

# ANNEX E

## CANADIAN ARMY MEDIUM RANGE RADAR (MRR)

### LIST OF ACRONYMS AND DEFINITIONS

## 1.0 General

The acronyms and definitions listed below are applicable to the MRR RFP documents, specifically, Annex A1 (System Performance Specification), Annex A (Statement of Work - Acquisition), and Annex B (Statement of Work – In Services Support).

## 2.0 Acronym

24/7	24 hours per day, 7 days per week
Ao	Operational Availability
AC	Alternating Current
ADP	Automated Data Processing
Ah	Ampere-hour
ALD	Administrative and Logistics Delay, where $ALD = 0.1(TPM + TCM)$
ARTY	Artillery
ATC	Area Training Center
AWLS	Acoustic Weapon Locating System
BAIO	Brigade Artillery Intelligence Officer
BIT	Built In Test
BITE	Built In Test Equipment
C	Celsius
C2	Command and Control
C4	Command, Control, Communications and Computers
CA	Contracting Authority
CAF	Canadian Armed Forces
CANUS	Canada / US
CARC	Chemical Agent Resistant Coating
CB	Counter Bombardment
CDR	Critical Design Review
CDRL	Contract Data Requirements List

Solicitation No: W8476-133817

CEP	Circular Error Probable (50%)
CFFZ	Call For Fire Zone
CFSS	Canadian Forces Supply System
CFZ	Critical Friendly Zone
CG	Centre of Gravity
CIB	Controlled Image Base
CL	Command Link
CLS	Contractor Logistics Support
CM	Configuration Management
CNR	Combat Net Radio
COE	Common Operating Environment
COMMS	Communications
CONOPS	Concept of Operations
COTS	Commercial Off The Shelf
CP	Command Post
CSE	Common Systems Environment
CTC	Combat Training Center
DC	Direct Current
DET	Detachment
dB	decibel
DGLEPM	Director General Land Equipment Program Management
DND	Department of National Defence
DPU	Data Processing Unit
DTED	Digital Terrain Elevation Data
DVD	Digital Video Disk
E3	Electromagnetic Environmental Effects

Solicitation No: W8476-133817

EC	Electronic Combat
ECCM	Electronic Counter-Counter Measures
ECM	Electronic Counter Measures
EID	Enterprise identifier
EMC	Electromagnetic Compatibility
EMCON	Emission Control
EME	Electromagnetic Environment
EMI	Electromagnetic Interference
EMP	Electromagnetic Pulse
EMSEC	Emission Security
ENGR	Engineers
EPA	Effective Project Approval
EPM	Electronic Protection Measures
ESD	Electrostatic Discharge
EW	Electronic Warfare
FM	Frequency Modulation
FOC	Final Operating Capability
FSR	Field Support Representative
G	Guns
G/H	Gun Howitzer
GFE	Government Furnished Equipment
GIC	Garbarit International de Chargement (International Loading Gauge)
GHz	Giga Hertz
GPS	Global Positioning System
GPTE	General Purpose Test Equipment
GSM	Government Supplied Materiel

Solicitation No: W8476-133817

GVW	Gross Vehicle Weight
H	Howitzer
HB	Hostile Battery
HF	High Frequency
HLVW	Heavy Lift Vehicle Wheeled
HQ	Headquarters
Hz	Hertz
IAW	In Accordance With
ICAO	International Civil Aviation Organization
ICD	Interface Control Document
IED	Improvised Explosive Device
IETM	Interactive Electronic Technical Manual
IFCC	Indirect Fire Control Computer
IFCCS	Indirect Fire Computer Control Software
IMI	Inter-Modulation Interference
ILS	Integrated Logistics Support
IMINT	Imagery Intelligence
INS	Inertial Navigation System
INT	Intelligence
IOC	Initial Operational Capability
IP	Internet Protocol
IR	Infrared
IRR	Infrared Reflective
ISTAR	Intelligence, Surveillance, Target Acquisition and Reconnaissance
KE	Kinetic Energy
kg	kilogram

Solicitation No: W8476-133817

km	kilometre
km/hr	kilometres per hour
kHz	kilo Hertz
kph	kilometre per hour
LAV	Light Armoured Vehicle
LCC	Life Cycle Costs
LCMM	Life Cycle Material Manager
LCSS	Land Command Support System
LEMS	Land Equipment Management System
LF	Land Force
LFC	Land Force Command
LIFD	Light Indirect Fire Digitization
LMS	Land Maintenance System (This is replaced by LEMS)
LP	Listening Post
LOG	Logistic
LOS	Line-of-Sight
LRU	Line Replaceable Unit
LSA	Logistic Support Analysis
LSAR	Logistic Support Analysis Record
m	meter
m/s	meters per second
M	Mortars
mA	milliamp
MB	mega bytes
MCN	Materiel Change Notice
MET	Meteorological

Solicitation No: W8476-133817

MGRS	Military Grid Reference System
MHz	Mega Hertz
MIL-STD	Military Standard
MKBMF	Mean Kilometres Between Mission Failure
mm	millimetre
mm/hr	millimetres per hour
MMF	Mobile Maintenance Facility
MMI	Man Machine Interface
MOTS	Military Off The Shelf
MRR	Medium Range Radar
MRT	Mobile Repair Team
MSN	Mission
MSVS	Medium Support Vehicle System
MTBFC	Mean Time Between Critical Failure
MTBF	Mean Time Between Failure
MTTR	Mean Time To Repair
N/A	Not Applicable
NATO	North Atlantic Treaty Organization
NBC	Nuclear Biological Chemical
NCO	Non-Commissioned Officer
NDI	Non-Developmental Item
NM	Nautical Miles
NRC	National Research Council
OJT	On the Job Training
Ops	Operations
OT	Operational Time

Solicitation No: W8476-133817

OWSM	Optimized Weapon System Management
para	paragraph
PCBs	Polychlorinated Biphenyls
PD	Project Director
PDR	Preliminary Design Review
PM	Project Manager
PMP	Project Management Plan
PO	Performance Objective
PRM	Progress Review Meeting
QAP	Quality Assurance Plan
QC	Quebec
R&O	Repair and Overhaul
RADHAZ	Radiation Hazard
RAM-D	Reliability, Availability, Maintainability, Durability
RCS	RADAR Cross-Section
RDF	Radio Direction Finding
RECCE	Reconnaissance
RF	Radio Frequency
RFP	Request For Proposal
Rh	Relative Humidity
RL	Rocket Launcher
RMS	Root Mean Square
RPG	Rocket Propelled Grenade
RSPL	Recommended Spare Parts List
RTML	Recommended Training Materials List
SCAT	Shelling Connection Activity Trace

Solicitation No: W8476-133817

SME	Subject Matter Expert
SOR	Statement of Operational Requirement
SOW	Statement of Work
SP	Self Propelled
SPTE	Special Purpose Test Equipment
SRR	Short Range Radar
SRS	Software Requirements Specification
ST	Standby Time
STA	Surveillance and Target Acquisition
STANAG	Standardization Agreement (NATO)
STP	Software Test Plan
STR	Software Test Report
STTE	Special Tools and Test Equipment
SURV	Surveillance
SVY	Survey
SWA	Single Weapon Accuracy
TA	Technical Authority
TAC	Technical Acceptance Certificate
TBD	To Be Determined
TCP/IP	Transmission Control Protocol/Internet Protocol
TCM	Total Corrective Maintenance Time
TCP	Troop Command Post
TIES	Technical Investigation and Engineering Services
TMP	Training Master Plan
TPM	Total Preventative Maintenance Time
TREE	Transient Radiation Effects on Electronics

Solicitation No: W8476-133817

TSM	Troop Sergeant Major
TTP	Tactics, Techniques and Procedures
TWG	Training Working Group
TWT	Traveling Wave Tube
UID	Unique identification
USB	Universal Serial Bus
UTM	Universal Transverse Mercator (Projection)
UV	Ultra Violet
V	Volt
V/m	Volts per meter
VDC	Volt Direct Current
W	Watt
WES	Weapons Effects Simulator
WGS 84	World Geodetic System 1984
WHMIS	Workplace Hazardous Materials Information System
WLR	Weapon Locating Radar
WLS	Weapon Locating Sensors
WPN	Weapon

### 3.0 Definitions

All Weather Conditions for Radar Emissions	All weather conditions includes any combination of rain, snow or any other type of precipitation fog, humidity, wind, temperature extremes and altitude, blowing sand and dust.
Aspect Angle	The Aspect Angle is the angle between the muzzle azimuth of the weapon and the azimuth of the radar from the weapon site. The aspect angle is measured in degrees.

Availability	<p>Availability combines reliability and maintainability characteristics into a single measure of effectiveness. It is defined as the degree to which the subject system will be in an operable and committable state at the start of a mission when a mission is called for at some random point in time. It is defined as <math>A = \text{MTBF} / (\text{MTBF} + \text{MTTR})</math>, where <math>\text{MTBF} = \text{Mean Time Before Failure} = 1/\lambda</math>, <math>\text{MTTR} = \text{Mean Time To Repair}</math>.</p>
Base Bleed	<p>Base bleed is a system used on some artillery shells to increase their range, typically by about 30%.</p> <p>Most of the drag on an artillery shell comes from the nose of the shell, as it pushes the air out of its way at supersonic speeds. Shaping the shell properly can reduce this greatly. However, another powerful source of drag is the vacuum left behind the shell due to its blunt base. This drag is difficult to remove, because the shell needs to be "nose heavy" in order to have proper ballistics, and it cannot easily be shaped into a more aerodynamic form.</p> <p>Base bleed is one way to reduce this drag without extending the base of the shell. Instead, a small ring of metal extends just past the base, and the area in the rear of the shell is filled with a small gas generator. The gas generator provides little net thrust, but simply fills the area behind the shell with pressure, dramatically reducing the drag due to the vacuum. The only downsides are a small loss of accuracy due to the somewhat more turbulent airflow, and a small loss in explosive payload due to some of the shell being taken up by the engine.</p> <p>Since base bleed extends the range by a percentage, it is only really useful on longer range artillery. Until recently the loss in explosive was not considered worthwhile for the small gains in range. However, the introduction of much longer range systems based on the GC-45 howitzer has changed the equation somewhat, as 30% extra range on these systems represents 5 to 10 km. Base bleed shells are starting to become more common in units equipped with modern artillery of this type.</p>
Chaff	<p>Chaff is a radar countermeasure in which aircraft or other targets spread a cloud of small, thin pieces of aluminum, metal-coated glass fiber or plastic, which either appears as a cluster of secondary targets on radar screens or swamps the screen with multiple returns. Modern armed forces use chaff (in naval applications, for instance, using short-range SRBOC rockets) to distract radar-guided missiles from their targets. Most military aircraft and warships have chaff dispensing systems for self-defense. An intercontinental ballistic missile may release in its midcourse phase several independent warheads, a large number of decoys, and chaff. Chaff can also be used to signal distress by an aircraft when communications are not functional. This has the same effect as an SOS, and can be picked up on radar. It is done by dropping chaff every 2 minutes</p>

Circular Error Probable (CEP)	<p>In the military science of ballistics, Circular Error Probable is a simple measure of a weapon system's precision.</p> <p>The impact of munitions near the target tends to be normally distributed around the aim point, with most reasonably close, progressively fewer and fewer farther away, and very few indeed at long distance.</p> <p>A mathematician might characterize this pattern by its standard deviation, but a more intuitive method is to state the radius of a circle within which 50% of rounds will land. That radius is the circular error probable, abbreviated to CEP (50).</p> <p>For most weapons, the CEP increases with range, so it should either be stated for a particular range, or as an angle.</p> <p>In the case of munitions, which strike at a shallow angle to the Earth's surface, the pattern will become elongated into an ellipse. This can be thought of as the ellipse formed by the plane of the Earth's surface intersecting a cone of error. In this case, the CEP is given as what it would be if the rounds impacted the surface vertically.</p> <p>It should be noted that the concept of CEP is only strictly meaningful if misses are roughly normally distributed. This is generally not true for precision-guided munitions.</p> <p>In the case of a weapon locating system, CEP is a measure of the accuracy of the locations computed by the weapon locating system. CEP (50) is the radius of the circle around the actual weapon location in which 50% of the locations computed by the weapon locating system will be found.</p>
Corrective Maintenance Time	Corrective Maintenance Time is that part of the <b>maintenance</b> time including that due to <b>logistic delays</b> , during which corrective maintenance is performed on an item.
Electronic Counter Measures (ECM)	ECM are deliberate electromagnetic emissions that are meant to negatively affect the use of the electromagnetic spectrum.
False Tracks	A false track with respect to air surveillance is defined as a track being drawn between plots where there is no target actually present. Spurious detections drawn as plot points when there is no target present shall not be considered as a false track. False tracks do not persist on the display.
Good Conditions for Radar Emissions	Good conditions includes all detectable object returns except those from helicopters, aircraft, vehicles, rain and caused by ECM and caused by winds over 56 km/hr.

Ground Track	The ground track refers to the projection of the air track on to the surface of the earth where the position shown on the earth is directly below the actual position of the projectile. A "ground track" for an air target is generally defined as the projection of the "air track" on to the surface of the earth as opposed to a Plan Position Indicator (PPI) type display which displays the azimuth and slant range of a given air track.
“Hooked”	A hook in air surveillance is a common term to refer to the line that links the data block to the icon of the aircraft shown on the display.
Jam Strobe Function	The Jam Strobe function gives the ability to detect, locate and report sources of active RF interference in the environment.
Location Error (2D)	<p>Location Error is the two dimensional location error is the flat earth distance in meters between the surveyed location of the weapon and the location of the weapon as computed by the WLR.</p> <p>In terms of Easting and Northing, the location error is defined as</p> $\text{Location Error}_i = [(E_0 - E_i)^2 + (N_0 - N_i)^2]^{1/2}$ <p>where <math>E_0</math> and <math>N_0</math> is the Easting and the Northing of the surveyed weapon location, and <math>E_i</math> and <math>N_i</math> are the Easting and the Northing of the <math>i^{\text{th}}</math> location of the weapon as computed by the WLR.</p>
Logistics Delay	Logistics Delay is that accumulated time during which a maintenance action cannot be performed due to the necessity to acquire maintenance resources, excluding any administrative delay.
Look Angle (azimuth)	The Look Angle (azimuth) is the angle between the bore sight azimuth of the radar antenna and the azimuth of the weapon from the radar antenna. If a two dimensional coordinate system is defined as x the east and y to the north, then x to y is defined as a positive angle. This definition of the look angle is for WLR. The look angle is measured in degrees.
Maintenance	Maintenance is all action taken to retain materiel in or restore it to a specified condition. It includes inspection, testing, servicing, classification as to serviceability, repair, rebuilding and reclamation.
Mean Time To Repair (MTTR)	MTTR is the average or expected time it takes to repair an equipment. It can be estimated by the total elapsed <b>corrective maintenance time</b> divided by the total number of corrective maintenance actions during a given period.
Mil	Unit of measure of angle equivalent to 1/6400 of a circle. There are 6400 mils in 360 degrees.

Mission Planning	Mission planning normally has to do with software to help plan the best position to emplace the radar for best coverage of the target area and to minimize clutter input to the radar. This software has access to mapping data to provide an analysis of the radar coverage.
Operational Availability (Ao)	$A_o = (EAP - TCT) / (EAP), \text{ where}$ <p style="text-align: center;">EAP = Expected Availability Period – calculated as 24 hours per day 7 days per week for each month.</p> <p style="text-align: center;">TCT = Total Contractor Time - period of time from when a defect / deficiency report is submitted to the Contractor until the System is returned in a serviceable condition.</p>
Quadrant Elevation	The Quadrant Elevation is the elevation angle of the muzzle of the weapon measured from the horizontal plane. The quadrant elevation is measured in mils.
Reliability	<p>Reliability is defined as:</p> $R = e^{-\lambda t}, \text{ where } \lambda = \text{failure rate (\# failures / \# hours)}, t = \text{time (hours)}.$
Sector	Sector is the search angle in azimuth.
State of the Art	The term " <b>state of the art</b> " refers to the highest level of general development, as of a device, technique, or scientific field achieved at a particular time. It also refers to the level of development (as of a device, procedure, process, technique, or science) reached at any particular time as a result of the common methodologies employed.
Terrain Mask	The Terrain Mask represents the elevation angle, as a function of azimuth relative to the MRR, at which a projectile launched outside the detectable range of the system would become visible based on line of sight considerations.
Track Latency	With respect to air surveillance, track latency is the time that it takes to detect several plots (more than 2) and draw a track between the plots.
Uncooperative Target	An uncooperative target is a target that is not responding to interrogation by IFF equipment. An uncooperative target can be either hostile or friendly.
Volley Fire	Volley fire originates from at least 5 or more different weapons. The weapons arranged such they are 60 to 80 metres apart laterally and in depth with respect to the primary direction of fire of the battery. Volley fire represents fire that happens simultaneously however for practical reasons the fire from these weapons will be fired sequentially between 0.5 and 2 seconds apart with instructions to the gunners to fire at one second intervals.