

APPLICATION FOR FREQUENCY ALLOCATION	CLASSIFICATION:	PAGE 1 OF PAGES	FORM APPROVED: OMB 22-R 0248
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I. SYSTEM REVIEW

A. GENERAL INFORMATION

TO	FROM: RCA-MSRD Borton Landing Road Moorestown, NJ 08057	RECEIVED AUG 8 - 1986
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1. SYSTEM NOMENCLATURE: MULTIPLE OBJECT TRACKING RADAR (MOTR)	FCC Office of the Secretary
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2. STATUS OF ALLOCATION:	☐ STAGE 1 ☐ STAGE 2 ☐ STAGE 3 ☒ STAGE 4
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3. PURPOSE OF SYSTEM: The MOTR is a primary, general purpose, metric track, range instrumentation radar. Each MOTR will track as many as 10 objects simultaneously. It is designed to be compatible with existing range instrumentation systems. MOTRs will be tested at RCA-MSRD in New Jersey and will be installed at national ranges: ESMC, WSMR, etc.

4. INFORMATION TRANSFER REQUIREMENTS: Each MOTR will be modified as necessary to meet the assigned range interface requirements.

5. ESTIMATED TERMINATION DATE: Not Available

6. ESTIMATED INITIAL COST OF THE SYSTEM: \$30,000,000 (First System Non-recurring and Recurring Costs). Subsequent Systems: \$15,000,000

7. TARGET DATE: February 1988

8. SYSTEM RELATIONSHIP AND ESSENTIALITY: MOTR will be one of the prime sensors for obtaining radar metric data for aircraft and missile trajectory measurements/data analysis at national test ranges.

9. REPLACEMENT INFORMATION: The MOTR is expected to replace several single-object tracking radars at most national test ranges.
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10. RELATED ANALYSIS DATA: EMI/EMC tests to be conducted on first system 2nd quarter 1987. Data is expected to be similar to that of present RCA single-object tracking radars: AN/FPS-16, AN/MPS-25, AN/MPS-36, etc.
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11. LINE DIAGRAM: See attachment

12. REMARKS: MOTR is a multiple object, C-band tracking radar which can replace a number of older, existing single-object C-band tracking radars.
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B. TERRESTRIAL SYSTEMS

1. STATION CLASS(ES): MO - MOTR is mobile, but will usually be used at a fixed site on a national test range	2. NUMBER OF UNITS A MOTR consists of: o 1 Electronics Van o 1 Pedestal/Transmitter Lowboy o 1 Antenna, Boresight Tower carrying Lowboy
3. STATION LOCATIONS AND/OR AREAS OF OPERATION: RCA - New Jersey CONUS National Test Ranges Kwajalein Island Roosevelt Roads, Puerto Rico	4. FREQUENCY REQUIREMENTS: 5.4 - 5.9 GHz (Instantaneous Bandwidth)
5. PROPOSED DATE OF ACTIVATION:	

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D. TRANSMITTER EQUIPMENT CHARACTERISTICS			
1a. NOMENCLATURE, MANUFACTURER'S MODEL NO.: MOTR C-band Transmitter		1b. MANUFACTURER'S NAME: RCA-MSRD Moorestown, NJ 08057	
2. SYSTEM NOMENCLATURE: Multiple Object Tracking Radar (MOTR)		3. TRANSMITTER TYPE: TWT Driven CFA	
4. TUNING RANGE: 5.4 - 5.9 GHz		5. METHOD OF TUNING: Synthesizer	
6. RF CHANNELING CAPABILITY: 0.2 MHz		7. FREQUENCY TOLERANCE: 5×10^{-8}	
8. EMISSION TYPE(S): P0N + Chirp		9. EMISSION BANDWIDTH (MHz) (See 21.) ☒ CALCULATED ☐ MEASURED (a) 3 dB .89, 1.8, 3.6, 5.0, 5.3, 5.6 (b) 20 dB 6.4, 12.7, 25.5, 11, 9, 7 (c) 40 dB 64, 127, 255, 80, 41, 22 (d) 60 dB 637, 1270, 2550, 760, 420, 220 (e) Occupied Bandwidth 20, 40, 80, 7.5, 7.0, 6.0	
10. FILTER EMPLOYED: (a) ☒ LOW PASS (c) ☐ BAND PASS (b) ☐ HIGH PASS (d) ☐ NONE			
11. MAXIMUM BIT RATE: N/A		12. MAXIMUM MODULATION FREQUENCY: 6 MHz (Linear FM Chirp)	
13. PRE-EMPHASIS: ☐ YES ☒ NO		14. DEVIATION RATIO: N/A	
15. POWER: (a) CARRIER N/A (b) MEAN 5 kilowatt (c) PEAK ENVELOPE 1 megawatt		16. PULSE CHARACTERISTICS: (a) RATE 20, 40, 80, 160, 320, 640, 1280 PPS (b) WIDTH 0.25, 0.5, 1.0, 3.125, 12.5, 50 usec (c) RISE TIME 0.05 usec (d) FALL TIME 0.15 usec (e) COMPRESSION RATIO 200 to 1 max	
17. OUTPUT DEVICE: CFA			
18. SPURIOUS LEVEL: -30 dBc		19. HARMONIC LEVEL: (a) 2nd _____ (b) 3rd _____ (c) OTHER 50 dBc total power	
20. FCC TYPE ACCEPTANCE NO: N/A			
21. REMARKS: . BWs of 9 listed for PW 0.25, 0.5, 1.0, 3.125, 12.5, 50 usec . The 3.125, 12.5, 50 usec are chirped by 6 MHz linear FM The emission bandwidths for non-chirp are calculated for an assumed $(\sin x/x)^2$ power			

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E. RECEIVER EQUIPMENT CHARACTERISTICS				
1a. NOMENCLATURE, MANUFACTURER'S MODEL NO.: MOTR C-band Receiver		1b. MANUFACTURER'S NAME: RCA-MSRD Moorestown, NJ 08057		
2. SYSTEM NOMENCLATURE: Multiple Object Tracking Radar (MOTR)		3. RECEIVER TYPE: Double Conversion Super heterodyne		
4. TUNING RANGE: 5.4 - 5.9 GHz		5. METHOD OF TUNING: Synthesizer		
6. RF CHANNELING CAPABILITY: 0.2 MHz steps over 5.4 to 5.9 GHz		7. FREQUENCY TOLERANCE: $\pm 5 \times 10^{-8}$		
EMISSION TYPE(S): P0N + chirp		9. RF SELECTIVITY: ☒ CALCULATED ☐ MEASURED (a) -3 dB 770 MHz (b) -20 dB 980 MHz (c) -60 dB 1460 MHz (d) TYPE OF PRESELECTION USED Band pass Filters		
10. IF SELECTIVITY: (a) -3 dB 20 ± 2 MHz (b) -20 dB Not specified (c) -60 dB Not specified				
11. MAXIMUM BIT RATE: N/A		12. MAXIMUM POST DETECTION FREQUENCY: 2.8 MHz (0.25 usec pulse)		
13. DE-EMPHASIS AVAILABLE: ☐ YES ☒ NO		14. MINIMUM POST DETECTION FREQUENCY: .67 MHz (1.0 usec pulse)		
15. IF FREQUENCY: (a) 1st 540 MHz (b) 2nd 60 MHz		16. SENSITIVITY: (a) -114 dBm (b) CRITERIA 0 dB S/N (c) NOISE TEMPERATURE 333.7 ° Kelvin		
17. OSCILLATOR TUNED: (a) ABOVE TUNED FREQUENCY ☐ (b) BELOW TUNED FREQUENCY ☒ (c) EITHER ABOVE OR BELOW THE FREQUENCY ☐				
18. SPURIOUS REJECTION: 80 dB Minimum		19. IMAGE REJECTION: 80 dB Minimum		
20. REMARKS: Item 10 - Total of five additional $\pm$ F Amplifiers; all have -3 dB bandwidth of 20 ± 2 MHz				

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F. ANTENNA EQUIPMENT CHARACTERISTICS				
1. TRANSMITTING: ☐ RECEIVING ☐ TRANSMITTING AND RECEIVING ☒				
2a. NOMENCLATURE, MANUFACTURER'S MODEL NO.: Nomenclature in process		2b. MANUFACTURER'S NAME: RCA-MSRD Moorestown, NJ 08057		
3. SYSTEM NOMENCLATURE: Multiple Object Tracking Radar (MOTR)		4. TYPE: Phased Array on a pedestal		
5. FREQUENCY RANGE: 5.4-5.9 GHz (Instantaneous Bandwidth)		6. POLARIZATION: Transmit and receive linear vertical		
7. GAIN: (a) MAIN BEAM 45.9 dB (b) SIDE LOBE 15.9 dB		8. SCAN CHARACTERISTICS: (a) TYPE <u>Phased Array on El over Az Ped.</u> (b) VERTICAL SCAN <u>Mechanical and Electrical</u> (1) MAX ELEV <u>190° (Mech), +30° (Elect)</u> (2) MIN ELEV <u>-10° (Mech), +0.5° (Elect)</u> (3) SCAN RATE <u>22.5°/sec (Mech); Instantan. (Elect)</u> (c) HORIZONTAL SCAN <u>Mechanical and Electrical</u> (1) SECTOR SCANNED <u>0° to 360° (Mech),</u> <u>+0.5° to +30° (Elect)</u> (2) SCAN RATE <u>45°/sec (Mech);</u> <u>Instantaneous (Elect)</u>		
9. BEAMWIDTH: (a) HORIZONTAL 1° (b) VERTICAL 1°				
10. REMARKS				

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II. EQUIPMENT USAGE

A. TARGET STARTING DATE FOR EACH STAGE:

STAGE 1 1981-83
STAGE 2 1981-84

STAGE 3 1984-87
STAGE 4 1987-2000

B. TYPE OF SERVICE:

Radio location

C. EXTENT OF USE:

Intermittent - 8 hours/day during Mission Flight Activities including pre- and post-mission calibration periods.

GEOGRAPHICAL AREA FOR:

STAGE 2

STAGE 3 RCA Plant, Moorestown, NJ

STAGE 4 White Sands Missile Range, New Mexico

E. NUMBER OF EQUIPMENTS IN INITIAL STAGE:

One

F. NUMBER OF EQUIPMENTS PLANNED FOR OPERATIONAL USE:

Twelve - installed at various ranges - WSMR, ESMC, WSMC, etc.

G. NUMBER OF EQUIPMENTS OPERATING SIMULTANEOUSLY IN THE SAME ENVIRONMENT:

Three MOTRs and up to 18 single object tracking C-band radars

H. TRANSMITTER INSTALLATION:

Transportable - mounted on Lowboy Trailer

I. RECEIVER INSTALLATION:

Transportable - Mounted in EMI (80 dB)
Electronics Van

J. PREVIOUS J/F 12 APPLICATION NUMBER TO BE:

☐	CONTINUED, UNCHANGED	J/F 12/	_____
☐	SUPERSEDED	J/F 12/	_____
☐	RELATED	J/F 12/	_____
☒	NONE		

K. IS AN ECP SPECTRUM SIGNATURE BEING SCHEDULED FOR THIS EQUIPMENT IN ACCORDANCE WITH MEASUREMENT PROCEDURES DESCRIBED IN MIL-STD-449 ()?

☐ YES

☒ NO

L. DESCRIBE BRIEFLY ANY OTHER MEASURED DATA BEING OBTAINED IN LIEU OF OR IN ADDITION TO PROCEDURES SET FORTH IN MIL-STD-449 ():

Radar Electromagnetic Compatibility Measurements will be made to the requirements of MIL-STD-469.

M. EQUIPMENT SPECIFICATION NUMBER(S):

WSMR PD 2071-82

N. APPLICABLE SERVICE CONTRACT NUMBER(S):

N/A

O. NAME AND OFFICE SYMBOL OF:

TELEPHONE NUMBERS

PROGRAM MANAGER	H. H. Anderson, Jr.	Commercial	609/722-3140	Autovon	N/A
PROJECT ENGINEER	J. F. O'Brien, Jr.	Commercial	609/722-2715	Autovon	N/A