

Draft Qualitative Requirement for Four wheeled/tracked Tactical Robot

Nomenclature : Four wheeled/ Tracked Tactical Robot

QR Formulated on : Jul 2019

Part –I Description of Equipment

1. Introduction:

There is requirement to develop a small four wheeled/ Tracked Tactical Robot which can get into buildings and confined areas to give information about any suspected object or activity. The primary objective of the robot is to provide situational awareness in built-up environment for infantry missions, C/I and C/T operations.

2. Aim: To specify the Qualitative Requirement of four wheeled Tactical Robot used for Surveillance.

3. Proposed Service Employment: The four wheeled/ Tracked Tactical Robot shall send video feedback of the surroundings with various camera mounted on it and continuously show it on screen on master control station in real time. The equipment will be deployed on urban and cross country terrain.

PART-II PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

Physical characteristics

1. Weight

a) Platform: Not more than 22 kg (Excluding weight of payload and accessories)

b) Master control station: Not more than 8 kg

2. Dimension (in mm):

Platform (L x B x H): 610 x 420 x 220 (Maximum Overall dimension)

Back pack based Master control station

a) Operator Console Unit: 320 x 250 x 100 (Maximum Overall dimension)

b) Back-pack: 400 x 300 x 600 (Maximum Overall dimension in antenna folded position)

3. **Surface Finish and Colour** : It should have a non reflecting surface, dull black (Matte finish) in colour.
4. **Design** : Equipment should be ergonomically designed to operate with smooth edges in all structure. All cable/wires should be marked adequately and fitted with mil grade connectors. The cables should be prevented from weathering effect and damage during operation.

Environmental Condition

1. **Temperature:**

- a) Operation: -10° C to $+55^{\circ}$ C

2. **Ingress protection:** Equipment should conform to minimum IP 64 rating.

PART -III OPERATIONAL PARAMETERS

1. **Platform Mobility**

- a) **Speed:** The four wheeled/ Tracked Tactical Robot should have speed up to 2 kmph on flat surface.
- b) **Brake in Situ:** The braking system of four wheeled/ Tracked Tactical Robot should be capable of holding the vehicle in-situ (in any position).
- c) **Stair climbing capability:** The four wheeled/Tracked Tactical Robot should have Climbing capability on **30 degree slope/stair** with maximum **165 mm riser** height.
- d) **Turning:** The four wheeled/Tracked Tactical Robot should be able to turn at its own axis by skid steering.

2. **Range of remote operation:**

- a) The four wheeled/ Tracked Tactical Robot should be remotely controlled from a portable Master Control Station using RF with operating range of 200m line of sight (LOS).
- b) The four wheeled/ Tracked Tactical Robot should be remotely controlled from a portable Master Control Station using RF with operating range of minimum 80 m Non-line of sight (NLOS) with obstacle of one wall between control station and robot.

✓ 3. Endurance for operation

The four wheeled/ Tracked Tactical Robot should have capability to operate continuously for **two hours** with rechargeable Li Ion batteries in all-weather condition with heaviest payload onboard.

4. RobotVision system

- a) Robot should have total four cameras mounted at following location of robot for all around viewing.
 - Front side of Robot
 - Rear side of Robot
 - Robotic platform left (LHS) of Robot
 - Robotic platform right (RHS) of Robot
- b) Fixed cameras mounted on platform should conform to at-least following or better specification
 - Type: CCD with Infra-Red capability
 - Resolution: 420 TVL or better
 - Field of view: minimum 60 degree
- c) All four camera fixed to robotic platform should have night vision capability.

5. Master control station

- a. Robotic platform to be operated from backpack based master control station.
- b. It should be easy to operate robotic platform from master control station with window/ Linux based human machine interface (HMI)
- c. It should have control console display sizing not less than 8 inches with provision to relay real-time video through RF link
- d. Display should conform to at least 640 x 480 pixel resolution.
- e. It should have provision to store recorded video/ image with capacity not less than 20 GB
- f. Master control station should have provision of integrating additional display through wire which can be placed in control room to relay live video feed from cameras of robotic platform.

g. Master control station should have provision of indication of low battery.

6. Payloads

Following **three payloads** should be supplied along with main equipment (essential) and should have interface (Electrical/Electronic and mechanical) to integrate with main equipment

a) **Recoilless water jet Disrupter with mounting assembly on Pan tilt Unit**

Recoilless water jet Disrupter with mounting assembly should have following specification

- Mini Modular recoilless water jet disrupter
- Should be powered with electrically initiated 12 gauge cartridges
- Barrel 19 mm bore
- Weight of empty disrupter should not be more than 1.5 kg
- Mount of disrupter should be integrated to Pan Tilt Unit
- Projectiles : (Quantities indicated below)
 - Plain slug-50
 - Chisel-40
 - Flying blade-20
- Cartridges 12 g mini (Quantities indicated below)
 - High velocity 100 Nos.
 - Medium velocity: 150-Nos.

b) **Under belly camera for inspection of bottom of vehicle**

Under belly camera for inspection of bottom of vehicle should match at least following specification

- Type: CCD with LED Light
- Resolution: 520 TVL or better
- Field of view: minimum 80 degree

c) Camera with Zoom capability(with provision to integrate with Pan Tilt unit).

Camera with Zoom capability integrated with Pan Tilt units should match at least following specification

- Type: CCD
- Resolution: 420 TVL or better
- Field of view: minimum 40 degree
- Zoom-10X Digital

7. Accessories:

Following three accessories to be supplied along with equipment

- a. Main Battery charger
 - Battery charging of MCS
 - Battery charging of platform
 - Indication of audio visual alarm on full charge of battery
- b. Mechanical toolbox Honiton /Bosch or equivalent
- c. Electronic/Electrical toolbox

PART –IV Maintenance Requirement

1. The routine maintenance and repair should be minimum and easy to carry under field or service condition.
2. List of recommended spares for two years maintenance shall be provided.
3. A maintenance periodicity chart indicating maintenance points and maintenance instruction shall be provided.
4. There should be built in Test Equipment (BITE) and self-diagnostic facilities provided in the mobile platform of SROV.
5. **Literature:** The following technical literature shall be provided with every equipment:-
 - a. User Handbook,
 - b. Logbook
 - c. List of critical spares-Supplying firm shall provide list of critical spares with cost which should be effective for 05 years after completion of guarantee/ warranty period.

6. Training: Training for a batch of two person per equipment on operational usage and maintenance of equipment for 1 week. Each trainee to be certified by trainer.

PART -V List of Deliverables

1. Four wheeled/ tracked robotic platform
2. Back pack based Master control station
3. Payloads
 - a. Recoilless water jet disrupter along with mounting assembly
 - b. Underbelly camera
 - c. Camera with zoom capability along with mounting bracket
4. Accessories
 - a. Battery charger for MCS battery and robotic platform battery
 - b. Mechanical toolbox Honiton/Bosch or equivalent
 - c. Electronic/Electrical toolbox
5. Spares
 - a. One pair of tracks
6. Literature
 - a. User Handbook,
 - b. Logbook
 - c. List of critical spares
7. Rugged case for delivery and transportation

Draft Trial Directive for Evaluation of four wheeled/ Tracked Tactical Robot

1. **Aim:** Aim of this document is to formulate trial directive for evaluation for the four wheeled/ Tracked Tactical Robot.

2. Test Procedure and Acceptance Criteria:

The four wheeled/ Tracked Tactical Robot will be subjected to following Tests.

- a) Physical and Functional Parameter Testing
- b) Environmental Tests as per JSS 55555

2.1 Physical and Functional Parameter Testing:

Following physical and functional parameters will be tested for four wheeled/ Tracked Tactical Robot. Board of officers (BOO) shall witness these test.

2.1.1 Overall Weight:

The overall weight of Integrated CSWS will be checked as per following.

Table 1: Overall weight Inspection procedure		
Test Parameter	Test Procedure	Acceptance Criteria
Weight <i>Robotic platform</i>	a) Place the four wheeled/ Tracked Tactical Robot on weighing Scale (No parts of four wheeled/ Tracked Tactical Robot should be in contact of any vertical face of scale or walls)	Average of weight reading should not exceed 22 kg.
	b) Record the max weight reading 03 Nos of times	
Weight <i>Master Control Station</i>	a) Place the back pack based master control station of four wheeled/ Tracked Tactical Robot on weighing Scale (No parts of control station or backpack should be in contact of any vertical face of scale or walls)	Average of weight reading should not exceed 8 kg.
	b) Record the max weight reading 03 Nos of times	

2.1.2 Overall Dimension:

The overall Dimension of four wheeled/ Tracked Tactical Robot shall be checked as per following.

Table 2: Overall Length Inspection procedure		
Test Parameter	Test Procedure	Acceptance Criteria
Overall	a) Place four wheeled/ Tracked	Overall dimension (in

Dimension <i>Robotic platform</i>	Tactical Robot on flat surface. b) Mark both the extreme faces/points with the help of flat plates. c) Measure the maximum distance of length, width and height.	mm) should not exceed 610 x 420 x 220
Overall Dimension <i>Master control station</i>	a) Place master control station with backpack on flat surface. b) Mark both the extreme faces/points with the help of flat plates. c) Measure the maximum distance of length, width and height of control console and backpack separately.	Overall dimension (in mm) of Operator Console Unit should not exceed: 320 x 250 x 100 Overall dimension (in mm) of Back-pack should not exceed: 400 x 300 x 600 (in antenna folded position)

2.1.3 Surface finish

Table 3: Surface finish		
Test Parameter	Test Procedure	Acceptance Criteria
Surface finish and colour	Visual check	Colour of platform to be checked visually by BOO. It should be black in colour with matte finish.

2.1.4 Platform Mobility

Table 4: Platform Mobility		
Test Parameter	Test Procedure	Acceptance Criteria
Speed	a) Mark two points 20 m apart on fairly leveled surface. b) Run Robotic platform on this surface at full speed to cover	Calculated speed of platform should be more than 1.5 kmph.

	<p>distance of 20 m with a time counting using calibrated stopwatch using master control station.</p> <p>c) Perform this operation two times by running robotic platform.</p> <p>d) Calculate average speed of platform.</p>	
Stair climbing	<p>a) Identify staircase of building with 25 to 30 degree slope and riser in range of 150 mm to 165 mm.</p> <p>b) Operate robotic platform to climb on stairs using master control station</p>	The four wheeled/Tracked Tactical Robot should climb on stair; if stair climbing is achieved then test is passed successfully
Brake in situ	<p>a) operate platform using master control station to take it on slope by executing forward command of motion,</p> <p>b) Release command joystick of motion</p> <p>c) Do Visual check of robotic platform not sliding down on its own weight.</p>	The braking system of four wheeled/ Tracked Tactical Robot should hold the vehicle in-situ (in any position like slope, staircase etc).if robotic platform is not sliding down on its own weight; then this test is passed successfully.
Turning	<p>a) operate platform using master control station by using turning command of joystick,</p> <p>b) Do Visual check of robotic platform performing turning operation</p>	The four wheeled/Tracked Tactical Robot should turn at its own axis by skid steering, if turning is achieved then this test is passed successfully.

2.1.5 Range of remote operation

Test Parameter	Test Procedure	Acceptance Criteria
Range <i>Line of sight</i>	a) Mark two points 200 m apart on fairly leveled surface which should be in line of sight.	Successful execution of various task like turning, movement of platform etc

(LOS)	<ul style="list-style-type: none"> b) Operate robotic platform using master control station and cover a distance of 200 m. c) Perform various task like turning, movement of platform etc at distance of 200 m 	at distance of 200 m from master control station
Non-Line of sight (NLOS)	<ul style="list-style-type: none"> a) Identify a wall with thickness of 150 mm. b) Operate robotic platform using master control station and take it across wall. c) Perform various task like turning, movement of platform etc from Non-Line of sight (NLOS). 	Successful execution of various task like turning, movement of platform etc using master control station from NLOS

2.1.6 Endurance for operation

Test Parameter	Test Procedure	Acceptance Criteria															
Endurance for operation	<ul style="list-style-type: none"> a) Following operation with time count to be performed by robotic platform using master control station 	Platform should operate for two hours of operations.															
	<table border="1"> <tr> <td>1.</td> <td>Platform movement including skid steer turn</td> <td>60 minutes</td> </tr> <tr> <td>2.</td> <td>Stair climbing with flipper movement</td> <td>20 minutes</td> </tr> <tr> <td>3.</td> <td>Slope climbing</td> <td>20 minutes</td> </tr> <tr> <td>4.</td> <td>Platform Static - surveillance using cameras</td> <td>20 minutes</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>	1.	Platform movement including skid steer turn	60 minutes	2.	Stair climbing with flipper movement	20 minutes	3.	Slope climbing	20 minutes	4.	Platform Static - surveillance using cameras	20 minutes				
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2.1.7 Certificate from Original equipment manufacturer (OEM) is required for following certification/ specification

1.	Life of equipment	OEM to certify that they should be able to give service support for 10 years from date of delivery
2.	Environmental conditions	OEM to certify for following rating of equipment a) <u>IP 64</u> for robotic platform b) Temperature range of operation: -10° C to $+55^{\circ}$
3.	Rugged case for delivery	OEM to certify for following rating of rugged case a) <u>IP 65</u> for rugged case for deliver and transportation
4.	Specification of cameras	OEM to produce a certificate stating that all cameras conform to specifications mentioned in QR
5.	Labelling of cables and wires	OEM to certify and BOO shall randomly check physically and confirm any two cables for legible marking and labelling.
6.	Specification of master console station console	OEM to produce a certificate stating that console conform to specifications mentioned in QR