Application: 5425

Plextek - Cutting-edge radar technologies for space

Page: General Information

Provide information about the company to be considered for the award. If you will be nominating an individual, specify the nominee's employer.

Name of Organization/Company

Plextek

[redacted]

Additional Contacts

I do not wish to list additional contacts

Page: Entry Information

Entry Title

Plextek - Cutting-edge radar technologies for space

Category

B03. Technical Innovation of the Year - Aerospace Technology

Technical Innovation of the Year Submission Format

Written Answers

a. Briefly describe the organization that achieved the nominated technical innovation: its history and past performance (up to 200 words). Required

Plextek Services Ltd

Plextek is known as a leading innovator in radio, radar and sensing solutions. Over the last 6 years alone Plextek has completed 40+ radar developments across multiple markets and applications with 25+ of these developments in millimetre wave (mmWave) radar technology. Due to its reputation, Plextek was invited in to develop solutions for sensing and detecting micro space debris - very small millimetre sized debris which can be hugely destructive for craft but too small to detect and track using conventional space surveillance systems. More recently we have been creating radars for Rendezvous and Proximity Operations (RPO) radar for dead / failed satellites that need removing from space.

Background of innovation

New commercial communications satellite constellations, like Starlink and OneWeb, have rapidly increased the number of orbiting satellites, particularly in Low Earth Orbit. Some of these satellites fail and there is also debris created through disused rocket bodies and other fragments. Consequently, the amount of space debris in orbit continues to rise quickly. Some 35,000 objects are now tracked by space surveillance networks. About 9,000 of these are active payloads, the other 26,000 are pieces of debris that are larger than 10 cm in size.

b. Outline the nominated technical innovation. Be sure to describe it in terms that someone with limited knowledge of the technology can understand and appreciate (up to 250 words). Required

Problems with existing solutions

1. Current sensors for Rendezvous and Proximity Operations (RPO), are typically optical based and suffer from problems in eclipse or if the Sun is in boresight. Optical systems can also have delicate mechanical parts which can be affected by vibration and shock during launch. The Plextek mmWave radar works in all of these conditions and is not influenced by optical phenomena. The radar is also a fully solid-state device with no moving parts.

2. Sensors sometimes can be obscured. For In-Orbit Servicing and Manufacturing (IOSM) applications, there can be protective materials placed on the IOSM satellite to prevent fragments being created in a docking procedure. Optical systems would not see through obscured materials, where Plextek mmWave radar can. Plextek is also looking at applying these solutions to Lunar and Martian terrain vehicles. These environments create dust on the sensors. Again, optical systems will suffer, whilst Plextek mmWave will continue to see through the dust.

3. For future commercialisation of space 2.0, industry needs agile customisation, utilising COTS (commercial-off-the-shelf) components, lower cost, lower power size and weight. The Plextek mmWave radar platform and team meets these demands. This also allows the customers to add back-up systems for added redundancy at only nominal levels of cost.

Target audience for debris detecting radar:

• Satellite manufacturers (debris observation)

• In-orbit and servicing satellite manufacturers (IOSM) and operators (debris removal)

• Commercial space station manufacturer

• Shuttle manufacturer

• Lunar and Martian vehicle manufacturer

c. Explain why the technical innovation you have highlighted is unique or significant (up to 250 words). Required

•[redacted]

• The Plextek approach is [redacted]unique; taking automotive grade technologies and ruggedising them for a space environment.

• The resulting benefit for the customer is small, lightweight, and low power while offering high accuracy and flexibility. With antennas as compact as a credit card, the radar enables precise motion detection in various environments on the ground, in the air, and in space.

• Another unique advantage of using mmWave is the availability to use very large signal bandwidths, which enables improved range resolution for detecting multiple objects.

• Plextek also holds solutions for Machine Learning & AI algorithms which enables the potential for object classification and even orientation and attitude determination.

Innovation
Developing reliable electronics for space is traditionally very time consuming, uses very specialist components, hence very expensive and normally only within the resources of the very large aerospace organisations/institutions. Plextek has used its know-how to take automotive grade components, improve their performance and add layers of protection and redundancy so that they work reliably in the space environment.

Value
Plextek has developed its mmWave platform for the space environment to produce sensing solutions that are typically 1/3rd of the size, weight, power consumption, and even ongoing manufacturing cost for its customers compared to alternative technology. This has also been achieved in timescales in a year or less, which is space technology terms, is fast!

d. Reference any attachments of supporting materials throughout this nomination and how they provide evidence of the claims you have made in this nomination (up to 250 words). Optional

We have demonstrated unique capability, that is cutting edge and is showcasing the achievements of British radio engineering. We have received feedback from the highest grades in the largest aerospace organisations, that our mmWave radar approach is absolutely what the industry needs, and we are filling a capability gap.

Plextek's radar innovation represents a significant contribution to improving in-orbit servicing operations, showcasing the organisation's dedication to technological excellence and its role in advancing radar technology for space applications.

Plextek has a proven track-record for developing efficient, low-size, weight, and power (SWaP) sensing and RF communication systems. Using this experience to solve these complex engineering challenges showcases how UK SMEs like Plextek are contributing to large-scale space missions and aligning with national strategic objectives.

The developments in radar technology from Plextek are never off-the-shelf. These solutions are for the almost-impossible tasks. If it’s not ambitious, then it’s not for us.

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Would you like to add an additional webpage link?

Yes

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[redacted]

Would you like to add an additional supporting document?

No

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