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Long-term sustainability of outer space activities

Australia – Input to the Working Group on the Long-term Sustainability of Outer Space Activities

The present conference room paper was prepared by the Secretariat on the basis of information received from Australia. The information was reproduced in the form it was received. A shorter related text is available in all the official languages of the United Nations in document A/AC.105/C.1/L.409/Add.3.

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Australia – input to the Working Group on the Long-term Sustainability of Outer Space Activities

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1. Australia is committed to the development and implementation of rules and norms that seek to support the safety, stability and sustainability of outer space. The Guidelines for the Long-term Sustainability of Outer Space Activities (LTS Guidelines) provide an effective framework to support this outcome.
2. This submission provides case studies for consideration by the Working Group on the Long-term Sustainability of Outer Space Activities (LTS 2.0 Working Group). Australian case studies are structured on the United Kingdom's reporting approach for voluntary implementation of the LTS Guidelines (A/AC.105/C.1/2020/CRP.15 and A/AC.105/C.1/2021/CRP.16). Additional case studies will be submitted in line with the five-year workplan of the LTS 2.0 Working Group.
3. The Australian Space Agency (the Agency) is working with industry to understand their awareness, perspectives and activities related to Australia's implementation of the LTS Guidelines as part of building a culture of safety and sustainability. The broad objective of this work is to identify practices, and gaps for further research and development, in Australia's national implementation of the LTS Guidelines.
4. In 2021, the Agency conducted a survey of Australia's implementation of the LTS Guidelines, consisting of approximately 38 participants across industry and government, including satellite manufacturers, launch companies and universities. When asked what sustainability in space meant to them, responses included:
    a. Responsible and safe use of space,
    b. Preserving the space environment for future generations, and
    c. Agreed governance structures to facilitate sustainability in space.
5. Participants noted that sustainability in space has an influence on project planning and activities. Additionally, participants stated that the LTS Guidelines themselves provide clarity and consistency on safe and sustainable uses of space, influence the creation of sustainable technologies and support building a responsible reputation.
6. A number of examples were provided by participants implementing the LTS Guidelines within their current activities. For example, companies are considering the development of internal policy on space debris mitigation which draws on the UN Space Debris Mitigation Guidelines. Another example is universities collaborating with industry to develop innovative space debris monitoring technologies. The participants also noted some challenges in implementing the LTS Guidelines, including the implementation of sustainability measures while maintaining commercial viability.
7. The Agency also consulted stakeholders to develop case studies for consideration by the LTS 2.0 Working Group. The case studies provide an insight into experiences in implementing sections of the Guidelines, namely A. Policy and regulatory framework for space activities; B. Safety of space operations; and C. International cooperation, capacity-building and awareness (see **Attachment A**).
8. The Agency is responsible for regulating activities that go above 100km, or attempt to do so, or involve high power rockets, as specified under the *Space (Launches and Returns) Act 2018* and associated rules. A review of the *Space Activities Act 1998* was announced by the then Minister for Industry, Innovation and Science in 2015. The review's aim was to ensure Australia's space regulation is appropriate to technology advancements and does not unnecessarily inhibit innovation in Australia's space capabilities. The framework was updated in 2019 to ensure it supports the growth of the space industry by removing

unnecessary barriers to participation and encouraging entrepreneurship, as well as ensuring the safety of the activities and implementing certain of our international obligations. This supports implementation of LTS Guidelines A.1 and A.2.

9. Australia recognises the importance of space weather data and forecasts, and recognises that a model and tool that can assist in the mitigation of space weather effects contributes to the sustainability of outer space, and success of the space industry. The Bureau of Meteorology (the Bureau) has implemented measures to build space weather capability and provide space weather engagement, forecasting, research and operational activities. This is in addition to the Bureau's participation in international fora, including the World Meteorological Organization, International Space Weather Initiative, International Space Environmental Service, and International Civil Aviation Organization. These activities support implementation of LTS Guidelines B.6, B.7 and C.1.
10. As part of our efforts to promote and support mutual learning in space legislation and policy, the Agency is collaborating with India, Indonesia, Japan, Malaysia, New Zealand, the Philippines, the Republic of Korea (ROK), Singapore, Thailand, Türkiye and Viet Nam through the National Space Law Initiative (NSLI). The NSLI, which was established under the Asia-Pacific Regional Space Agency Forum (APRSAF) in 2019, seeks to: promote information-sharing and mutual learning on the practices and examples of national space legislation and policies in the Asia-Pacific; and enhance drafting capacities and implementation of national space legislation and policies in Asia-Pacific countries in accordance with international norms. These activities support implementation of LTS Guidelines C.1 and C.3.
11. Finally, *Advancing Space: Australian Civil Space Strategy 2019 – 2028* defines four strategic pillars to transform and grow Australia's space industry, including *inspire*. Core to the *inspire* pillar is the establishment of the Australian Space Discovery Centre (ASDC), which seeks to raise awareness of space activities by engaging with the Australian community, including school children and tertiary audiences. The ASDC includes a number of exhibits and seminars on issues relevant to sustainability and debris mitigation. This supports implementation of LTS Guideline C.4.
12. Australia strongly supports the aims of the LTS 2.0 Working Group. In our view, the sharing of experiences, practices and lessons learned from voluntary national implementation of the LTS Guidelines is key to raising awareness of, and facilitating capacity building in, implementation of the LTS Guidelines as a whole. We look forward to continuing to engage with the LTS 2.0 Working Group as we work towards supporting the safety, stability and sustainability of outer space.

Attachment A

A.1, A.2	**A.1 – Adopt, revise and amend, as necessary, a national regulatory framework for outer space activities.** **A.2 – consider a number of elements when developing, revising or amending, as necessary, national regulatory frameworks for outer space activities.**	**Australia**
Thoughts or approach to implementation	A key responsibility of the Australian Space Agency (the Agency) is to implement our international civil space obligations. Additionally, our objective includes ensuring that a reasonable balance is achieved between the removal of barriers to participation in space activities and the encouragement of innovation and entrepreneurship in the space industry, and the safety of space activities. This was realised through implementation of the *Space Activities Act 1998* (1998 Act), which established a regulatory framework for the licensing and safety requirements for space activities carried on either from Australia, or by Australian nationals outside Australia, and implemented certain of our international obligations (**A.1**). These goals are also achieved through an update of the legislation and associated rules. Amendments to the 1998 Act commenced in mid-2019. The amended framework takes into account the changing operating environment, including activities undertaken by new space actors (**A.1**). In addition to amending the 1998 Act, the Agency developed subordinate legislation in consultation with industry, which addressed insurance, high power rockets, and application requirements. Subordinate legislation is made by the Minister responsible for civil space activities, and must be tabled in the Australian Parliament. This allows for flexibility to update requirements as the nature of space activities evolves, and to keep pace with industry activities (**A.2**).	
Current progress and/or proposed future activities	There have been a number of applications, including for overseas launches of satellites. Since the commencement of the *Space (Launches and Returns) Act 2018*, the Agency has assessed 7 complex applications, including for launch facility licences and Australian launch permits. It has also assessed 15 overseas payload permit applications. These applications come from an increasingly diverse range of organisations, including small to medium enterprise, and universities. The Australian Space Agency is undertaking a program of regulatory refinement, which may include identifying improvements to procedures and practices, and streamlining interaction with industry.	
Experiences, challenges and lessons learnt	A recent House of Representatives inquiry into developing the Australian space sector received submissions from stakeholders that included suggestions to improve education and awareness of regulatory processes. Publicly available guidance was identified as an important means to assist industry navigate the regulatory process and reduce possible delays and costs.	

	The Agency has since established a dedicated industry engagement mechanism to guide stakeholders through the application and regulatory process, including through the provision of publicly available guidance documents.
Comments on specific needs for capacity building to support implementation	Dialogue with counterpart regulators provides a useful mechanism to share learnings, experiences and methods to address issues associated with implementation. The Agency communicates with counterpart regulators to ensure an understanding of our respective regulations and their application to proposed space activities. Communication is effective on a bilateral and multilateral basis, and may be underpinned by arrangements to support such engagement, or at a regional level for example, through our engagement with the National Space Law Initiative (NSLI). Additionally, the Agency participates in outreach activities, which are an opportunity to raise the level of awareness and understanding of the regulatory framework among industry and academia.

B.6, B.7, C.1	**B.6 – Share operational space weather data and forecasts.** **B.7 – Develop space weather models and tools and collect established practices on the mitigation of space weather effects.** **C.1 – Promote and facilitate international cooperation in support of the long-term sustainability of outer space activities.**	**Australia**
Thoughts or approach to implementation	Australia recognises the importance of space weather data and forecasts. It recognises that a model and tool that can assist in the mitigation of space weather effects is essential to the sustainability of outer space, and the success of the space industry (**B.6)**. To support this approach, a dedicated space weather capability in Australia was acknowledged as an integral step to supporting the long-term sustainability of outer space activities, as well as our consistent support to government, key industry and defence. Australia's approach is to have a space weather capability that delivers valued environmental services which specify, predict, and forecast space weather events. For example: the ability to provide owners and operators of critical infrastructure across key industries timely and accurate information to enable mitigation of the adverse impacts of space weather. In recognition of this, the Bureau of Meteorology (the Bureau) undertook a space weather capability transformation which commenced in September 2021, with its outcomes clearly aligning with the goals and ambitions of **B.6**, **B.7** and **C1.** Australia has long held a space weather capability since the development of the Ionospheric Prediction Service (IPS) in 1947. In 2008, the IPS became a part of the Bureau, and in 2014 was renamed Space Weather Services. The space weather capability transformation built on this expertise **(B.6)**. The centre of the Bureau's capabilities, is the Australian Space Weather Forecasting Centre (ASWFC), with 24/7 operating services; and dedicated space weather teams focusing on space weather engagement, forecasting, research to operations and IT specialists (**B.7)**. In addition to recognising the need for Australia's own dedicated space weather capability, the Bureau also recognises the importance of international collaboration to support the sharing and strengthening of space weather knowledge.	
Current progress and/or proposed future activities	**B.6 – Share operational space weather data and forecasts.** Officially opened on 6 October 2022, the ASWFC is located in Adelaide's Lot Fourteen innovation precinct in South Australia alongside more than 80 of Australia's space businesses and agencies. It ensures that it can provide real-time space weather information to those who need it most, when they need it **(B.6)**.	

	The ASWFC's location enables the team to participate in important collaborations as the Australian space industry develops. In order to achieve accurate and reliable services for customers, constant monitoring of the Sun and the space environment from a range of vantage points is needed, together with timely dissemination of reliable data to those needing the information. This approach was supported by the establishment of dedicated teams including: ○ Specialist and dedicated space weather forecasters; ○ Experts working with industry on research and development; ○ IT specialists turning ideas into products; and ○ To ensure the Bureau is meeting the needs of Australia's developing space industry, industry engagement experts. Through this transformation the Bureau is now focused on developing products and services that benefit the Australian community and drive competitive advantage for businesses and industries, by supporting space weather intelligence to the space industry. **C.1 – Promote and facilitate international cooperation in support of the long-term sustainability of outer space activities.** Internationally the Bureau's space weather team participate in international fora, and recently attended the International Astronautical Congress in Paris and the European Space Weather Week in Croatia. The Bureau is also an active contributor to several international forums on space weather. This promotes and facilitates international cooperation in support of long-term sustainability of outer space activities **(C.1)**. For example, the Bureau is a member/participant of: • World Meteorological Organisation (WMO) – The Bureau is a core member of the WMO Inter-Programme Team on Space Weather Information, Systems and Services (IPT-SWeISS); • United Nations Committee on the Peaceful Uses of Outer Space (UN COPUOS) – Australia is committed to maintaining global and regional space weather observations; • International Space Weather Initiative (ISWI) - The Bureau is a member on the ISWI Steering Committee. The Bureau is the National Coordinator for Australia, and regional coordinator for ISWI; • International Space Environment Service (ISES) - The Bureau has two representatives on the ISES Directing Board: Secretary for Space Weather and the Regional Warning Centre (RWC) Australia delegate. The Bureau operates the regional warning centre for the Australasian region as part of this Network; • International Civil Aviation Organisation (ICAO) - The Bureau is an expert advisor on space weather to the ICAO Met Panel (METP), Space Weather Workstream of the Working Group on Meteorological Information and Service Development (WG-MISD); and

	• International Council for Science World Data System (ICSW-WDS) World Data Centre – SWS operates a World Data Centre (WDC) and is a member of the ICSW-WDS. By sharing space weather data in an organised and considered way, Australia's space weather capability can ensure it will be able to support **(B.6)**: • services for sectors and customers with appropriate and timely space weather event forecasts and warnings so sectors and customers can respond in a timely and appropriate way; • advice and awareness to Government on how to respond to a fast onset, high impact space weather event to keep the community safe and where necessary, make the best decisions to protect the community, vital services and critical infrastructure; and • a focussed forecasting and warning capability, which is sustainable, and provides forecasts and warning that are consistent, persistent and well tested.
Experiences, challenges and lessons learnt	The Bureau works closely with the space industry and operations exposed to space weather risk and provides space weather advisory services focussing on severe-to-extreme events that may threaten critical infrastructure, including radiocommunications, satellite operations, GNSS, PNT, debris and orbital awareness, mineral exploration, pipeline protection, and electricity supply networks. Increasing awareness of space weather in this industry, and in industries that rely on space data or space-based services, can be a challenge. Using opportunities to educate, inspire as well as better understand the needs of the space industry is a continued area of focus.
Comments on specific needs for capacity building to support implementation	Increasing regional capability and sustainability, and the continual contribution to international networks for the benefit of a safe and sustainable space environment is vital. It is a capability that allows its space weather researchers to support the development of space weather models and tools that add value and impact to these sectors and customers **(B.7)**. It is important that there is a focus on developing resilient systems and processes that support delivery of products and services to support a sustainable space environment. Timely and accurate space weather information, nowcasts and forecasts are possible only if sufficient observation data are continuously available through a multi-instrument capability. Building capacity and capability through international partnerships is also a way to achieve these ambitions.

C.1, C.3	**C.1 – Promote and facilitate international cooperation in support of the long-term sustainability of outer space activities** **C.3 – Promote and support capacity-building**	**Australia**
Thoughts or approach to implementation	Australia is undertaking a range of activities to implement **Guidelines C.1** and **C.3**. The Australian Space Agency is collaborating with India, Indonesia, Japan, Malaysia, New Zealand, the Philippines, the Republic of Korea (ROK), Singapore, Thailand, Türkiye and Viet Nam through the National Space Law Initiative (NSLI). The NSLI, established under the Asia-Pacific Regional Space Agency Forum (APRSAF) in 2019, seeks to: promote information-sharing and mutual learning on the practices and examples of national space legislation and policies in the Asia-Pacific; and enhance drafting capacities and implementation of national space legislation and policies in Asia-Pacific countries in accordance with international norms. Phase 1 of the NSLI took place from 2019 to December 2021, with Australia, India, Indonesia, Japan, Malaysia, the Philippines, ROK, Thailand, and Viet Nam as members. This first phase included the development of a report that promoted information-sharing and mutual learning in relation to members' respective regulatory frameworks. This report was presented at the 60th session of the Legal Subcommittee of the Committee on the Peaceful Uses of Outer Space (COPUOS) in 2021, and was noted by COPUOS. Also as part of Phase 1, Australia participated in expert panels held in conjunction with the APRSAF Space Policy and Law Working Group, as well as at the 60th session of the Legal Subcommittee.	
Current progress and/or proposed future activities	The Australian Space Agency is currently participating in Phase 2 of the NSLI, which commenced in March 2022 with New Zealand, Singapore and Türkiye as new members. The objective of this phase is to develop a second report on national space law for presentation to the Legal Subcommittee at its 62nd session in 2023. This report will examine NSLI members' implementation of **Guidelines A.1 to A.5**. Australia will also deliver a presentation to the NSLI Space Policy and Law Working Group, which will hold its second meeting at APRSAF-28 (14-18 November 2022). This presentation aims to share Australia's experiences in implementing **Guidelines A.1-A.5**, with a view to promoting mutual learning in drafting and implementing national space legislation and policies in accordance with international norms.	
Experiences, challenges and lessons learnt	From Australia's perspective, the value of the NSLI is in the technical forum that it provides for space law and policy practitioners in the Asia-Pacific to share information and updates on their work in developing, implementing, reviewing and/or updating their national space laws. It has provided an avenue for Australia to learn from others in the region on how they are implementing the LTS Guidelines in relation to their policy and regulatory frameworks for space activities.	
Comments on specific needs for capacity building to	The NSLI brings together members from across the Asia-Pacific, including space-faring countries, and emerging space-faring countries. The support of the NSLI Secretariat in convening regular meetings, drafting reports, and planning panel events to share information and learnings with	

support implementation	broader audiences has been instrumental in the achievements of the NSLI to date. Australia conveys its thanks to Japan, including the Japan Aerospace Exploration Agency (JAXA) as NSLI Secretariat, for its continued support of the NSLI and its commitment to promoting and supporting mutual learning in space legislation and policy.

C.4	C.4 – Raise awareness of space activities	Australia
Thoughts or approach to implementation	The Australian Space Agency was established on 1 July 2018 with the purpose to transform and grow a globally respected Australian space industry that lifts the broader economy, inspires and improves the lives of Australians – underpinned by strong international and national engagement. *Advancing Space: Australian Civil Space Strategy 2019-2028* defines four strategic space pillars to transform and grow Australia's space industry, namely: - **International**, to open doors to leverage international partnerships; - **National**, to increase sovereign capability; - **Responsible**, through regulation, risk mitigation and culture; and - **Inspire**, to build the future workforce. Core to the *Inspire* pillar was the establishment of the Australian Space Discovery Centre (ASDC) in Adelaide, co-located with the headquarters of the Australian Space Agency in the innovation precinct of Lot Fourteen. The ASDC serves the dual purpose of raising awareness of space activities by engaging with the Australian community, as well as facilitating school programs that target secondary and tertiary audiences to highlight the range of careers available in the growing space sector. Visitors to the ASDC have the opportunity to explore the latest innovations in space technologies, to learn about Australia's role in the global space industry, and to highlight accessible careers. A robust and growing digital program is being rolled out to share similar learning opportunities to the general public and schools across the Australia. The ASDC also includes public viewing access of an operating Mission Control facility run by Saber Astronautics, which provides members of the public and schools who visit the centre the opportunity to observe real-time space satellite management, and space weather monitoring.	
Current progress and/or proposed future activities	Since opening to the public on 5 May 2021, the ASDC has welcomed more than 40,000 visitors, including over 5000 secondary students as part of dedicated school programs. Space Communicators, who are part of the front-facing engagement team of the ASDC, have also supported a range of events by facilitating booths at career expos and science fairs, and have delivered keynotes or panel discussions that have led to an additional 5000+ interactions across 6 Australian states. A growing digital program includes sessions on space and planetary exploration, as well as monthly Q&A opportunities with subject matter experts from the space sector. In the coming months and years, the ASDC and staff will continue to grow physical outreach capabilities by supporting more intrastate and interstate events, including the ability for ASDC to run further school programs.	

Experiences, challenges and lessons learnt	The ASDC was built in partnership with Questacon, the National Science and Technology Centre. Questacon not only helped with the concept design of the centre, but also contributed towards the design of the *visitor experience framework* that underlies all ASDC programs and experiences. After the build phase of the ASDC was completed, ongoing governance of the ASDC was adopted by the Agency and has supported ongoing learnings where the Agency is not only establishing itself as a national space agency, but now has the added responsibility of running and operating a public education facility. This combination has proven to be complimentary, in that the Agency not only fulfils its role as the national space agency, but also has a public platform and centre to share the progress and achievements of the sector. The ASDC was built and opened during the COVID-19 pandemic, where the original intention was to serve as a community meeting place, in which visitors from schools or the general public could engage and interact with people and companies from the space industry. Tight COVID restrictions, and strict centre capacity requirements required a pivot from what was designed as a more passive visitor experience to a revised operating model. Instead of engaging with space industry experts within the ASDC, a team of Space Communicators presented talks to each group of visitors in a more directed and facilitated visit that also included time to explore the hands-on and interactive gallery. COVID-19 restrictions and requirements throughout 2020 and into 2021 allowed the ASDC to focus attention on in-centre programming, and ensuring all visitors had a positive learning experience. Late in 2021, an easing of COVID restrictions has allowed for expansion beyond the centre, both physically and digitally.
Comments on specific needs for capacity building to support implementation	Due to the COVID environment in which the ASDC was established, the role of the ASDC to increase public awareness of space has been able to benefit from the agility that a new centre and new space agency provides. This has enabled the ASDC to quickly adapt and follow new initiatives. Additionally, the small team which works within the ASDC is able to leverage the network and influence of the Agency, which can also act as a coordinator and facilitator for other outreach and public awareness activities within the Australian space sector.