes (min) to each of 3 indicators. 200 to 700 microamperes to each of 2 indicators.
Primary Power:	27.5 vdc/27.5 vdc and 115 vac 300 to 1000 cycle
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

LCP-5 (Omnipack)	Converter VOR
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into course deviation indicator currents. This is generally used with the LR-6 VHF receiver and the LDP-5 (Omniscope) indicator.
Audio Bandpass:	30 to 10000 cps
Output:	Dc course deviation indicator currents
Primary Power:	14 vdc
Manufacturer:	Lear, Incorporated

LDMR-5	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is also a power supply-modulator unit generally used in place of the LD-5 dynamotor supply in the LTR-5 and LTRA-5 combinations when marker beacon reception is desired.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Aural only
Primary Power:	14 vdc
Manufacturer:	Lear, Incorporated

LNC-100B

Radio Set
Receiver-Transmitter
VOR/LOC/VHF/MKR-BN

Primary Use: Airborne VOR/LOC/Marker Beacon instrumentation and two-way voice communications in air/air and air/ground service. This consists of a Model 5611 VHF receiver, a 5640 VHF transmitter and a 2374 navigation module.

	Transmitter	Receiver	MKR-BN
Frequency Range:	118 to 131.95 mc	108 to 130.9 mc	75 mc fixed
Channels Available:	140 manual	240 manual	1
Channels Preset:	None	None	1
Channel Selection:	Local switch	Local switch	Local switch
Output:	3 watts	5 watts	Aural only
Primary Power:	14/28 vdc		
Manufacturer:	Lear, Incorporated		

LNC-100C

Radio Set
Receiver-Transmitter
VOR/LOC/VHF/MKR-BN/ILS

Primary Use: Airborne navigation instrumentation and two-way voice communications in air/air and air/ground service. Consists of 2 - 5611 VHF receivers, 1 - 5640 transmitter, 1 - 2374 navigation module and 1 - 5607 glide slope receiver.

	Transmitter	Receiver	Receiver	MKR-BN
Frequency Range:	118 to 131.95 mc	108 to 130.9 mc	329.6 to 335 mc	75 mc fixed
Channels Available:	140 manual	480 manual	10	1
Channels Preset:	None	None	10	1
Channel Selection:	Local switch	Local switch	Local switch	Local switch
Output:	3 watts	5 watts		Aural only
Primary Power:	14/28 vdc			
Manufacturer:	Lear, Incorporated			

LNC-100D

Radio Set
Receiver-Transmitter
VOR/LOC/VHF/MKR-BN/ILS

Primary Use: Dual version of the LNC-100C airborne navigation instrumentation and two-way voice communications system. Consists of 2 - 5611 receivers, 2 - 5640 transmitters, 2 - 4087 indicators, 2 - 2374 navigation modules, and 1 - 5607 glide slope receiver.

	Transmitter	Receiver	Receiver	MKR-BN
Frequency Range:	118 to 131.95 mc	108 to 130.9 mc	329.6 to 335 mc	75 mc fixed
Channels Available:	280 manual	480 manual	10	1
Channels Preset:	None	None	10	1
Channel Selection:	Local switch	Local switch	Local switch	Local switch
Output:	3 watts	5 watts		Aural only
Primary Power:	14/28 vdc			
Manufacturer:	Lear, Incorporated			

LR-5, A, B

Receiver
VHF

Primary Use: Airborne reception of voice communications in air/air and air/ground service.

Frequency Range: 108 to 127 mc
Channels Available: Continuously tuned
Channels Preset: None
Channel Selection: Local manual tuning
Output: 3.5 watts
Primary Power: 14 vdc
Manufacturer: Lear, Incorporated

LR-6, 6N

Receiver
VHF

Primary Use: Airborne reception of voice communications in air/air and air/ground service. This is a part of the LTR-6, LTRA-6, LTTR-6 or L3TR-6 combinations.

Frequency Range: 108 to 127 mc
Channels Available: Continuously tuned
Channels Preset: None
Channel Selection: Local switch
Output: 3.5 watts
Primary Power: 14 vdc
Manufacturer: Lear, Incorporated

LRA-6A*, 6B — Receiver Adapter LF/MF/MKR-BN*

Primary Use:	Airborne reception of mcw and voice communications in air/ground service. This is part of the LTRA-6 combination. *Marker beacon reception is provided by the LRA-6A only.

	Receiver	MKR-BN
Frequency Range:	200 to 1600 kc	75 mc fixed
Channels Available:	Continuously tuned	1
Channels Preset:	None	1
Channel Selection:	Local manual tuning	Local switch
Output:	1.5 watts	Aural only
Primary Power:	14/28 vdc	
Manufacturer:	Lear, Incorporated	

LTR-5 — Receiver-Transmitter VHF

Primary Use:	Airborne two-way mcw and voice communications in air/air and air/ground service. The receiver unit is designated LR-5B and the transmitter unit is designated RT-10C.

	Transmitter	Receiver
Frequency Range:	121.5 to 122.9 mc	108 to 127 mc
Channels Available:	6	Continuously tuned
Channels Preset:	6	None
Channel Selection:	Local switch	Local manual tuning
Output:	2 watts	3.2 watts
Primary Power:	14 vdc	
Manufacturer:	Lear, Incorporated	

LTR-6 — Receiver-Transmitter VHF

Primary Use:	Airborne two-way mcw and voice communications in air/air and air/ground service. The receiver unit is designated LR-6 and the transmitter unit is designated RT-10E in a single dust cover.

	Transmitter	Receiver
Frequency Range:	120.5 to 124.5 mc	108 to 127 mc
Channels Available:	12	Continuously tuned
Channels Preset:	12	None
Channel Selection:	Local switch	Local manual tuning
Output:	2 watts	3.5 watts
Primary Power:	14/28 vdc	
Manufacturer:	Lear, Incorporated	

LTRA-5

Receiver-Transmitter
LF/MF/VHF

Primary Use: Airborne two-way mcw and voice communications in air/air and air/ground service. The receiver unit is designated LR-5B and the transmitter unit is designated RT-10C and the LF adapter is designated LRA-5. They are all under one dust cover and are generally used with the VCA adapter for LOC and the LCP-5 converter for VOR.

	Transmitter	Receivers
Frequency Range:	121.5 to 122.9 mc	108 to 127 mc and 200 to 600 kc
Channels Available:	3/6	Continuously tuned
Channels Preset:	3/6	None
Channel Selection:	Local switch	Local manual tuning
Output:	2 watts	3.5 watts
Primary Power:	14 vdc	
Manufacturer:	Lear, Incorporated	

LTRA-6

Receiver-Transmitter
LF/MF/VHF/MKR-BN

Primary Use: Airborne two-way mcw and voice communications and reception of L/MF and marker beacon signals in air/air and air/ground service. The receiver unit is designated LR-6, the transmitter unit is designated RT-10E and the LF adapter is designated LRA-6A. They are all under one dust cover and are generally used with the VCA adapter for LOC and the LCP-5 or 2214 converter for VOR.

	Transmitter	Receiver	MKR-BN
Frequency Range:	120.5 to 124.5 mc	108 to 127 mc & 200 to 600 kc	75 mc fixed
Channels Available:	12	Continuously tuned	1
Channels Preset:	12	None	1
Channel Selection:	Local switch	Local manual tuning	Local switch
Output:	2 watts	1.5 watts	Aural only
Primary Power:	14/28 vdc		
Manufacturer:	Lear, Incorporated		

Mark V	Receiver-Transmitter VHF	
Primary Use:	Airborne two-way voice communications in air/air and air/ground service. This also provides an output to a VOA-3A omni-converter for VOR/LOC instrumentation.	
	Transmitter	Receiver
Frequency Range:	118 to 127 mc	108 to 127 mc
Channels Available:	90 manual	190 manual
Channels Preset:	None	None
Channel Selection:	Local switch	Local switch
Output:	5 watts	5 watts
Primary Power:	13.75 / 27.5 vdc	
Manufacturer:	National Aeronautical Corporation	

MB-3	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 50 mw
Primary Power:	12/24 vdc
Manufacturer:	Flitetronics, Incorporated

MBT-12, 24	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 3 watts (via auxiliary equipment)
Primary Power:	MBT-12: 13.75 vdc MBT-24: 27.5 vdc
Manufacturer:	National Aeronautical Corporation

MKA-7A	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 100 mw
Primary Power:	27.5 vdc/27.5 vdc 115 vac 400 cycle 1 phase
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

MN-53, 53B	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 100 mw
Primary Power:	14/28 vdc/115 vac 400 cycle 1 phase
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

MN-55	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 100 mw
Primary Power:	14/28 vdc/115 vac 400 cycle 1 phase
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

MN-61B	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 100 mw
Primary Power:	14/28 vdc/115 vac 400 cycle 1 phase
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

MN-85DB, F	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service.
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote motor control
Output:	Visual: VOR/LOC indicator currents Aural: 200 mw
Primary Power:	27.5 vdc/115 vac 300 to 1000 cycle 1 phase
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

MN-100, A, B	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. The military designation is R-746/ARN.
Frequency Range:	329.9 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	Dc cross pointer currents
Primary Power:	27.5 vdc and 115 vac 400 cycle
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

NVA-21A	Converter VOR/LOC
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is generally used with the RA-21A VHF receiver.
Audio Bandpass:	30 to 10500 cps
Output:	Flag current: 0 to 500 microamperes dc Cross pointer current: 450-0-450 microamperes dc To-From current: 500-0-500 microamperes dc
Primary Power:	27.5 vdc and 26 vac 400 cycle 1 phase
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

OC-3A	Converter VOR/LOC
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is generally used with the DTR-360 transceiver.
Audio Bandpass:	30 to 10500 cps
Output:	Dc course deviation indicator currents
Primary Power:	14/28 vdc
Manufacturer:	Dare, Incorporated

R-8/ARN-8	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is the receiver unit of Radio Receiving Set AN/ARN-8.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: Dual at 10 mw each
Primary Power:	28 vdc
Typical Mfgr:	Unknown

R-13A, B/Type 15	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/ground service. This is generally used with a B-10 or B-13A/Type 15 converter to form the Type 15C or 15D VHF navigation system. The military designation is R-445/ARN-30( ).
Frequency Range:	108 to 135 mc
Channels Available:	Continuously tuned
Channels Preset:	None
Channel Selection:	Remote manual tuning
Output:	170 to 360 mw
Primary Power:	14/28 vdc
Manufacturer:	Aircraft Radio Corporation

R-20A/Type 12	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is part of the A. R. C. Type 12 system.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: 50 mw
Primary Power:	14/28 vdc
Manufacturer:	Aircraft Radio Corporation

R-32/Type 15	Receiver VHF
Primary Use:	Airborne reception of mcw and voice communications in air/air and air/ground service. This also provides output to the B-13A VOR converter in the Type 15E navigation system.
Frequency Range:	108 to 135 mc
Channels Available:	Continuously tuned
Channels Preset:	None
Channel Selection:	Remote manual tuning
Output:	360 mw
Primary Power:	14/28 vdc
Manufacturer:	Aircraft Radio Corporation

R-57/ARN-5	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-5 and is generally used with the RC-103A or AN/ARN-14 ( ) localizer receivers.
Frequency Range:	329.3 to 335 mc
Channels Available:	3
Channels Preset:	3
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	28 vdc
Typical Mfgr:	Crosley Radio Corporation

R-89A, B/ARN-5A	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-5A and is generally used with the RC-103A or AN/ARN-14 ( ) localizer receivers.
Frequency Range:	329.3 to 335 mc
Channels Available:	R-89A,B (military): 3 R-89B (airlines): 6/10
Channels Preset:	R-89A,B (military): 3 R-89B (airlines): 6/10
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	28 vdc
Typical Mfgr:	Western Electric Company

R-122/ARN-12	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is the receiver unit of Radio Receiving Set AN/ARN-12.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Dual single light indicators Aural: 180 mw
Primary Power:	26.5 vdc
Manufacturer:	Trad Television Corporation

R-252A, B, C/ARN-14A	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is part of Radio Receiving Set AN/ARN-14 and is generally used with the R-322A/ARN-18 glide slope receiver. The commercial designation is 51R( ).
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote servo control
Output:	Visual: dc cross pointer currents Aural: 300 mw
Primary Power:	26.5 vdc/26.5 vdc and 115 vac 400 cycle
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

R-268A, B/ARN-5B	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-5B and is generally used with the RC-103A or AN/ARN-14 ( ) localizer receivers.
Frequency Range:	329.3 to 335 mc
Channels Available:	3
Channels Preset:	3
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	28 vdc
Typical Mfgr:	Crosley Radio Corporation

R-322A/ARN-18	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-18 and is generally used with the AN/ARN-14 ( ) localizer receiver.
Frequency Range:	329.3 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	Visual: dc cross pointer currents
Primary Power:	26.5 vdc and 115 vac 320 to 1700 cycle 1 phase
Typical Mfgr:	Unknown

R-430A, B/ARN-5C	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-5C and is generally used with the RC-103A or AN/ARN-14 ( ) localizer receivers.
Frequency Range:	329.3 to 335 mc
Channels Available:	6
Channels Preset:	6
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	28 vdc
Manufacturer:	Crosley Radio Corporation

R-443A, B/ARN-5D	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-5D and is generally used with the RC-103A or AN/ARN-14 ( ) localizer receivers.
Frequency Range:	329.3 to 335 mc
Channels Available:	6
Channels Preset:	6
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	28 vdc
Manufacturer:	Crosley Radio Corporation

R-445/ARN-30	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is part of Radio Receiving Set AN/ARN-30() and is generally used with a CV-265/ARN-30A VOR converter. The commercial designation is R-13/Type 15.
Frequency Range:	108 to 135 mc
Channels Available:	Continuously tuned
Channels Preset:	None
Channel Selection:	Remote manual tuning
Output:	170 to 360 mw
Primary Power:	14/28 vdc
Typical Mfgr:	Aircraft Radio Corporation

R-539/ARN-14B	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is part of Radio Receiving Set AN/ARN-14B and is generally used with the AN/ARN-18 glide slope receiver. The commercial designation is 51R( ).
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote servo control
Output:	300 mw
Primary Power:	26.5 vdc/26.5 vdc and 115 vac 400 cycle
Typical Mfgr:	Collins Radio Company

R-540/ARN-14C	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is part of Radio Receiving Set AN/ARN-14C and is generally used with the AN/ARN-18 glide slope receiver. The commercial designation is 51R( ).
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote servo control
Output:	300 mw
Primary Power:	26.5 vdc/26.5 vdc and 115 vac 400 cycle
Typical Mfgr:	Bendix Radio Div. of Bendix Aviation Company

R-541/ARN-14D	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is part of Radio Receiving Set AN/ARN-14E and is generally used with AN/ARN-18 glide slope receiver. The commercial designation is 51R( ).
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote servo control
Output:	300 mw
Primary Power:	26.5 vdc/26.5 vdc and 115 vac 400 cycle
Typical Mfgr:	Collins Radio Company

R-603/ARN-36	Receiver LOC
Primary Use:	Airborne navigation receiver providing lateral guidance. This is the receiver unit of Radio Receiving Set AN/ARN-36 and is a Navy replacement for receiver unit BC-733F/RC-103A.
Frequency Range:	108.3 to 110.3 mc
Channels Available:	6
Channels Preset:	6
Channel Selection:	Remote relay switch
Output:	Visual: 150-0-150 microamperes dc cross pointer currents Aural:
Primary Power:	28 vdc
Typical Mfgr:	Unknown

R-604/ARN-37	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-37 and is generally used with the R-605/ARN-38 localizer receiver.
Frequency Range:	329.3 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	Visual: dc cross pointer currents
Primary Power:	28 vdc
Typical Mfgr:	Unknown

R-605/ARN-38	Receiver LOC
Primary Use:	Airborne reception of voice communications and ILS lateral guidance in air/air and air/ground service. This is the receiver unit of Radio Receiving Set AN/ARN-38 and is generally used with the R-604/ ARN-37 glide slope receiver.
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote motor control
Output:	Visual: dc cross pointer currents Aural: 300 mw
Primary Power:	27.5 vdc and 115 vac 400 cycle
Typical Mfgr:	Bendix Radio Div. of Bendix Aviation Company

R-606/ARN-39	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-39.
Frequency Range:	332.6 to 335 mc
Channels Available:	3
Channels Preset:	3
Channel Selection:	Remote relay switch
Output:	Visual: dc cross pointer currents
Primary Power:	28 vdc
Typical Mfgr:	Unknown

R-625A/ARN-31	Receiver LOC
Primary Use:	Airborne reception of lateral guidance signals. This is the receiver unit of Radio Receiving Set AN/ARN-31 and is generally used with R-626A/ARN-31 glide slope receiver.
Frequency Range:	108.1 to 111.9 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	26.5 vdc and 115 vac 320 to 1700 cycle 1 phase
Typical Mfgr:	Crosley Radio Corporation

R-626A/ARN-31	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is the receiver unit of Radio Receiving Set AN/ ARN-31 and is generally used with the R-625A/ ARN-31 localizer receiver.
Frequency Range:	329.2 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	26.5 vdc and 115 vac 320 to 1700 cycle 1 phase
Typical Mfgr:	Crosley Radio Corporation

R-666A/ARN-32	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is the receiver unit of Radio Receiving Set AN/ARN-32.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: 15 mw
Primary Power:	27.5 vdc
Typical Mfgr:	Stromberg Carlson

R-746/AR	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. The commercial designation is MN-100A.
Frequency Range:	329.9 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	Visual: dc cross pointer currents
Primary Power:	27.5 vdc and 115 vac 400 cycle 1 phase
Typical Mfgr:	Bendix Radio Div. of Bendix Aviation Company

R-811/ARN-56	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is the receiver unit of Radio Receiving Set AN/ARN-56.
Frequency Range:	108 to 135.9 mc
Channels Available:	20 LOC, 80 VOR and 180 COMM
Channels Preset:	None
Channel Selection:	
Output:	Visual: On VOR or ILS indicators ID-351, 387 or 250/ARN Aural:
Primary Power:	27.5 vdc and 115 vac 400 cycle 1 phase
Typical Mfgr:	Bendix Radio Div. of Bendix Aviation Company

RA-21A	Receiver VHF
Primary Use:	Airborne reception of voice communications in air/air and air/ground service. This is generally used with the NVA-21 converter for VOR/LOC instrumentation.
Frequency Range:	108 to 135.95 mc
Channels Available:	560 manual
Channels Preset:	None
Channel Selection:	Remote motor control
Output:	100 mw
Primary Power:	27.5 vdc / 115 vac 300 to 1000 cycle 1 phase
Manufacturer:	Bendix Radio Div. of Bendix Aviation Company

RC-103A, AZ	Radio Receiving Set LOC
Primary Use:	Airborne navigation receiver providing lateral guidance. The receiver unit is designated BC-733 ( ).
Frequency Range:	108 to 110.3 mc
Channels Available:	6
Channels Preset:	6
Channel Selection:	Remote relay switch
Output:	Visual: 150-0-150 microamperes dc cross pointer currents Aural: 3 watts
Primary Power:	RC-103A: 28 vdc RC-103AZ: 14 vdc
Typical Mfgr:	Philco Corporation

RC-193A, AZ	Radio Receiving Set Marker Beacon
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. The receiver unit is designated BC-1023A, BC-1033A, B or BC-1333.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Single light indicator Aural: None
Primary Power:	RC-193A: 26 vdc RC-193AZ: 13 vdc
Typical Mfgr:	Air Communications, Incorporated

V12MP-2, A	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. This is the combination power supply and marker beacon receiver generally used in the VC-12, VTA-3 and VC-27 combinations.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Aural only
Primary Power:	12 vdc
Manufacturer:	National Aeronautical Corporation

VC-12, A, B (Simplexer)	Receiver-Transmitter VHF	
Primary Use:	Airborne two-way voice communications in air/air and air/ground service. This can be used with the VOA-3, VOA-2 and VFA-1 for VOR/LOC instrumentation.	
	Transmitter	Receiver
Frequency Range:	118 to 127 mc	108 to 127 mc
Channels Available:	12	Continuously tuned
Channels Preset:	12	None
Channel Selection:	Local manual switch	Local manual tuning
Output:	.35 to .5 watts	175 mw (min)
Primary Power:	VC-12: 13.5 vdc VC-12A: 6.5 vdc VC-12B: 27 vdc	
Manufacturer:	National Aeronautical Corporation	

VC-27 (Simplexer)	Receiver-Transmitter VHF	
Primary Use:	Airborne two-way voice communications in air/air and air/ground service. This can be used with the VOA-3 for VOR/LOC instrumentation.	
	Transmitter	Receiver
Frequency Range:	118 to 127 mc	108 to 127 mc
Channels Available:	27	Continuously tuned
Channels Preset:	27	None
Channel Selection:	Local manual switch	Local manual tuning
Output:	.35 to .5 watts	175 mw (min)
Primary Power:	13.5 / 27 vdc	
Manufacturer:	National Aeronautical Corporation	

VCA, 2D	Converter LOC
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is generally used with the LR-6( ) VHF receiver.
Audio Bandpass:	10 to 10000 cps (approx)
Output:	Dc course deviation indicator currents
Primary Power:	14/28 vdc
Manufacturer:	Lear, Incorporated

VFA-1	Filter Amplifier LOC
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into course deviation indicator currents. This is generally used with the VOA-1 VOR converter and the VC-12 VHF receiver.
Audio Bandpass:	10 to 10000 cps (approx)
Output:	Dc course deviation indicator currents
Primary Power:	13.5 vdc
Manufacturer:	National Aeronautical Corporation

VHT-1, 2, 3 (Superhomer/Omnihomer)	Receiver-Transmitter VOR/VHF	
Primary Use:	Airborne two-way voice communications and VOR in air/air and air/ground service. VOR output is displayed on a self contained course deviation indicator.	
	Transmitter	Receiver
Frequency Range:	108 to 126.5 mc	108 to 126.5 mc
Channels Available:	VHT-1,2: 4; VHT-3: 12	Continuously tuned
Channels Preset:	VHT-1,2: 4; VHT-3: 12	None
Channel Selection:	Local manual switch	Local manual tuning
Output:	.6 watts	175 mw
Primary Power:	13.5 vdc	
Manufacturer:	National Aeronautical Corporation	

VOA-1, 2	Converter VOR
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into course deviation indicator currents. This is generally used with the VC-12 VHF receiver and VFA-1 filter amplifier for voice communications and LOC instrumentation respectively.
Audio Bandpass:	30 to 10500 cps
Output:	Dc cross pointer currents
Primary Power:	13.5 / 27 vdc
Manufacturer:	National Aeronautical Corporation

VOA-3A	Converter VOR/LOC
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is generally used with the Mark V, VC-27, 1016 or 1016A VHF receivers.
Audio Bandpass:	30 to 10500 cps
Output:	Dc cross pointer currents
Primary Power:	13.5 / 27 vdc
Manufacturer:	National Aeronautical Corporation

VTR-1 (Omnigator Mark I)	Receiver-Transmitter VOR/LOC/VHF/MKR-BN		
Primary Use:	Airborne VOR/LOC/Marker Beacon instrumentation and two-way voice communications in air/air and air/ground service. Visual instrumentation output is presented on a zero center course deviation indicator.		
	Transmitter	Receiver	MKR-BN
Frequency Range:	121.5 to 122.9 mc	108 to 127 mc	75 mc fixed
Channels Available:	8	Continuously tuned	1
Channels Preset:	8	None	1
Channel Selection:	Local switch	Local tuning	None
Output:	3 watts	5 watts	5 watts
Primary Power:	12 to 14 vdc		
Manufacturer:	National Aeronautical Corporation		

VTR-2 (Omnigator Mark II)	Receiver-Transmitter VOR/LOC/VHF/MKR-BN		
Primary Use:	Airborne VOR/LOC/Marker Beacon instrumentation and two-way voice communications in air/air and air/ground service. Visual instrumentation output is presented on a zero center course deviation indicator.		
	Transmitter	Receiver	MKR-BN
Frequency Range:	108 to 127 mc	108 to 127 mc	75 mc fixed
Channels Available:	28	Continuously tuned	1
Channels Preset:	28	None	1
Channel Selection:	Local switch	Local tuning	None
Output:	3 watts	1 watt	1 watt
Primary Power:	12 to 14 vdc		
Manufacturer:	National Aeronautical Corporation		

15, Type	Radio Set Receiver-Transmitter VOR/LOC/VHF
Primary Use:	Airborne two-way voice communications and VOR/LOC instrumentation in air/air and air/ground service. This consists of an R-13A, R-13B or R-32 VHF receiver and a B-10, B-10A or B-13A converter.
Frequency Range:	
Channels Available:	
Channels Preset:	(SEE R-13A, 13B/Type 15, R-32/Type 15 and B-10,
Channel Selection:	B-10A, B-13A/Type 15 FOR ADDITIONAL DETAILS)
Output:	
Primary Power:	
Manufacturer:	Aircraft Radio Corporation

27A, B	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 150 mw
Primary Power:	12 vdc and 115 vac 800 cycle 1 phase
Manufacturer:	Western Electric Company

51R-1, 2, 3	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is generally used with the 17L-2 transmitter.
Frequency Range:	108 to 135.9 mc
Channels Available:	280 manual
Channels Preset:	None
Channel Selection:	Remote motor control
Output:	Visual: 150-0-150 microamperes dc cross pointer currents and 400 cycle resolver currents for an Omni-Bearing Indicator Aural: 300 mw
Primary Power:	26.5 vdc/26.5 vdc and 115 vac 400 cycle
Manufacturer:	Collins Radio Company

51V-1, 2	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. This is generally used with a 51R navigation receiver. Output is displayed on one or more cross pointer indicators.
Frequency Range:	329.3 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote relay switch
Output:	150-0-150 microamperes dc cross pointer currents
Primary Power:	27.5 vdc/27.5 vdc and 115 vac/27.5 vdc and 250 vdc
Manufacturer:	Collins Radio Company

51X-2	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is generally used with a 17L-7 transmitter for two-way voice communications or with the 344A-1, B-1 converter for VOR/LOC instrumentation.
Frequency Range:	108 to 151.95 mc
Channels Available:	880 manual
Channels Preset:	None
Channel Selection:	Remote motor control (autopositioner)
Output:	Visual: dc cross pointer currents Aural: 100 mw
Primary Power:	27.5 vdc and/or 115 vac 400 cycle 1 phase
Manufacturer:	Collins Radio Company

51X-3	Receiver VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. This is generally used with a 17L-8 transmitter for two-way voice communications or with the 344A-1 converter for VOR/LOC instrumentation.
Frequency Range:	108 to 126.9 mc
Channels Available:	190 manual
Channels Preset:	None
Channel Selection:	Local manual switch
Output:	Visual: dc cross pointer currents Aural: 4.5 watts
Primary Power:	12/24 vdc
Manufacturer:	Collins Radio Company

51Z-1, 2	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 100 mw
Primary Power:	27.5 vdc/27.5 vdc and 115 vac 300 to 1000 cycle
Manufacturer:	Collins Radio Company

344A-1, B-1	Converter VOR/LOC
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. This is generally used with the 51X-2 VHF receiver.
Audio Bandpass:	30 to 10500 cps
Output:	400 cycle resolver currents for an Omni-Bearing Indicator
Primary Power:	27.5 vdc and 115 vac 400 cycle 1 phase
Manufacturer:	Collins Radio Company

429A	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals.
Frequency Range:	329.3 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote ledex switch
Output:	Visual: dc cross pointer currents
Primary Power:	12/24 vdc/115 vac 400 cycle 1 phase
Manufacturer:	Wilcox Electric Company

700	Glide Slope Receiver ILS
Primary Use:	Airborne reception of ILS vertical guidance signals. The receiver unit is designated 97238A. This is generally used with the 706 navigation receiver for full ILS instrumentation.
Frequency Range:	329.6 to 335 mc
Channels Available:	20
Channels Preset:	20
Channel Selection:	Remote ledex switch
Output:	Dc cross pointer currents
Primary Power:	27.5 vdc/115 vac 400 cycle 1 phase
Manufacturer:	Wilcox Electric Company

702	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals. The receiver units are designated 97241A, 97242A and 97134A.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 100 mw
Primary Power:	27.5 vdc and/or 115 vac 400 cycle 1 phase
Manufacturer:	Wilcox Electric Company

706, A	Radio Receiving Set VOR/LOC/VHF
Primary Use:	Airborne reception of voice communications and VOR/LOC navigation signals in air/air and air/ground service. The receiver units are designated 97298 or 97270. Features two-section construction with the receiver portion identical to the 705 VHF receiver. The converter portion provides VOR/LOC instrumentation.
Frequency Range:	108 to 135.95 mc
Channels Available:	280/560 manual
Channels Preset:	None
Channel Selection:	Remote motor control
Output:	Visual: dc cross pointer currents Aural: 100 mw
Primary Power:	27.5 vdc, 250 vdc and 26 vac 400 cycle 1 phase
Manufacturer:	Wilcox Electric Company

1016 (Sapphire, VSC-1)	Radio Set Receiver-Transmitter VHF	
Primary Use:	Airborne reception of voice communications in air/air and air/ground service. The transmitter is designated VST-1. The receiver unit is designated VSR-1. This can be used with the VOA-3 for VOR/LOC instrumentation.	
	Transmitter	Receiver
Frequency Range:	118 to 135.95 mc	108 to 135.95 mc
Channels Available:	90/360 manual	90/560 manual
Channels Preset:	None	None
Channel Selection:	Remote ledex switch	Remote ledex switch
Output:	6 to 8 watts	3 watts
Primary Power:	12 to 14 vdc	
Manufacturer:	National Aeronautical Corporation	

1016A (Sapphire, VSC-2)	Radio Set Receiver-Transmitter VHF
Primary Use:	Airborne two-way voice communications in air/air and air/ground service. The receiver unit is designated VSR-1A and the transmitter unit is designated VST-1A. This can be used with the VOA-3 for VOR/LOC instrumentation.

	Transmitter	Receiver
Frequency Range:	118 to 135.95 mc	108 to 135.95 mc
Channels Available:	90/180/360 manual	90/180/360/560 manual
Channels Preset:	None	None
Channel Selection:	Remote ledex switch	Remote ledex switch
Output:	5 to 7 watts	1.5 watts
Primary Power:	12/24 vdc	
Manufacturer:	National Aeronautical Corporation	

2200A, B/2201A, B	Marker Beacon Receiver
Primary Use:	Airborne reception of 75 megacycle marker beacon signals.
Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural: 150 mw
Primary Power:	14/28 vdc
Manufacturer:	Lear, Incorporated

2214A, B	Converter VOR
Primary Use:	An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard deviation indicator currents. This is generally used with the LTRA-6 receiver-transmitter group.
Audio Bandpass:	30 to 10000 cps (approx)
Output:	Dc course deviation indicator currents
Primary Power:	2214A: 14 vdc 2214B: 28 vdc
Manufacturer:	Lear, Incorporated

2374

Converter
VOR/LOC/MKR-BN

Primary Use: An airborne navigation instrumentation unit which converts the audio output of a suitable VHF receiver into standard cross pointer or course deviation indicator currents. 75 megacycle marker beacon reception is also provided. This is a part of the LNC-100( ) system.

	MKR-BN	Converter
Frequency Range:	75 mc fixed	30 to 10500 cps (approx)
Channels Available:	1 preset	
Output:	Aural only	Dc cross pointer currents and flag alarm currents
Primary Power:	14/28 vdc	
Manufacturer:	Lear, Incorporated	

5607A

Glide Slope Receiver
ILS

Primary Use: Airborne reception of ILS vertical guidance signals. This is part of the LNC-100C, D systems.

Frequency Range:	329.6 to 335.9 mc
Channels Available:	10
Channels Preset:	10
Channel Selection:	Remote relay switch
Output:	Dc cross pointer currents
Primary Power:	14/28 vdc and 125 vdc
Manufacturer:	Lear, Incorporated

5608A, B, C

Marker Beacon Receiver

Primary Use: Airborne reception of 75 megacycle marker beacon signals.

Frequency Range:	75 mc fixed
Channels Available:	1 preset
Output:	Visual: Three light indicator Aural:
Primary Power:	14/28 vdc
Manufacturer:	Lear, Incorporated

2. Abbreviations. The following abbreviations have been used in the compilation of FAA/BRD-61:

Abbreviation	Explanation
AC	Alternating Current
accord.	Accordance
Adjust.	Adjusted, Adjustment
AF	Audio Frequency, Air Force
AFB	Air Force Base
AL	Commercial Airlines
AM	Amplitude Modulation
Amer.	American
approx	Approximately
ASD	Airborne Systems Division
AVC	Automatic Volume Control
BRD	Bureau of Research and Development
C.	Centigrade
Char.	Characteristic(s)
Civ.	Civilian
COMM (Comm)	Communications
cont'd	Continued
Corp.	Corporation
cps	Cycles Per Second

Abbreviation	Explanation
db	Decibel(s)
dc	Direct Current
ddm	Difference in Depth of Modulation
Deg.	Degree
Defl.	Deflection
Dev.	Deviation
Div.	Division
ea.	Each
Est.	Estimated
FAA	Federal Aviation Agency
f	Frequency
F_c (f_c)	Carrier (or Center) Frequency
FM	Frequency Modulation
Freq.	Frequency
G	General Aviation Fleet
HF	High Frequency
hi	High
HP	Horsepower
IB	Instruction Bulletin
ILS	Instrument Landing System
Inc.	Incorporated
Ind.	Indicator

Abbreviation	Explanation
kc	Kilocycle(s)
LF	Low Frequency
lo	Low
LOC	Localizer
LOT	Lamp Operate Threshold
Max (max)	Maximum
mc	Megacycle(s)
mcw	Modulated Continuous Wave
Mech.	Mechanical
MF	Medium Frequency
Mfg.	Manufacturing
Mfgr (mfgr)	Manufacturer
microamps.	Microamperes
MIL (Mil.)	Military
Min (min)	Minimum
MKR-BN	Marker Beacon
Mod.	Modulator, Modulated, Modulating, Modulation Modified
mw	Milliwatt
N/A	Not Applicable
Nav.	Navigation
Neg.	Negative
No.	Number

Abbreviation	Explanation
Ord.	Ordinate
Para. (Par)	Paragraph
perf.	Performance
Pos	Positive
Prod.	Production
RCA	Radio Corporation of America
Rcvr (rcvr)	Receiver
recomd	Recommended
RF (R.F.) (rf)	Radio Frequency
RFI	Ready for Issue (after routine maintenance)
RTCA	Radio Technical Commission for Aeronautics
Sens.	Sensitivity
Sig. (sig.)	Signal(s)
std.	Standard
thru	Through
T.O.	Technical Order
TV (T.V.)	Television
ua	Microamperes
UHF	Ultra High Frequency
USA	United States Army
USAF	United States Air Force
USCG	United States Coast Guard

Abbreviation	Explanation
USN	United States Navy
uv	Microvolt(s)
v	Volt(s)
vac	Volts Alternating Current
Val.	Value
vdc	Volts Direct Current
VHF	Very High Frequency
VOR	Very High Frequency Omnidirectional Range
w/	With
w/o	Without
Z	Impedance

SECTION D

REFERENCES

3. Extracts from RTCA Papers.

A. RTCA Paper 87-54/DO-57, April 13, 1954

2.1 Audio Frequency Response

The total spread in audio output of the receiver shall not exceed 9 db when the frequency of the modulation on the input signal is varied over the combined ranges of 380 to 420 cps, 1235 to 1365 cps, and 2850 to 3150 cps. The rf level of the input signal shall be ten times that producing lamp operate threshold at 1300 cps.

2.2 Lamp Frequency Response

The variation in rf input level required to produce lamp operate threshold shall not exceed 9 db when the frequency of the modulation on the input signal is varied over the combined ranges of 380 to 420 cps, 1235 to 1365 cps, and 2850 to 3150 cps.

2.3 Audio Level Characteristic

The receiver audio output at each of the modulation frequencies of 400, 1300, and 3000 cps shall not vary more than 10 db when the level of the rf input signal is varied over the range from that producing lamp operate threshold to 200,000 uv.

2.4 Rated Audio Power Output

The audio output power of the receiver shall be not less than the rated output when an rf signal having a level ten times that producing lamp operate threshold at 1300 cps is applied to the receiver input.

2.5 Audio Noise Level - Without Signal

(a) The level of the noise output of the receiver, in the absence of an rf input signal, shall be at least 35 db below the output obtained with an rf input signal having a level ten times that producing lamp operate threshold.

2.6 Audio Noise Level - With Signal

(a) The receiver output signal plus noise-to-noise ratio shall be at least 20 db over the range of rf input signal level from that producing lamp operate threshold to 200,000 uv.

2.7 Distortion

Over the range of rf signal input level from that producing lamp operate threshold to 200,000 uv, the combined noise and distortion in the equipment output shall not exceed 30% of the total output.

2.8 Output Regulation

With an output load of 200% of design impedance and with an output load of 50% of design impedance, the distortion in the output shall not exceed 30%, and the output voltage level shall be within 2:1 of the level when the load is that for which the receiver is designed.

2.9 Emission of Radio-Frequency Energy

The emission of radio-frequency energy on each frequency over the range of .19 - 1500 Mc shall not exceed the following:

(a) Between any two terminals or any cable terminal and ground . . . . . 200 uv

(b) From the antenna input into a resistive load equal to the characteristic impedance of the transmission line for which the equipment is designed . . . 400 micromicrowatts

NOTE: It is recognized that radio-frequency emissions having a level considerably less than the maximum permitted by the above standard are capable of interfering with the operation of other electronic equipment of an aircraft installation. It is also recognized that methods of reducing the level of emissions of radio-frequency energy to much lower values are known. However, at the present state of the art, large and expensive filters are often required in addition to the exercise of care in the mechanical and electrical design of the equipment. The end result is often a compromise between what

is desired and cost. In view of the above, the emission standards were set at a level which can be met by the exercise of reasonable care in design and yet effect a reduction in the present overall interference problem. Lower emission levels are desirable, and it is, therefore, recommended that equipment manufacturers make a determined effort to reduce the level of emissions from electronic equipment to the lowest practicable value below that specified above.

2.10 Sensitivity Depression

(a) The level of the rf input signal at 75 Mc, required to produce lamp operate threshold, shall not increase more than 4 db when there is added to the receiver input channels 4 and 5 television signals having a level of 3.5 v.

(b) The level of the rf input signal at 75 Mc, required to produce lamp operate threshold, shall not increase more than 4 db when there is added to the receiver input a .5 v rf signal frequency modulated 1300 cps at a deviation of $\pm$15 kc. This standard shall be met over the FM signal frequency ranges of 72.02 - 74.58 Mc and 75.42 - 75.98 Mc.

2.11 Input Operating Differential

The ratio of the rf input signal level required to produce lamp operate threshold when the rf input signal level is increasing to the rf input signal level required to produce lamp operate threshold when the rf input signal level is decreasing shall not exceed 2:1.

2.13 Cross Modulation

(a) The voltage across the indicator lamp(s) due to cross modulation shall not exceed the voltage at lamp operate threshold nor shall the audio output exceed one-half the manufacturer's rated output when there are applied simultaneously to the receiver input an unmodulated carrier at center response frequency having a level equal to that of a signal producing lamp operate threshold and a television signal having a level of 3.5 v. This standard shall be met at the television signal frequencies of channels 2 through 6.

(b) The voltage across the indicator lamp(s) due to cross modulation shall not exceed the voltage at lamp operate thresh-

old nor shall the audio output exceed one-half the manufacturer's rated output when there are applied simultaneously to the receiver input an unmodulated carrier at center response frequency having a level equal to that of a signal producing lamp operate threshold and a .5 v rf signal frequency modulated 1300 cps at a deviation of ±15 kc. This standard shall be met over the FM signal frequency ranges of 72.02 - 74.58 Mc and 75.42 - 75.98 Mc.

2.14 Spurious Response

(a) The voltage across the indicator lamp(s) shall not exceed the lamp operate threshold voltage nor shall the audio output exceed one-half the manufacturer's rated output when an rf input signal of 0.5 v, amplitude modulated 30% in turn at 400, 1300, and 3000 cps, is varied over the frequency range of .190 Mc to 1500 Mc, excluding the band from 65 to 85 Mc.

(b) The voltage across the indicator lamp(s) shall not exceed the lamp operate threshold voltage nor shall the audio output exceed one-half the manufacturer's rated output when an rf input signal of .5 v, frequency modulated in turn at 400, 1300, and 3000 cps at a deviation of ±15 kc, is varied over the frequency ranges of 72.02 - 74.58 Mc and 75.42 - 75.98 Mc.

(c) The voltage across the indicator lamp(s) shall not exceed the lamp operate threshold voltage nor shall the audio output exceed one-half the manufacturer's rated output when an rf input signal of 3.5 v with television signal modulation is applied at television signal frequencies of channels 2 through 6.

2.15 Nose Bandwidth 1/

The level of the input signal required to produce lamp operate threshold over the input signal frequency range of 75 Mc -10 kc to 75 Mc +10 kc shall not be more than 6 db above the input required to produce lamp operate threshold at the frequency of maximum response.

2.16 Lamp Operate Selectivity

In the case of equipment designed to operate a separate lamp for each of the three modulation frequencies of 400, 1300 and 3000 cps, the voltage across the two lamps not intended to be operated

1/ Amended as of 11-8-55

shall be less than 30% of rated lamp voltage over the input signal range from that producing lamp operate threshold to 200,000 uv.

3.1 Temperature Variation Test

When the equipment is subjected to the temperature variation test, the standards of paragraph 2.15 shall be met.

B. RTCA Paper 88-54/DO-58, April 13, 1954

2.3 Centering Characteristic

The deviation indicator shall not depart from its centered position by more than 5% of the standard deflection when the level of a standard glide slope centering signal is varied over the range of 100 to 30,000 uv.

2.4 Sensitivity and Deflection Characteristic

The variation in deviation indicator deflection shall be within +20% and -10% of the deflection at 200 uv input when the level of a standard glide slope deviation signal is varied over the range of 200 to 30,000 uv. When the input level is varied over the range from 40 to 200 uv, the deviation indicator deflection shall be within the limits of -20% and +10% of the deflection at 200 uv input.

2.5 Deflection Linearity

Over the deflection range of the deviation indicator, the amount of deflection shall be within 10% of being proportional to the difference in depth of modulation[1/] of the 90 and 150 cps signals, or the amount of deflection shall be within 5% of standard deflection of being proportional to the difference in depth of modulation, whichever is greater. Additionally, as the difference in depth of modulation is increased beyond that producing full scale deflection to a value of .9 ddm, the indicator deflection shall not be less than full scale. These standards shall be met over the range of signal input level from 200 to 30,000 uv.

2.6 Selectivity

The receiver shall meet the following selectivity standards on each frequency channel:

(a) Over the frequency range from center response frequency[2/] -60 kc to center response frequency +60 kc, the response shall not vary more than 6 db.

1/ Difference in depth of modulation (ddm) is the percentage modulation depth of the larger signal minus the percentage modulation depth of the smaller signal divided by 100.

2/ Center response frequency is the frequency midway between the two frequencies at which the selectivity curve is 6 db down.

(b) Over the frequency range from 230 kc to 530 kc from the center response frequency, the response shall be at least 40 db down from the response at the frequency of maximum response.

(c) Over the frequency range from 328.77 Mc to 335.53 Mc, excluding frequencies between ±530 kc of center response frequency, the response shall be at least 60 db below the response at center response frequency.

2.7 Spurious Response

The receiver shall meet the following spurious response standard on each frequency channel:

The response of the receiver shall be at least 60 db below the response at center response frequency when an input signal modulated 30% at 150 cps is varied over the frequency range of .190 Mc to 1500 Mc, excluding the frequency band 328.77 Mc to 335.53 Mc.

2.8 Cross Modulation

With the simultaneous application of a standard glide slope centering signal at maximum response frequency (desired signal) and a signal, consisting of an rf carrier amplitude modulated 30% at 150 cps, at other than maximum response frequency (undesired signal), the deviation indicator shall not deflect from its centered position due to cross modulation by more than 10% of standard deflection under the following conditions:

Level of Desired Signal	Level of Undesired Signal	Frequency Range over which Undesired Signal is Varied
200 uv	20,000 uv	329.0 Mc - 335.3 Mc, excluding desired signal frequency ±300 kc
1000 uv	20,000 uv	329.0 Mc - 335.3 Mc, excluding desired signal frequency ±300 kc

2.9 Alarm Signal

An alarm signaling device shall be provided. The alarm signal shall:

(a) Be plainly visible in the absence of an rf signal and in the absence of 90 and 150 cps modulation on a 200 uv carrier at center response frequency.

(b) At least begin to appear when the percentage modulation of the 90 and 150 cps signals of a 200 uv standard glide slope centering signal is reduced to 22.5% of each and when the percentage modulation of either the 90 or 150 cps signal is zero and the other 45%.

(c) At least begin to appear when the level of a standard glide slope deviation signal produces 50% of standard deflection of the deviation indicator.

(d) Be energized and its indicator off or out of sight when the level of a standard glide slope test signal is varied over the range of at least 40 to 30,000 uv.

2.10 Emission of Radio-Frequency Energy

The emission, from the receiver, of radio-frequency energy over the frequency range of .190 to 1500 Mc shall not exceed the following:

(a) Between any cable terminal and ground - 200 uv.

(b) Into the test antenna or into a resistive load equal to the characteristic impedance of the transmission line for which the receiver is designed - 400 micromicrowatts.

NOTE: It is recognized that radio-frequency emissions having a level considerably less than the maximum permitted by the above standard are capable of interfering with the operation of other electronic equipment of an aircraft installation. It is also recognized that methods of reducing the level of emissions of radio-frequency energy to much lower values are known. However, at the present state of the art, large and expensive filters are often required in addition to the exercise of care in the mechanical and electrical design of the equipment. The end result is often a compromise between what is desired and cost. In view of the above, the emission standards were set at a level which can be met by the exercise of reasonable care in design and yet effect a reduction in the present overall interference problem. Lower

emission levels are desirable, and it is, therefore, recommended that equipment manufacturers make a determined effort to reduce the level of emissions from electronic equipment to the lowest practicable value below that specified above.

2.12 Power Source Frequency Variation

When the receiver is designed for operation from an AC power source of variable frequency and the frequency is slowly varied through the range for which the receiver is designed, the deviation indicator needle shall not vary more than 5% of standard deflection in the presence of a standard glide slope centering signal of 200 uv.

2.13 Deviation Indicator Stability with Change in Frequency of 90 and 150 cps Signals

(a) The deviation indicator shall not change from its centered position by more than 5% of standard deflection when the frequency of the modulation signals of a 1000 uv standard glide slope centering signal is simultaneously varied over the range from 97.5% to 102.5% of 90 and 150 cps.

(b) The deviation indicator shall not depart from standard deflection by more than 15% of standard deflection when the frequency of the modulation signals of a 1000 uv standard glide slope deviation signal is simultaneously varied over the range from 97.5% to 102.5% of 90 and 150 cps.

2.14 Deviation Indicator Sensitivity Adjustment Range

Means shall be provided for the adjustment of the deviation indicator deflection sensitivity. The range of adjustment shall be at least from .4 to .8 of full scale deflection of the deviation indicator when the input signal is a standard glide slope deviation signal of 200 uv. At all sensitivity settings over the range from .4 to .8 of full scale, the standards of Sections 2.3, 2.4, and 2.5 shall be met except that, in this case, reference deflection shall be the deflection obtained with a standard glide slope deviation signal of 200 uv at the particular deflection sensitivity setting.

2.15 Operation of Two Glide Slope Receivers from the Same Antenna

(This standard is applicable to those receivers designed to operate from an antenna which also supplies signals to another receiver.)

When the receiver is connected, in accordance with the manufacturer's instructions, to an antenna which also supplies signals to another glide slope receiver and both receivers are operated in accordance with the manufacturer's instructions, the standards of all paragraphs of Section 2 shall be met, and the deviation indication inaccuracies resulting from interaction between the two receivers when operated on the same rf frequency shall not exceed 5% of standard deflection.

For the purpose of this standard, the junction of the two transmission lines connected to the receivers shall be considered the receiver input.

NOTE: It is recognized that two receivers meeting the above standard may interfere with one another on some combinations of channel settings. While it is desirable that two receivers so connected cannot interfere with one another at all channel setting combinations, the state of the art is such that it is impracticable to set forth an equipment standard in these terms as a minimum requirement. It is recommended that equipment manufacturers take cognizance of this and make a determined effort to reduce the number of channel setting combinations where interference might occur and to reduce the severity of the interference in those cases where it cannot be eliminated.

2.16 Indicator Stability

Random movement of the deviation indicator shall not exceed 10% of standard deflection when a standard glide slope centering signal having a level of 40 uv and when a standard glide slope deviation signal having a level of 40 uv are applied successively to the equipment. When the level of the input signal is 200 uv, the random movement of the deviation indicator shall not exceed 5% of standard deflection.

2.17 90 and 150 cps Phase Characteristic

The position of the indicator shall not change more than 5% of standard deflection when a standard glide slope centering signal of 1000 uv is applied to the receiver input and the phase relationship between the 90 and 150 cps signals is varied continuously from that in which the positive peaks add to a maximum to that in which the negative peaks add to a maximum. If referred to the 30 cps subharmonics, this is a shift of 24° between the 30 cps subharmonics of the 90 cps signal and the 30 cps subharmonics of the 150 cps signal.

2.18 Frequency Channel Selection

The receiver shall be designed to select, in discrete increments, the frequency channels allocated for use in the glide slope portion of the ILS system. The accuracy of frequency channel selection shall be such that the center response frequency of the receiver shall be within 45 kc of the center frequency of the respective frequency channel.

NOTE: In the ILS system, the frequency channels allocated for the localizer facilities are paired with those allocated for the glide slope facilities. Usually, a single selector switch is used in the aircraft to select the various paired frequency channel combinations.

3.3 Temperature Variation Test

When the equipment is subjected to the temperature variation test:

(a) The center response frequency of the receiver shall remain within 45 kc of the assigned channel frequency.

(b) The deviation indicator deflection, with a 200 uv standard glide slope centering signal, shall not change from that obtained under standard test conditions by more than 5% of standard deflection.

(c) The deviation indicator deflection, with a 200 uv standard glide slope deviation signal, shall not change from that obtained under standard test conditions by more than 15% of standard deflection.

C. RTCA Paper 89-54/DO-59, July 15, 1954

2.3 Centering Characteristic 1/

The deviation indication shall not depart from the centering position by more than 10% of the standard deflection when the level of a standard localizer centering signal is varied over the range of 40 to 20,000 uv.

2.4 Sensitivity and Deflection Characteristic 1/

The deviation indicator deflection shall remain within a range equal to 20% of the deflection at 1000 uv input when the level of a standard localizer deviation signal is varied over the range of 40 to 20,000 uv.

2.5 Deflection Linearity 1/

Over the deflection range of the deviation indicator, the amount of deflection shall be within 10% of being proportional to the difference in depth of modulation 2/ of the 90 and 150 cps signals, or the amount of deflection shall be within 10% of standard deflection of being proportional to the difference in depth of modulation, whichever is greater. Additionally, as the difference in depth of modulation is increased beyond that producing maximum deflection to a value of .4 ddm, the deflection shall not be less than its maximum value. These standards shall be met over the range of signal input level from 40 to 20,000 uv.

2.6 Selectivity

The receiver shall meet the following selectivity standards on each frequency channel:

(a) Over the frequency range from center response frequency 3/ -20 kc to center response frequency +20 kc, the response shall not vary more than 6 db.

1/ Amended as of 1-11-55.

2/ Difference in depth of modulation (ddm) is the percentage modulation depth of the larger signal minus the percentage modulation depth of the smaller signal divided by 100.

3/ Center response frequency is the frequency midway between the two frequencies at which the selectivity curve is 6 db down.

(b) Over the frequency range from 108.0 Mc to 112.0 Mc, excluding frequencies within 200 kc of center response frequency, the response shall be at least 60 db below the response at center response frequency.

NOTE: The selectivity standards set forth herein are based upon the use of the ILS Localizer system at distances not exceeding 25 nautical miles from the facility and at altitudes not exceeding 2000 feet above the facility. When it is intended that satisfactory receiver operation be obtained at greater distances and at higher altitudes, additional selectivity is required to suppress signals from VOR facilities 100 kc removed from the desired signal.

2.7 Spurious Response

The response of the receiver shall be at least 60 db below the response at center response frequency when an input signal modulated 30% at 150 cps is varied over the frequency range of .190 Mc to 1500 Mc, excluding the frequency band 107.8 Mc to 112.2 Mc.

2.8 Cross Modulation

With the simultaneous application of a standard localizer centering signal at maximum response frequency (desired signal) and a signal consisting of an rf carrier amplitude modulated 30% at 150 cps at other than maximum response frequency (undesired signal, the alarm signaling device shall indicate a useable signal, and the deviation indication shall not depart from its centered position due to cross modulation by more than 10% of standard deflection under the following conditions:

Level of Desired Signal	Level of Undesired Signal	Frequency Range over which Undesired Signal is Varied
200 uv	10,000 uv	107.0 Mc - 112.0 Mc, excluding the band within 200 kc of the desired signal frequency
1000 uv	20,000 uv	

2.9 Alarm Signal

An alarm signaling device shall be provided. The device shall:

(a) Be plainly visible in the absence of an rf signal. Be plainly visible in the absence of 90 and 150 cps modulation on a 1000 uv carrier at center response frequency.

(b) At least begin to appear when the percentage modulation of the 90 and 150 cps signals of a standard localizer centering signal is reduced to 10% of each and when the percentage modulation of either the 90 or 150 cps signal is zero and the other 20%.

(c) At least begin to appear when the level of a standard localizer deviation signal produces 50% of standard deflection of the deviation indicator.

1/ (d) Be energized and its indicator off or out of sight when the level of a standard localizer test signal is varied over the range of at least 40 to 20,000 uv.

2.10 Emission of Radio-Frequency Energy

The emission of radio-frequency energy from the receiver over the frequency range of .190 to 1500 Mc shall not exceed the following:

(a) Between any two cable terminals or any cable terminal and ground - 200 uv.

(b) Across the test antenna or, in cases where the receiver is designed for a specific source impedance, across a resistive load equal to the source impedance for which the equipment is designed - 400 micromicrowatts.

2.12 Power Source Frequency Variation

When the receiver is designed for operation from an AC power source of variable frequency and the frequency is slowly varied through the range for which the receiver is designed, the deviation indication shall not vary more than 5% of standard deflection in the presence of a standard localizer centering signal of 1000 uv.

1/ Amended as of 1-11-55.

2.13 Deviation Indicator Stability with Change in Frequency of 90 and 150 cps Signals

(a) The deviation indicator shall not change from its centered position by more than 10% of standard deflection when the frequency of the modulation signals of a 1000 uv standard localizer centering signal is simultaneously varied over the range from 97.5% to 102.5% of 90 and 150 cps.

(b) The deviation indicator shall not depart from standard deflection by more than 15% of standard deflection when the frequency of the modulation signals of a 1000 uv standard localizer deviation signal is simultaneously varied over the range from 97.5% to 102.5% of 90 and 150 cps.

2.14 Deviation Indicator Sensitivity Adjustment Range

Means shall be provided for the service adjustment of the deviation indicator sensitivity over the range of at least from .4 to .8 of full deflection when the input signal is a standard localizer deviation signal of 1000 uv. At all sensitivity adjustments over the range of .4 to .8 of full deflection, the standards of Sections 2.3, 2.4, and 2.5 shall be met except that, in this case, the deflection obtained with a standard localizer deviation signal of 1000 uv at the particular deflection sensitivity setting shall be used instead of standard deflection.

NOTE: Adjustment of deviation indicator deflection sensitivity may be accomplished by means of a variable control or by replacing circuit elements, such as resistors, with those having another value.

2.15 Operation of Two Localizer Receivers from the Same Antenna

(This standard is applicable to those receivers designed to operate from an antenna which also supplies signals to another receiver.)

When the receiver is connected in accordance with the manufacturer's instructions to an antenna which also supplies signals to another receiver and both receivers are operated in accordance with the manufacturer's instructions, the standards of all paragraphs of Section 2 shall be met and, in addition, the deviation indication inaccuracies resulting from interaction between

the two receivers when operated on the same rf frequency shall not exceed 5% of standard deflection. For the purpose of this standard, the junction of the two transmission lines connected to the receivers shall be considered the receiver input.

NOTE: It is recognized that two receivers meeting the above standard may interfere with one another on some combinations of channel settings. While it is desirable that two receivers so connected cannot interfere with one another at all channel setting combinations, the state of the art is such that it is impracticable to set forth an equipment standard in these terms. It is recommended that equipment manufacturers take cognizance of this and make a determined effort to reduce the number of channel setting combinations where interference might occur and to reduce the severity of the interference in those cases where it cannot be eliminated.

2.16 Audio Frequency Response

The receiver audio output level shall not vary more than 9 db when the audio modulating frequency of a standard localizer audio signal is varied over the range of 350 to 2500 cps. The rf input level shall be held constant at a value producing an output signal plus noise-to-noise ratio of 25 db, and the output at 1000 cps shall be not less than 90% of the rated output.

NOTE: The above standard on audio frequency response defines a minimum acceptable performance in accordance with current practice. The equipment designer should be aware, however, that advances in air/ground communications system design may dictate a revision of this standard in the future.

2.17 Audio Output Regulation and Distortion 1/

With an output load of 200% of design impedance and with an output load of 50% of design impedance, the combined distortion and noise in the receiver audio output shall not exceed 25% of the total output, and the output power level shall be within 2:1 of the level when the load is that for which the receiver is designed. This requirement shall be met over the rf input range of 40 to 20,000 uv and over the audio frequency range of 350 to 2500 cps.

1/ Amended as of 1-11-55.

2.3 Bearing Accuracy

At all bearing indications, the bearing error at all combinations of the following variable conditions shall not exceed 4.2° with a statistical probability of 95% in the case of equipments intended for installation in aircraft which will not be operated at altitudes above 15,000 feet, or 2.7° with a statistical probability of 95% in the case of equipments intended for installation in aircraft which will be operated at altitudes above 15,000 feet.

a. ±.5% variation in frequency of the reference and variable phase signals.

b. ±10% variation in primary power voltage.

c. Variation in percentage modulation of the carrier by the variable phase signal from 25% to 35%.

e. Variation in rf input voltage from 10 uv to 10,000 uv.

f. Variation in power supply frequency throughout the range for which the equipment is designed.

NOTE: It is not required that equipment be subjected to all combinations of the above variable conditions simultaneously to determine compliance with this standard. Tests have shown that the overall error at a given bearing indication is the algebraic sum of the errors due to the separate variables.

2.4 Deflection Linearity

Over the deviation indicator deflection range from 10% of standard deflection to maximum deflection, the amount of deflection shall be within 10% of being proportional to the difference in phase of the reference and variable phase signals, from that phase producing centered deflection. As the difference in phase is increased beyond that producing maximum deflection to a value of 90°, the deflection shall not be less than its maximum value. These standards apply over the range of signal input level from 10 uv to 10,000 uv.

NOTE: Non-linear deflections of deviation indicators is being evaluated as of the date of this report. If non-linear deflection characteristics are proved to be superior the above characteristic will be amended.

2.5 Selectivity

a. Receivers designed for selection of frequency channels in discrete increments.

2.18 Percentage Modulation Characteristic

The deviation indicator shall not depart from its centered position by more than 5% of standard deflection when a standard localizer audio signal is applied to the receiver input and the percentage modulation of the 90 and 150 cps signals is increased from 20% each to 25% each.

3.3 Temperature Variation Test

When the equipment is subjected to the temperature variation test:

(a) The center response frequency of the receiver shall remain within:

(1) 12 kc of the assigned channel frequency in the case of receivers designed to select the assigned frequency channels in discrete increments.

(2) .1% of the assigned channel frequency in the case of continuously tunable receivers.

(b) The deviation indicator deflection, with a 1000 uv standard localizer centering signal, shall not change from that obtained under standard test conditions by more than 15% of standard deflection.

(c) The deviation indicator deflection, with a 1000 uv standard localizer deviation signal, shall not change from that obtained under standard test conditions by more than 30% of standard deflection.

NOTE: In the case of continuously tunable receivers, the receiver shall meet the standards of paragraphs b and c above when it is tuned to the center response frequency.

(1) The level of an input signal required to produce a given output shall not vary more than 6 db over the input signal frequency range:

From:

The assigned channel frequency -10.4 kc, -.005% of the assigned channel frequency, minus the maximum positive departure of center response frequency 1/ from the assigned channel frequency under the Temperature Variation Test.

To:

The assigned channel frequency +10.4 kc, +.005% of the assigned channel frequency, plus the maximum negative departure of center response frequency from the assigned channel frequency under the Temperature Variation Test.

(2) The level of an input signal required to produce a given output shall be at least 60 db greater than the level required to produce the given output at the frequency of maximum response:

At a frequency equal to:

The assigned channel frequency +100 kc -.005% of the assigned channel frequency minus the maximum positive departure of center response frequency from the assigned channel frequency occurring under the Temperature Variation Test.

And at a frequency equal to:

The assigned channel frequency -100 kc +.005% of the assigned channel frequency plus the maximum negative departure of center response frequency from the assigned channel frequency occurring under the Temperature Variation Test.

b. Receivers in which the resonant frequency changes continuously when tuning from one channel to another.

(1) The level of an input signal required to produce a given output shall not vary more than 6 db over the input signal frequency range from at least 20 kc below center response frequency to at least 20 kc above center response frequency.

1/ Center response frequency is the frequency midway between the two frequencies at which the receiver response, as shown by the selectivity curve, is 6 db down.

(2) The level of an input signal required to produce a given output at frequencies of 160 kc from the center response frequency shall be at least 60 db greater than the level required to produce the given output at the frequency of maximum response.

2.6 Spurious Responses

Over the input signal frequency range of .190 kc to 1500 Mc, excluding the band 107.8 to 118.2 Mc, the level of a standard audio test signal required to produce a given receiver output shall be at least 60 db greater than that required to produce the given output at the frequency of maximum response.

2.7 Cross Modulation and Intermodulation

With the simultaneous application of:

a. A standard VOR test signal at maximum response frequency producing center deflection of the deviation indicator (desired signal) and

b. A signal consisting of an rf carrier amplitude modulated by a 30 cps signal 90° out of phase with the variable phase component of the desired signal (undesired signal),

the alarm signaling device shall indicate a useable signal, and the bearing error shall not exceed 1° under the following conditions:

Level of Desired Signal	Level of Undesired Signal	Frequency Range Over Which Undesired Signal is Varied
20 uv	1,000 uv	108.0 Mc - 118.0 Mc, excluding the band within 200 kc of the desired signal frequency
2,000 uv	10,000 uv	

2.8 Alarm Signal

An alarm signaling device shall be provided. The device shall:

a. Be plainly visible or in the "alarm" sector (e.g., of the To-From indicator) in the absence of:

(1) An rf signal.

(2) 9960 cps modulation on an otherwise standard VOR test signal of 1000 uv.

(3) 30 cps modulation on an otherwise standard VOR test signal of 1000 uv.

b. At least begin to appear or to enter the "alarm" sector when the percentage modulation of the 30 and 9960 cps signals of a standard VOR test signal is reduced to 15% of each.

c. At least begin to appear or to enter the "alarm" sector when the level of a standard VOR test signal is such that the deviation sensitivity is one-half that with a 1000 uv signal.

d. Be energized and its indicator off or out of sight or be out of the "alarm" sector when the level of a standard VOR test signal is varied over the range of at least 10 to 20,000 uv.

2.9 Emission of Radio Frequency Energy

The emission of radio-frequency energy from the receiver over the frequency range of .190 to 1500 Mc shall not exceed the following:

a. Between any two cable terminals or any cable terminal and ground - 200 uv.

b. Across the test antenna or, in cases where the receiver is designed for a specific source impedance, across a resistive load equal to the source impedance for which the equipment is designed - 400 micromicrowatts.

2.11 Deflection Sensitivity

The deviation indicator shall deflect to at least standard deflection when the difference in phase between the variable and reference phase signals is not more than 10° from that producing centered deflection. The deflection on one side of the center zero position shall be within 10% of that on the other side for the same phase difference.

2.12 Audio Frequency Response

The receiver audio output level shall not vary more than 6 db when the audio modulating frequency of a standard VOR audio test signal is varied over the range of 350 to 2500 cps. The rf input level shall be held constant at the value producing an output signal-to-noise ratio of 20 db at 1000 cps. The output at 1000 cps shall be at least 90% of the rated output.

2.13 Audio Output Regulation and Distortion

With an output load of 200% of design impedance and with an output

load of 50% of design impedance, the combined distortion and noise in the receiver audio output shall not exceed 25% of the total output, and the output power level shall be within 2:1 of the level when the load is that for which the receiver is designed. This requirement shall be met over the rf input range of 100 to 10,000 uv and over the audio frequency range of 350 to 2500 cps, using a standard VOR test signal modulated 30% at the audio frequencies.

2.14 AVC Characteristic

Between the limits of 10 uv and 10,000 uv input, the audio output shall not vary more than 10 db.

2.15 Gain

An input signal of not more than 20 uv shall produce a receiver output which is not less than the manufacturer's published rated output.

2.16 Audio Output Noise Level

The signal-to-noise ratio of the receiver audio output shall be at least 25 db, excluding the noise effects of frequencies in the range 9,480 to 10,440 cps. The signal-to-noise ratio in the receiver audio output shall be at least 20 db, including the noise effects of frequencies in the range 9,480 to 10,440 cps. This standard shall be met over the rf input signal level range of 100 uv to 10,000 uv, using a Standard VOR Audio Test Signal. The receiver gain shall be adjusted to produce rated output.

When the equipment is designed for operation from an alternating current power source, the above standard shall be met over the range of power source frequencies for which the equipment is designed.

2.17 Operation of Two VOR Receivers from the Same Antenna

(This standard is applicable to those receivers designed to operate from an antenna which also supplies signals to another receiver.)

When the receiver is connected in accordance with the manufacturer's instructions to an antenna which also supplies signals to another receiver and both receivers are operated in accordance with the manufacturer's instructions, the standards of all paragraphs of Section 2 shall be met. For the purpose of this standard, the junction of the two transmission lines connected to the receivers shall be considered the receiver input.

3.1 Temperature Variation Test

When the equipment is subjected to the Temperature Variation Test:

a. and the receiver is designed for selection of frequency channels in discrete increments, the departure in center response frequency from the assigned channel frequency shall be within the limits specified in paragraph 2.5.

b. and the receiver is designed for selection of frequency channels through the use of continuous tuning methods, the center response frequency of the receiver shall remain within .1% of the assigned channel frequency.

D. RTCA Paper 100-54/DO-60, April 13, 1954

VIII. Temperature Variation Test

Three Temperature Variation Test Procedures are specified. Procedure A is applicable to equipment intended for installation in non-pressurized and non-heated locations in aircraft which operate at altitudes above 15,000 feet. Procedure B is applicable to equipment intended for installation in heated and pressurized locations in aircraft which operate at altitudes above 15,000 feet and to equipment intended for installation in aircraft which do not operate at altitudes above 15,000 feet. Procedure C is applicable to equipment intended for installation as described in Procedure B when the temperature of the air to which the equipment is exposed is maintained within -10°C to +40°C.

Procedure A

1. Subject the equipment to air at room pressure having a temperature of -55°C +0° -5°C. Apply standard primary test voltages to the equipment and operate it at maximum duty cycle until the equipment temperature stabilizes.

2. Increase the temperature of the air in the test chamber to +55°C -0° +5°C at a rate not exceeding .5°C per minute.

3. Maintain the temperature of the air in the test chamber at 55°C -0° +5°C until the temperature of the equipment under test stabilizes.

4. From the time the equipment temperature stabilizes at the lower temperature until it stabilizes at the higher temperature, conduct such of the tests specified in the applicable test procedures (see Page 1, paragraph 1) as are pertinent to a determination of the effects of the application of this environmental test upon the performance of the equipment.

Procedure B

1. Subject the equipment to air at room pressure having a temperature of -40°C +0° -5°C. Apply standard primary test voltages to the equipment and operate it at maximum duty cycle until the equipment temperature stabilizes.

2. Increase the temperature of the air in the test chamber

to +55°C -0° +5°C at a rate not exceeding .5°C per minute.

3. Maintain the temperature of the air in the test chamber at 55°C -0° +5°C until the temperature of the equipment under test stabilizes.

4. From the time the equipment temperature stabilizes at the lower temperature until it stabilizes at the higher temperature, conduct such of the tests specified in the applicable test procedures (see Page 1, paragraph 1) as are pertinent to a determination of the effects of the application of this environmental test upon the performance of the equipment.

Procedure C

1. Subject the equipment to air at room pressure having a temperature of -10°C +0° -5°C. Apply standard primary test voltages to the equipment and operate it at maximum duty cycle until the equipment temperature stabilizes.

2. Increase the temperature of the air in the test chamber to +40°C -0° +5°C at a rate not exceeding .5°C per minute.

3. Maintain the temperature of the air in the test chamber at +40°C -0° +5°C until the temperature of the equipment under test stabilizes.

4. From the time the equipment temperature stabilizes at the lower temperature until it stabilizes at the higher temperature, conduct such of the tests specified in the applicable test procedure (see Page 1, paragraph 1) as are pertinent to a determination of the effects of the application of this environmental test upon the performance of the equipment.

SECTION D

REFERENCES

4. Associated Publications. The following publications have been used as references in the compilation of FAA/BRD-61:

   a. Airborne and Ground Air Traffic Control Radio Communications Equipment Distribution, Volume I, August, 1959. (The first of two publications required by contract FAA/BRD-60)

   b. Airborne and Ground Air Traffic Control Radio Communications Equipment Technical Characteristics, Volume II, August, 1959. (The second of two publications required by contract FAA/BRD-60)

SECTION E

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SECTION E

APPENDIX

1. Statistical Analysis To Determine Radio Equipment Distribution, General Aviation Fleet.

a. Introduction. The sample survey was conducted to estimate the number and type of radio communications and/or navigation equipment carried by aircraft in the General Aviation Fleet. Private and governmental agencies and equipment manufacturers possessed some information concerning airborne radio equipment installed in the General Aviation Fleet, but it was necessary to poll individual private aircraft owners because they were the only complete source of required information.

The population estimates for the poll were utilized to select certain of the equipment types for laboratory test to evaluate degradation and other performance criteria. The models selected and the test data are given in FAA/BRD-60, Volume II, Section B, and FAA/BRD-61, Section C.

In order to confine the survey to General Aviation activity within the continental limits of the United States, the following aircraft classifications were excluded:

(1) Aircraft operated by scheduled, non-scheduled, and irregular aircarriers.
(2) Aircraft based outside the United States but with United States registration.
(3) Aircraft not leased for civil use which are operated by the United States Armed Forces.

Aircraft included in the preceding classifications are covered in FAA/BRD-60, Volume I, Section B, and FAA/BRD-61, Section B.

b. Development of the Questionnaire. The survey was conducted entirely by mail because budget limitations precluded contact by personal interview or telephone. To insure good response, the questionnaire was designed to be complete and void of complex items.

The questionnaire provided ample space for the listing by type, manufacturer, and model of dual or standby as well as for primary radio equipment installation.

The questionnaire, as shown in Figure E-1, was a prefold, self-contained

envelope which required no postage for mailing, thereby eliminating these responsibilities for the addressee.

c. Selection of the Sample. The sample was drawn from the FAA listing of all active aircraft owners in the General Aviation Fleet. This listing, maintained at FAA's Data Processing Branch, is categorized according to the following criteria:

(1) Manufacturer and partial model specifications.
(2) Year of manufacture and airworthiness status.
(3) Horsepower, number of engines, and places.
(4) Aircraft registration number and name and address of owner.

Since the size of aircraft is highly correlated with the type of equipment installed, stratification of the sample was necessary to make the population somewhat more homogeneous. The population of N units (i.e., the number of aircraft in the General Aviation Fleet) was broken down into sub-populations of $N_1, N_2, \ldots N_{10}$ units (e.g., the number of single engine aircraft, one and two place, 66 to 100 horsepower, inclusive). The sum of the units over all of the strata represented the entire universe.

Approximately 20 percent sampling was sufficient for those strata with large populations, while 100 percent sampling was necessary for those which were relatively small. These large sampling ratios were necessary in order to obtain a sufficient number of specific equipment models for each equipment type while at the same time increase the precision of the population estimates.

The procedure for drawing the basic sample names within each of the ten prescribed strata was accomplished through the application of the systematic cyclical method of sample selection. A sampling interval was established for each stratum and a random starting point for the selection of the initial sample name was chosen from a table of random numbers. Each name located at the established interval point was then selected systematically until the quota was reached for each stratum.

The description of the samples and the draw are given in Figure E-2.

d. Mail Contact and Response. Individual aircraft were sampled rather than individual owners. Therefore, in some cases, one owner was requested to furnish information with respect to two or more aircraft registered in his name.

Three mailings were sent out. On the first mailing, a questionnaire was directed to the owner of every aircraft listed on the sample frame. On the second mailing, a questionnaire was directed only to those who had not returned the first inquiry. The third and final mailing was a random sample

drawn from the addressees who had returned neither the first nor the second inquiry. Budget considerations precluded sampling from the 7th, 8th, and 10th strata for the final mailing. In developing totals, it was assumed that except for the three given strata the aircraft of the non-respondents had similar equipment characteristics as the third mailing respondents. Non-respondents from the 7th, 8th, and 10th strata were assumed to have had a similar equipment distribution as the second mailing respondents.

From the sample of 13,340 aircraft drawn from the source list, the overall response was 43.4 percent of the questionnaires which were presumably deliverable or 41.8 percent of the total mailed out. A detailed tabulation for each of the three mailings is given in Figure E-3.

e. Possible Bias. Non-respondents, those who presumably received the questionnaire yet did not reply, totaled 56.6 percent. It is possible then, that the respondents and non-respondents could have come from two separate populations, and that the respondents are not truly representative of the entire population. Yet three mailings, with analysis of each separate from the other, revealed the data to be from populations which were relatively homogeneous.

The analysis showed that a certain proportion of the addresses given by the FAA listing was abbreviated to the extent of being unsatisfactory for mailing purposes. This was the most common difficulty in those cases where the questionnaire was returned by the post office as undeliverable. Another major problem was addresses which were out of date. It would seem unlikely, however, that these factors would introduce a bias of any kind in the return. It appears most appropriate, therefore, to discuss the results in relation to the number of questionnaires which were presumably delivered.

Major radio equipment manufacturers were solicited to provide approximate total production figures for those equipments which were reported in the survey. With proper consideration to factors such as attrition, number of equipments on a test or loan basis, and those equipments in pipeline, the projected estimates were well within the bounds of normal expectation.

f. Results. Figure E-4 shows the number of aircraft with and without radio installation for each of the ten aircraft types. Of the 65,100 General Aviation Aircraft considered in the survey, 45,355 or 69.7 percent carried some type of radio navigation and/or communications equipment; there were 19,745 or 30.3 percent without radio.

FAA/BRD-60, Volume I, Section B, gives the distribution of airborne communications equipment, and FAA/BRD-61, Section B, gives the distribution of airborne navigation equipment for the 45,355 aircraft with radio installation. These totals include dual or standby as well as the primary radio

equipment. In addition, the distribution shows the functional capability for each equipment model. Principal technical characteristics for each model are given in FAA/BRD-60, Volume II, Section D, Sub-Section 1, and FAA/BRD-61, Section D, Sub-Section 1. Laboratory analysis of the "significant" equipments is given in FAA/BRD-60, Volume II, Section B, and in FAA/BRD-61, Section C.

FROM

_____

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FAA/CAA Registration No.

FIRST CLASS
Permit No 465
ALEXANDRIA, VA

BUSINESS REPLY ENVELOPE

No Postage Stamp Necessary If Mailed in United States

— POSTAGE WILL BE PAID BY —

FAA AIRCRAFT POLL

838 N. HENRY STREET

ALEXANDRIA, VIRGINIA

Attention Aircraft Owner:

The Federal Aviation Agency (FAA) has undertaken an accelerated modernization program. Part of this program requires vital information which can only be supplied by each individual aircraft owner. Therefore, it is respectfully requested that you complete the attached questionnaire and return it by mail at your earliest convenience. The questionnaire is designed as a self-contained envelope, when sealed, and does not require postage.

AIRCRAFT TYPE

A. SINGLE ENGINE (1 AND 2 PLACE)

- (1) 65 hp or less ☐
- (2) 66 hp to 100 hp ☐
- (3) Over 100 hp ☐

B. MULTI-ENGINE

- (1) 800 hp. or less ☐
- (2) 801 hp to 2,000 hp ☐
- (3) Over 2,000 hp. ☐

C. SINGLE ENGINE (3 OR MORE PLACE)

- (1) 144 hp. or less ☐
- (2) 145 hp to 200 hp ☐
- (3) Over 200 hp. ☐

D. ROTARY WING

- (1) Light ☐
- (2) Heavy ☐

E. LIGHTER THAN AIR ☐

AIRCRAFT EQUIPMENT

NOTES:

a. If you have a "package" equipment that performs a variety of functions (i.e. voice transceiver, marker beacon receiver, ILS receiver, etc.,) list that same equipment in each of the appropriate categories.

b. Space is provided in each category to indicate dual installation information.

A. RADIO NAVIGATIONAL EQUIPMENT

(1) VISUAL OMNI RANGE (VOR)

MANUFACTURER	1. 2.	MODEL	1 2.

(2) INSTRUMENT LANDING SYSTEM (ILS)

LOCALIZER MANUFACTURER	1. 2.	MODEL	1. 2.
GLIDE PATH MANUFACTURER	1. 2	MODEL	1. 2

(3) 75 MC MARKER BEACON

MANUFACTURER	1. 2	MODEL	1. 2

B. RADIO COMMUNICATION EQUIPMENT

(1) LOW, MEDIUM, AND HIGH FREQUENCY (LF/MF/HF) (30 KC to 30,000 KC)

RECEIVER MANUFACTURER	1. 2	MODEL	1. 2
TRANSMITTER MANUFACTURER	1. 2	MODEL	1. 2.
TRANSCEIVER MANUFACTURER	1. 2	MODEL	1. 2

(2) VERY HIGH FREQUENCY (VHF) (30 MC to 300 MC)

RECEIVER MANUFACTURER	1. 2	MODEL	1. 2
TRANSMITTER MANUFACTURER	1. 2.	MODEL	1. 2
TRANSCEIVER MANUFACTURER	1. 2	MODEL	1. 2

(3) ULTRA HIGH FREQUENCY (UHF) (300 MC to 3,000 MC)

RECEIVER MANUFACTURER	1. 2.	MODEL	1. 2.
TRANSMITTER MANUFACTURER	1. 2	MODEL	1. 2.
TRANSCEIVER MANUFACTURER	1. 2	MODEL	1. 2

FAA/BRD 7 (T) BUREAU OF BUDGET NO 04-5902. APPROVAL EXPIRES 7/31/59

STRATUM	COVERAGE*	DRAW (Percent)
1	Single engine aircraft of 65 horsepower or less, one and two place.	18.3
2	Single engine aircraft of 66 to 100 horsepower inclusive, one and two place.	19.7
3	Single engine aircraft of over 100 horsepower; one and two place.	17.8
4	Single engine aircraft of 144 horsepower or less; three or more place.	18.6
5	Single engine aircraft of 145 to 200 horsepower inclusive, three or more place.	17.2
6	Single engine aircraft of over 200 horsepower, three or more place.	20.1
7	Multi-engine aircraft of 800 horsepower or less (rated horsepower per engine).	29.8
8	Multi-engine aircraft of 801 to 2000 horsepower inclusive (rated horsepower per engine).	73.9
9	Multi-engine aircraft of over 2000 horsepower (rated horsepower per engine).	100.0
10	Rotary Wing, light and heavy.	100.0

* Source: FAA Data Processing Branch

DESCRIPTION OF SAMPLE COVERAGE

GENERAL AVIATION FLEET

MAILING	RESULTS	STRATUM										TOTAL
		1	2	3	4	5	6	7	8	9	10	
FIRST	No. Mailed Out	2130	2195	1168	984	2368	2342	1145	522	90	404	13348
	No. Undeliverable	134	79	48	43	123	83	0	0	1	0	511
	No. Respondents	585	742	272	262	762	282	315	127	23	103	3473
	% of Total	27.5	33.8	23.3	26.6	32.2	12.0	27.5	24.3	25.6	25.5	26.0
	% of Deliverable	29.3	35.1	24.3	27.8	33.9	12.5	27.5	24.3	25.8	25.5	27.0
SECOND	No. Mailed Out	1411	1374	848	679	1483	1977	830	395	66	301	9364
	No. Respondents	332	263	167	148	307	279	11	4	0	7	1518
	% of Total	23.5	19.1	19.7	21.8	20.7	14.1	1.3	1.0	0.0	2.3	16.1
THIRD	No. Mailed Out	273	183	171	135	86	245	0	0	66	0	1159
	No. Respondents	139	92	74	63	41	144	0	0	32	0	585
	% of Total	50.9	50.3	43.3	46.7	47.7	58.8	0.0	0.0	48.5	0.0	50.5
TOTAL	No. Mailed Out	2130	2195	1168	984	2368	2342	1145	522	90	404	13348
	No. Undeliverable	134	79	48	43	123	83	0	0	1	0	511
	No. Respondents	1056	1097	513	473	1110	705	326	131	55	110	5576
	% of Total	49.6	50.0	43.9	48.1	46.9	30.1	28.5	25.1	61.1	27.2	41.8
	% of Deliverable	52.9	51.8	45.8	50.3	49.4	31.2	28.5	25.1	61.8	27.2	43.4

DETAILS OF QUESTIONNAIRE MAILOUT

GENERAL AVIATION FLEET

AIRCRAFT CLASSIFICATION	AIRCRAFT TYPE										TOTAL
	Single Engine (Horsepower)						Multi-Engine (Horsepower per engine)			Rotary Wing	
	One and Two Place			Three or More Place							
	65 or Less	66 to 100	Over 100	144 or Less	145 to 200	Over 200	800 or Less	801 to 2000	Over 2000	Light and Heavy	
Number Aircraft With Radio Equipment*	3007	6288	2048	4427	13360	11290	3819	706	90	320	45355
Percent Aircraft With Radio Equipment	25.8	56.3	31.2	83.5	97.1	96.9	99.2	100.0	100.0	79.2	69.7
Number Aircraft Without Radio Equipment	8601	4879	4515	875	407	361	23	0	0	84	19745
Percent Aircraft Without Radio Equipment	74.2	43.7	68.8	16.5	2.9	3.1	0.8	0.0	0.0	20.8	30.3
Total Active Aircraft	11608	11167	6563	5302	13767	11651	3842	706	90	404	65100
* Estimated											

NUMBER OF ACTIVE AIRCRAFT WITH AND WITHOUT RADIO INSTALLATION

GENERAL AVIATION FLEET