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ISRO'S MULTI-OBJECT TRACKING RADAR: POTENTIAL APPLICATIONS IN DEFENCE

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The ISRO-built indigenous Multi-Object Tracking Radar (MOTR) will be tested shortly during a PSLV launch. The commissioning of the radar is expected to take place a couple of months after the testing.[i] This is a major achievement for ISRO and a significant boost to the 'Make in India' endeavour. Only five countries have the capability to build such a radar system. Another feather in the ISRO cap is the cost at which it was built; it took ISRO just Rupees 245 crore to build it, while it would have cost the nation around Rupees 800 crore if such a radar were to be imported from outside.[ii] The software for the radar too was developed in-house. It is a stationary radar which is 12 metres long and 8 metres tall (rectangular) planar array. Some 4608 T/R modules populate the rectangular array and the beam, which is electronically steered, can track 10 objects at a time.[iii]

Space Application

There are multiple space applications for the radar,

1. It will be used for tracking space debris (in real time) that could harm Indian space assets.

2. To track and monitor the rocket launch for range safety purposes.

3. The future application of the radar would be to track and monitor the re-entry capsules of the future manned space missions.[iv]

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Military Application

Apart from space the radar has immense value for military applications, particularly for air defence. Radar of this specific configuration will be suitable for ballistic missile defence. One specific capability in this regard is that it can detect and track a 50x50 cm object at a distance of 1000 km and a 30x30 cm object at a distance of 800 km. This will enable the radar to track ballistic missiles with a range of 4000 to 5000 km.

DRDO's Ballistic Missile Defence system presently uses the Swordfish radar which is a modified Israeli Greenpine Long Range Tracking Radar (LRTR). The Swordfish radar can scan and track targets at a distance of just 600 km, which means that it can detect and track ballistic missiles with ranges only up to 2000 km or little above. The MOTR, with necessary modifications, could either complement or replace the Swordfish LRTR. If adopted, it would enable early target detection, longer time to track, collect target signature and perform better decoy-warhead discrimination enabling better informed engagement decision which would increase the kill probability. As far as ballistic missile target with lesser range is concerned, the radar allows for much longer tracking time (compared to present) and better target resolution.

The other highlight is, apart from the capability aspect, the radar is indigenously produced by ISRO with the help of several Indian private companies like Astra Microwave Products Ltd which supplied the T/R Modules and DC-DC converters (DC-DC converters are used to change the voltage of direct current). With this, India has the capability to produce Long Range Tracking Radars (LRTR) indigenously. Very few countries like US, Israel, Japan, etc are capable of producing such systems. Now, with the indigenous production of the MOTR the country has attained indigenous capability to develop such class of radars with performance similar to such radars produced by other countries.

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The frequency band used by the radar has not been declared publicly. But it can be deduced to some extent. Given that the T/R modules were sourced from Astra Microwave Products Ltd (the company provides components for the indigenously produced Akash SAM system), which manufactures T/R modules that can operate in the UHF, L, S, C, X and Ku band for active apertures[v] and considering the declared range and resolution of the radar the frequency band is likely to be L-band or maybe S-band.

Another feather in the cap is that the software was also developed in-house (ISRO) the worth of which is around Rupees 100 crores.[vi] This gives the flexibility to modify the functioning of the radar as per the requirement and gives room for future improvements. The radar can also be adapted for other defence application mostly for high altitude air defence by reducing average power performance and necessary modification. Such high power radars operating at the above deduced frequency band would be effective against low observable aerial targets.

Comments

DRDO could consider buying this technology from ISRO and use it for building radars for its ballistic missile defence system. The technology could also be modified to build other air defence radars as per the user requirement.

Such low cost but high performance radars will have high demand in the international market, both in defence and defence domain. Given the low cost compared to other radars of similar class in the international market, India will have a clear cost advantage.

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(Disclaimer: The views and opinions expressed in this article are those of the author and do not necessarily reflect the position of the Centre for Air Power Studies [CAPS])

[i] ISRO's New Multipurpose Radar can Track Space Debris ", http://www.thehindubusinessline.com/news/science/isros-new-multipurpose-radar-can-track-space-debris/article7210183.ece , 15 may 2015. Accessed on 8 June 2015.

[ii] "ISRO Makes Sophisticated Multi-Object Tracking radar", http://timesofindia.indiatimes.com/home/science/Isro-makes-sophisticated-multi-object-tracking-radar/articleshow/47300242.cms , 15 May 2015. Accessed on 9 June 2015.

[iii] "ISRO to Launch First Indigenous multi-Object Tracking Radar in 3-5 months, "http://www.business-standard.com/article/current-affairs/isro-to-launch-first-indigenous-multi-object-tracking-radar-in-3-5-months-115051500868_1.html, 15 May 2015. Accessed on 9 June2015.

[iv] ibid

[v] Asrta Microwave products Ltd, http://www.astramwp.com/defence.php

[vi] No.3