

National Committee for Space and Radio Science

A committee of the Australian Academy of Science

Submission from the NC Space and Radio Science on Mission Control Centre grant opportunity guidelines by the Australian Space Agency

The National Committee for Space and Radio Science is pleased to be able to provide comment on proposed guidelines for the Mission Control Centre grant scheme administered by the Australian Space Agency. The scheme aims to provide a platform for small and medium sized enterprises (SMEs) and researchers to control small satellite missions and to provide access to space-enabled data.

All spacecraft interact with the space environment¹. Spacecraft experience energetic particle radiation, surface charging, fluctuating electric and magnetic fields, atmospheric drag, contamination, particle impacts, and possible degradation of radio and data communication circuits during active solar and geomagnetic conditions. Radiation is a particular concern for all crewed space missions. Therefore, mission control centres such as the Johnson Space Center in Houston, and the European Space Operations Centre (ESOC) in Darmstadt, monitor and respond to space weather and in situ radiation levels^{2,3}. These facilities are informed by space weather research programs, e.g. Living with a star⁴ (NASA) and the Space Weather Observatory⁵ (ESA).

There are clear legal, moral and practical imperatives for providing such services⁶. Therefore, to ensure compatibility with international operators and indemnify controllers it is essential that an Australian mission control centre similarly provides information on current and predicted space weather and radiation levels. A basic requirement for Mission Control would be large displays of space weather data that provide information about the operational integrity of space assets. For example, images of the sun and solar flares, intensity of the radiation environment, basic geomagnetic indices, solar and geomagnetic disturbance predictions, and estimates of radiation doses for space and air travellers.

A model of best practice is the European Space Security and Education Centre in Belgium⁷. This is a centre of excellence for space cyber security operations, operates a space weather data centre, and is home to the ESA Education Training Centre which provides training for school teachers and university students.

In Australia responsibility for space weather monitoring and forecasting rests with the Bureau of Meteorology Space Weather Service. While organisations in some states provide some elements of space-related education or training, there is no Australian space education and training facility or program.

In addition to providing real-time data and forecasts on radiation levels in space, to support new initiatives and collaboration with other global centres the Mission Control Centre should



also have the capability to provide biomedical support and monitoring of future human missions.

Space debris is recognised as a major and growing risk for space operations. Therefore international agencies and mission control centres recognise the need to include orbital debris monitoring and space traffic management as part of their activities⁸. For example, the Indian Space Research Organisation (ISRO) is currently developing a Space Situational Awareness Control Centre⁹. Within ESA space situational awareness data provision is the responsibility of the SSA Space Weather Service Network⁹ and integrated with ESOC operations.

An Australian Mission Control Centre therefore also needs to include facilities supporting SSA and Space Traffic Management. Furthermore, to support research and strategic applications, the Mission Control Centre also needs to include a secure data portal for defence, government and universities to access real-time space environment data recorded on Australian assets. The Space Agency's SSA work group is advocating the need for an SSA Data Lake to accelerate collaboration, research, and cutting edge operations.

There is an opportunity for the Space Agency to help stimulate a cycle of research and development to improve our understanding of the space environment and our ability to operate assets in that environment.

More broadly, the Mission Control Centre can be regarded as a national facility which supports operational, educational and research opportunities to stimulate new initiatives and developments.

Recommendations

1. To ensure compatibility with global centres and operations and meet legal, moral and practical requirements, the Australian Mission Control Centre needs to provide real-time space weather and space environment data. The Australian Bureau of Meteorology Space Weather Service should, logically, be responsible for supplying these data.
2. Similarly, the Mission Control Centre should have the capability to provide biomedical support and monitoring of future human missions.
3. It is vital that space situational awareness and management capability be available to the Mission Control Centre. This will require a coordinated R&D program most likely involving a number of agencies and institutions.
4. To support the improvement of satellite operation services, the Mission Control Centre should provide secure real-time access to space environment observations recorded on board space assets to government agencies and university researchers.

References

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