

Friday, April 18, 2008

Committee Secretary  
Senate Economics Committee  
Department of the Senate

Dear Committee,

**Re: Inquiry into The Current State of Australia's Space Science & Industry Sector**

Please find at the end of this letter a paper that was written by a colleague and myself in 2006 about the issue of Australia's involvement in space. The paper particularly outlines how to establish an Australian space agency, and describes the role such an organisation might play. Please note that this paper is submitted by myself, and the views expressed in this cover letter are mine alone, and don't necessarily reflect those of my colleague.

Space isn't a discipline domain, but rather is a mission domain. It involves a variety of different science and engineering disciplines to undertake certain missions. Hence, any sort of space operations involves a significant collaborative and integration undertaking.

This "integration factor" is, from personal experience, where value for an organisation (or a nation) really exists. For example, aircraft manufacturers (these days called "system integrators") are the organisations that deliver real value to their customers.

It follows that if Australia invests in some sort of space-related integration efforts, I believe that such experience will have significant benefits for other high-technology pursuits. As Australia's economy moves away from mass-production, and more towards a knowledge and innovation-based economy, having such experience would be invaluable in placing Australia in a leadership position. Focusing various organisations and disciplines around a mission-domain (such as space) is an excellent way of developing that capability.

Investment in space-related activities, especially from an industry perspective, and partnering with other nations on the research and exploration front, I believe will place Australia at the edge of technological and scientific development, which is a key enabler of a strong knowledge economy.

I thank the committee for considering these views.

Yours Sincerely,

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# Formation of an Australian Space Agency – A practical plan for the future

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**Of the top thirty GDP countries, Australia is one of only two nations without a formally recognized government space agency. How can this be so? Australia is seen as a global partner in the Asia Pacific region’s stability and security, and that leadership status is dependant increasingly more upon the technological, social and essential services that space system technologies provide. Yet, the Australian government is reluctant to support the establishment of a formal agency. As Australia moves towards another century without a space agency, this report discusses the potential for an Australian Space Agency, and gives recommendations for a structure and implementation process. This report also discusses and offers amendment suggestions for a number of recent documents on the future of Australia’s involvement in space.**

## Nomenclature

<i>ASRI</i>	=	Australian Space Research Institute
<i>CSIRO</i>	=	Commonwealth Science, Industry Research Organisation
<i>IP</i>	=	Intellectual Property
<i>ITAR</i>	=	International Trade in Arms Regulations
<i>NSSA</i>	=	National Space Society of Australia

## I. Introduction

**T**HIS paper discusses a possible implementation plan for a formal Australian Space Agency, and the political and scientific context in which it would be introduced into.

There have been a number of recent and continuing studies that have been conducted including the Space Science Decadal Plan, and Senator Grant Chapman’s “Space: A priority for Australia Senate” report. This paper acknowledges the existence of these reports and offers amendment ideas for the reports, but the main focus of this paper is the road-map for construction and potential structure for a future Australian Space Agency – something that both reports fail to address.

It is a positive that a lot of the ground work has been completed. The Space Science Decadal Plan has identified specialty areas in which Australian researchers can make substantial contributions to space knowledge, and have also identified many potential players and supporters of any future Australian Space involvement.

All of these previous studies have recommended the creation of a formal Australian Space Agency.

The plan described in this paper is not complete in itself, but provides a proposal that should be debated & thought about, and further still, acted upon in some form.

The paper considers the Australian context & climate on space involvement as it stands, the opportunities for Australia, and the hindrances that exist to an Australian space agency. It then provides a plan with specific actions that should be seriously considered.

There is evident and strong motivation in the space science research community for more Australian involvement and influence in international spaceflight technology and policy. The apparent obstacle for the creation of a future Australian Space Agency identified by the authors, however, is not “is there support for a formal

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Australian Space Agency?”, but “how do we as a country go about deciding upon how we want our space agency to form and operate?” Included in this section is a discussion of the history of Australian Space Policy, government project involvement and current attempts at developing a road-map towards an eventual framework for an Australian Space Agency.

## **II. History of Australian Space Policy, Involvement, & Agency Status**

Australia began its involvement in space technologies in the 1930’s with British launch testing. Australian space involvement showed a lot of promise in those days, with government support flowing. During the Apollo missions Australia played a large and essential role in communications due to our geographic position on the globe. To this day, Australia still provides invaluable communications services with facilities like the Tidbinbilla Deep Space Tracking Station, Parkes and Australia Telescope National Facility (ATNF).

Although Australian government support for spaceflight and space science research has been lacking over the years, Australia’s numerous amateur space organizations and a number of private companies have been working for many years to push the proliferation of space research and subsequent education of space science in Australia. To name a few; ASRI, Mars Society Australia, NSSA and the Australian Space Network have been pushing for a formal Australian Space Policy via a variety of possible Australian Space Agency models (note that Australia does have a formal space policy, but it is the opinion of the authors that this policy is vastly incomplete).

Australia’s current space involvements can act as a learning resource when considering potential show-stoppers like ITAR. Some current Australian space science involvements include FedSAT, TIGER array, Light Detection and Ranging (LIDAR) – Antarctica, Culgoora Solar Observatory (NSW) and Tidbinbilla Deep Space Tracking Station – Part of NASA’s Deep Space Network (DSN). Australian researchers have also played roles in the production of a number of satellite craft.

However the fact remains that Australia still has no formal space agency, or practical space policy and as a nation have no unified vision of how we are going to go about creating one.

### **A. Introduction: Political Activism**

There are many organizations, committees and individual stakeholders who are attempting to create and/or amend government space policy. Of the more active include the National Committee for Space Science who are compiling the Decadal Plan for Space Science, the Australian Space Network, Senator Grant Chapman and the Space Policy Advisory Group who compiled the Space-A Priority for Australia Senate report, in addition to a number of amateur space related societies namely the Mars Society Australia<sup>1</sup>.

### **B. Recent and current attempts at creating a road-map**

#### *The Australian Space Network (ASN)*

The Australian Space Network (ASN) was formed in April 2005 and it incorporates nine public and private stakeholders. Members of the ASN include; the Macquarie University Australian Centre for Astrobiology (ACA), several divisions of the CSIRO, the Australian Space Industry Chamber of Commerce, and a number of private technology companies. The ASN was formed to aid in the bidding process when vying for NASA and ESA space contracts. The ASN was created under the support of the NSW department of State and Regional Development. One of the recommendations of the ASN is the creation of a formal Australian Space Agency. Components of the Australian Space Network trade framework could be used in any future interim or preliminary formal space policy. This could pose very useful particularly when confronting ITAR obstacles.

#### *Decadal Plan for Space Science<sup>2</sup>*

Any future formal Australian Space Agency will need to initially decide upon what exactly are potential space science fields that Australian scientists, engineers, research organizations and private companies can make significant R&D contributions. Recognizing this need, the Australian Academy of Science commissioned the production of the Australian Decadal Plan for Space Science. A National Committee for Space Science was subsequently created, which comprises of nine experienced members of the Australian Space Science research community. The main aim of the Space Science Decadal Plan is to identify Australian space science expertise fields and to create a ten-year road-map for the completion of specific projects in these identified fields.

The primary emphasis of the Decadal Plan is on:

- Solar terrestrial physics
- Space weather
- Atmospheric forcing

- Remote sensing
- Planetary Science (including Astrobiology)

The Decadal plan has been produced via a framework of a main steering committee that was in charge of the development, approval, writing, and publication of the decadal plan.

The steering committee was supplemented by a number of working groups. These include; the science working groups, Industry/science working groups, Government working groups, Demographics working groups and public outreach working groups.

A number of global science themes were created:

- Sun and space to earth
- Observing Australia, earth and planets from space
- Plasma to planets
- Life and technology in space

The decadal plan is due for finalization in February 2007

The Space Science Decadal Plan offers a roadmap for Australian involvement in international space science, but offers no suggestions for other areas of potential involvement. Other areas include space structures and avionics engineering, of which Australia has a number of relevant private and public companies and research centers.

*Space – A priority for Australia – A report by Senator Grant Chapman<sup>3</sup>*

South Australian Liberal Senator Grant Chapman set up the Space Policy Advisory Group (SPAG) in April 2005, and since then the SPAG and Senator Chapman have worked to produce a submission for consideration by the Prime Minister and cabinet ministers. The senate report “Space; A priority for Australia” was presented to the Senate in January 2006, where it was received for consideration. The Space Policy Advisory Group consisted of 16 members from a diverse background including academics and space industry executives in addition to two defense department observers.

Australia currently has a “Space Policy and Engagement Framework” which was drafted by the portfolio for Industry, Tourism and Resources (DITR). According to Senator Chapman, this document was “neither endorsed by Cabinet nor formally agreed by the National Security Committee of Cabinet”<sup>3</sup>. Chapman goes on in the senate report to say that the DITR is no longer in a position to make the higher level broader strategic national interest decisions that are required when considering Australia’s space involvements.

The two main objectives that Senator Chapman calls for are; firstly “the development and promulgation of a broad and far-sighted whole of government space policy” and secondly, the “development of a 10 year action plan”. The report recommends that any creation of a formal Australian Space Agency should be assigned to the Department of Prime Minister or Cabinet.

Senator Chapman’s report has been produced with a very clear and objective aims. This is what is required to get the ball rolling in the right direction. Space – A priority for Australia is a starting point.

There exist many different visions of how to go about creating our Australian Space Agency, each coming from a slightly different perspective. It is the purpose of this paper to present a unified road-map to the creation of a unified road-map vision.

The steering committees and main motivating forces behind the studies mentioned in this section must be commended for their foresight and effort invested in Australia’s Space involvement future.

### **III. Benefits a strong domestic space capability has to Australia**

#### **A. The Global Space Industry**

Traditionally international space agencies have been reluctant to agree to any international collaboration via sub-contracts, with space agency details considered as national secrets. However, it would appear that this attitude is in the process of changing and international collaboration is seen as a necessity in the modern engineering world. Governments are being forced to be highly accountable for decisions made, and money is often tight. Hence, to spread the risk of current and future ambitious space initiatives and also to better utilize worldwide scientific knowledge, skills and equipment resources international partnerships have been formed.

##### *Growth Expectations*

International space agencies require government to government dialog. This is one of the main reasons for the creation of a formal Australian Space Agency. With NASA announcing in 2004 a new vision for future space exploration starting with the retiring of the Space Shuttle and the creation of a new launch vehicle for human missions back to the moon and beyond to Mars, and ESA continuing with un-manned probes to planets including Mars and Venus, Australia and international Space Agencies stand to benefit from specialist contracts. George W. Bush said in 2004; “We’ll invite other nations to share the challenges and opportunities of this new era of discovery.

The vision I outline today is a journey, not a race, and I call on other nations to join us on this journey, in a spirit of cooperation and friendship.”<sup>1</sup>

## **1. Benefits & Opportunities for Australia**

### *1. Industry*

Industry will potentially benefit with:

- more graduates as more young people chose to study and work in these cutting edge fields
- A knowledge based economy filling a world-wide specialist market
- Release reliance on outdated and non-Australian-practical industries
- Increased communications and internet security and speed
- Superior mining and natural resource management
- Increased transportation efficiency

### *2. Education*

Education is a benefit for Australia that was mentioned both in the Decadal Plan for Space Science and Sen. Grant Chapman’s report, however the importance of such outreach benefits were overlooked. Public outreach is one particular area that shows vast potential for benefit for Australia. The Victorian Space Science Education Centre (VSSEC) and the Australian International Space School are two very successful examples of how space can be used as a motivating factor for secondary school students to study and more importantly enjoy studying mathematics and science. A major part of any potential Australian Space Agency would be outreach to the community. This outreach would be predominantly in the form of education. Teachers would have better access to teaching material to make their classes more interesting and valuable for the students. What more motivation can a young student get that if you do well you may go to the moon?

At a tertiary level, new research projects will be created, which will be filled by Australian students. Any tertiary level research always feeds back into the teaching of Undergraduate students.

### *Economy*

Due to world economic powers of China and India mass manufacture is no longer economically lucrative in Australia. The fact is that if Australia is to maintain it’s lucrative manufacturing industry, innovation is required. This would cause a fundamental shift to a more knowledge based economy. Becoming an international space contributor will open up many possibilities for technology, skills and knowledge transfer, which will encourage the proliferation of a knowledge based economy.

### *3. Environment*

With increased surveillance capabilities, scientists will be in an enhanced position to monitor and study the climate and natural resources of Australia. Some possibilities include those listed in Sen. Grant Chapman’s *Space: A priority for Australia* senate report:

- Bushfire tracking and disaster management
- Forestry data collection and analysis
- Water management
- Traffic management allowing better planning for the future
- Air quality management
- Salinity management
- Weather tracking and forecasting
- Carbon management

### *4. The national interest*

Other potential benefits to Australia include:

- Increased capabilities of the Australian Defence Force
- Increased Coast-watch capabilities

## **IV. The challenges & issues facing the creation of an Australian space agency**

When considering the context of the proposed plan, it is important not only to have in mind the industrial & national drivers, but also the issues & challenges which the plan must seek to overcome. What is stopping ‘us’ (Australia as a nation) from ‘having’ a formal space agency? The authors have identified the following issues (which are by no means conclusive):

1. In Australia there are a considerable number of organisations who take an interest in some form of space (due to the fact that when considering “space”, there are many activities, disciplines and needs

that interact). This makes forming a shared vision, working together and creating unity & critical mass hard to achieve. There is also a 'silo-ing' of Australia's knowledge capability (its there, but connecting all the silo's is going to be important).

2. Among the interest groups, there are would appear to be many amateurs – this is a perception that would seem to be held by key aerospace industry & government leaders (whether membership numbers determine if this is true or not). Unfortunately, the perception of 'amateurs' is not a favourable one, and to use slang, there needs to be a clear distinction between “the fruit-loops and the professionals” in the view of current industry & government leaders.
3. Continuing on from the perception issue, there would appear to be misunderstandings about the specific role a Space Agency could play (perceptions of 'amateurs' tinkering with rockets, or opulent visions of sending Australia's to the moon on Australian 'spaceships', don't do well for establishing a professional image for the space industry).
4. It would appear that the government has been burnt by past experiences of company's who have had large plans (more visions of grandeur), in which the government has offered investment, only for those plans to come to nothing<sup>4</sup>. Indeed, it was after this 2001 failure that the government concluded that there was no future for Australia in the space industry. The government perhaps also has 'ammunition' that Australian involvement in space isn't viable by the failure of the Satellite Systems CRC to gain second-term finance in the last funding round.
5. There are both perceived and real difficulties associated with involvement in international space programs, including such issues as “ITAR” (International Trade in Arms Regulations – these govern numerous defence-related U.S. contracts), other export compliance issues, Intellectual Property/technology-transfer issues, and obtaining access to the global space supply chain.

Keeping in mind these major challenges that, in some instances, are unique to Australia, feasible actions that can make a difference can be made.

## **V. Responding to the challenges**

In order to achieve the objectives of establishing an Australian Space agency, all those interested in seeing such an eventuality, especially those in key working groups, need to undertake specific actions, as well as show leadership in a number of fields, as described below. These are loosely integrated into the plan/process described in section 6.

### **A. Showing Leadership**

1. Formulate a vision of Australian space involvement (for now, in 10, 20, 30 years, etc) and communicate that effectively to the required stakeholders
2. Combat the “fruit-loops” issue, demonstrating that Australia's engineers & scientists can, and are, professionals in their fields
3. Prove the viability of Australian space involvement (demonstrating the potential value associated with technology transfer, economic benefits, enhanced national-security capability, etc)
4. Make the vision plausible (demonstrate a risk management capability, identify potential opportunities for Australian involvement, show a push into international programs)
5. Establishing a framework for developing critical mass (perhaps through a peak professional body, or some other network)
6. Integrate the diverse amount of interests in a space agency
7. Increase public awareness of the need for a space agency, and how Aust can benefit

### **B. Specific Actions**

1. Conduct an audit of space-related technical skill capability in Australia – Not just looking at space science but also applicability of aerostructures, systems etc. of which the Space Science Decadal Plan lacks.
2. A register & case-study series on successful space related work that has been won by Australian companies
3. Conduct opportunity analysis for 'off-shoot' businesses (such as biotechnology, communications & defence)
4. Identify what research areas could potentially put Australia ahead in the knowledge front ('trend setters').

5. Conduct research into the implications & impact an Aust space agency would have on the economy, national security, etc
6. Lobby government & public for the need & demonstrate viability
7. Engage appropriate bodies & stakeholders to drive at a resolution to issues such as ITAR & other export compliance issues
8. Conduct an opportunity audit & identify entry gates for mainstream Australian involvement in space programs

## VI. Implementation Plan

### A. Plan outline

The following is the proposed staged plan for the establishment of a formal Australian space agency, as illustrated in Fig.1. It is a broad, multi-phased approach that seeks to address the issues described in section 4, utilizing the actions & leadership outcomes described in section 5, in order to establish a sustainable agency.

The plan has the following objectives in mind:

1. Demonstrating the viability & feasibility of Australia’s space capability (technically, commercially, socially), and the concept of a formal Space Agency – making space a commercial reality for Australia
2. Address current beliefs about Australia’s space capability
3. Develop a sustainable domestic space industry that is integrated into the global Space Industry supply chain (involvement in both government and private space programs), by a number of strategies including developing critical mass within the industry

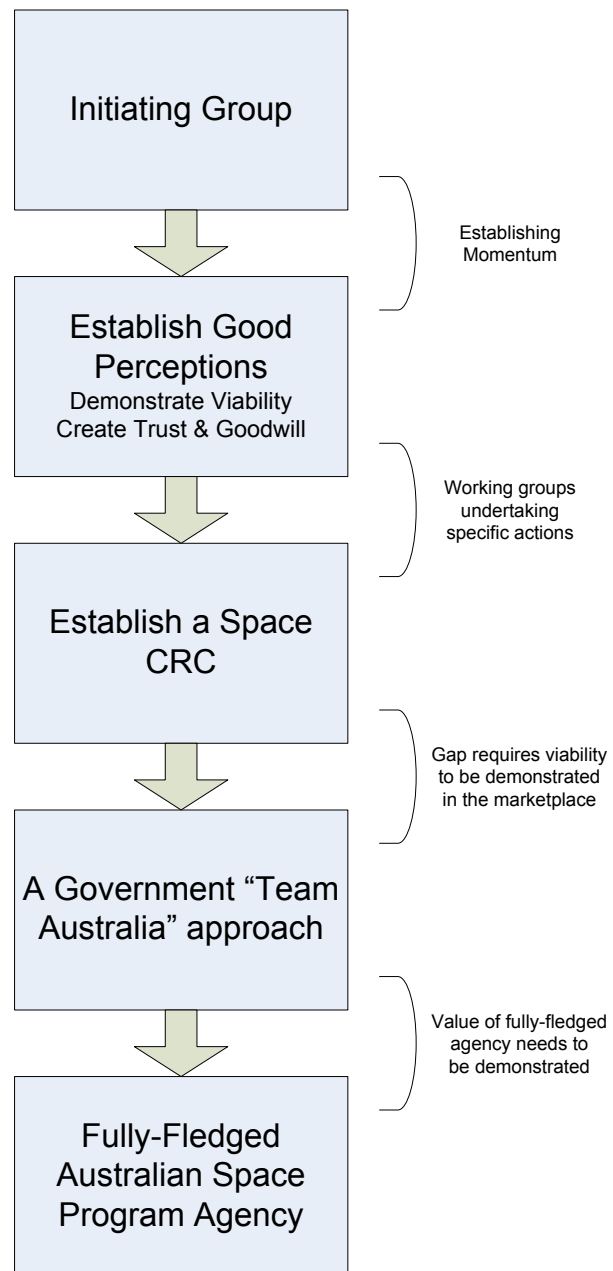
### B. Initiating Group

The purpose of the initiating group is to ‘de-clutter’ all of the interest groups who would like to see a space agency formed, for the purposes of showing leadership (section 5.1), communicating a unified vision to stakeholders, and organizing groups to carry out the actions (as specified in section 5.2). The initiating group would create some momentum, and would also seek to establish critical relationships with industry & government, as well form teams to consider the formation of a Space Flight Systems Cooperative Research Centre (which is a government funded organization which fosters collaboration between academia and industry – this phase is described in section 6.4). Additional discipline & industry-main teams (such as Satellites, Launch Vehicles, Exploration Systems, etc) should be formed in order to facilitate later phases of this plan.

One suggestion would be for a professional auspicing organization to host a national “Space Agency Formation Forum” to start delegating actions.

### C. Establishing Good Perceptions

During this phase, the initiating group leads the established action groups in combating the negative perceptions associated with Australia’s space



**Figure 1: Process Plan**

capability. It is important that the viability of space, and the opportunities that present Australia be publicized, and that key government & industry leaders be engaged professionally in order to demonstrate the importance & role of an Australian space agency. Key groups such as the general public, the government, academia and industry & business need to be targeted.

Issues need to be debated publicly and consistently by those involved in the initiative. Both organizations & individuals can contribute by writing letters to politicians & other leaders, talking with the media & local political representatives and by holding public events to establish a presence in Australian society. This ‘campaigning’ should not be carried out in a militant or grudging way, but rather make the concept of Australian involvement in space seem plausible, exciting and positive in the hearts and minds of Australian’s.

Additionally, the use of public personalities, such as Australian astronauts, politicians, and other prominent Australian’s, would add credibility & ‘authority’ to the argument. Overall, the purpose of this phase is to raise the professional profile of Australia’s space industry, placing the amateur operations into perspective.

#### **D. Establishing a Space CRC**

The purpose of establishing a Space Cooperative Research Centre (CRC) is to demonstrate Australia’s technological expertise in various disciplines that relate to space.

The purpose of a CRC is for academia, industry & the government to collaborate (technically & financially) in a number of fields [CRC info day, Nov, IIRD, 05]. CRCs are partly funded by the government, but at least 50% of CRC program funding must come from non-government organizations. Additionally, CRCs must commercialise their research, and exploit their generated Intellectual Property (either by use by partner organizations, or to other applications). CRCs normally have at least thirty full time researchers and an average budget of \$13 million per year. Overall, CRCs resemble more of a ‘high-tech start-up’ business, and it is important that it is a financial success. CRCs are funded for 7 years, and can apply for 7 year extensions at the end of that period.

The bidding process for funding from the government is a very competitive & time-consuming process, with a 25% success rate. There is much ground preparation work, such as market research, budgeting, defining clear research objectives & milestones, as well as sourcing partners. A business concept case has to be submitted for round 1, followed by (if successful in attaining to the next round) a Full Business Case. It would be advisable that a body (or bodies) start exploring this option straight away, as the next round of funding applications will be in about seven years (the latest round closed this year, with those CRCs to be up-and-running by July 2007). Effectively this means in 2013, a proposal would need to be submitted.

It would be advisable to pick a specific field that Australia has key strengths in, which would demonstrate Australia’s international standard capability, whilst also demonstrating the financial viability of moving towards a bigger, more encompassing space agency. Additionally, any ‘CRC exploration group(s)’ should begin discussions with potential partners including the CSIRO, Defence Science & Technology Organisation (DSTO), Australian universities, current Australian companies engaged in space technologies, Australian-based aerospace companies such as BAE Systems Australia and Hawker de Havilland (who have connections to Boeing, who are major space-program contractors), contacts within the European Space Agency (ESA), NASA, and perhaps also consider partnerships with New Zealand as well (who also do not have a space agency). [Chapman report]

The outcome of a Space-related CRC (or perhaps several) would be the development of some world-class IP that can launch Australia into a field of technical leadership & status. Such a setup would cater for both ‘quick-wins’, as well as establishes long-term credibility.

#### **E. Government “Team Australia” Approach**

About the time Australia signed onto the “Systems Development & Demonstration” (SDD) Phase of the Joint Strike Fighter, the government coordinated the “Team Australia” initiative – a brand name & marketing effort of Australian defence capability to major JSF partners in a bid to secure contracts for Australian companies. The initiative, which has been retained to be of use beyond the JSF program, is a showcase of Australian companies, research institutions, and other public bodies.

The proposed phase of a “Government ‘Team Australia’ Approach” takes the above approach, but builds upon it. Assuming a CRC program proves successful, the Federal Government could be convinced to consider this next step.

Essentially, this would see the initial formation of an Australian Space Agency. Under this phase, it is a marketing and enabling agency that would undertake the following role & activities:

- Deals with other nations & large corporations, having the authority of the Federal Government behind it
- Integrates an IP development, commercialization & marketing capability (most likely a CRC)
- Provides an official centralized hub for Australian Space industry organizations (facilitating critical mass), to be used for joint-bidding & delivering integrated solutions

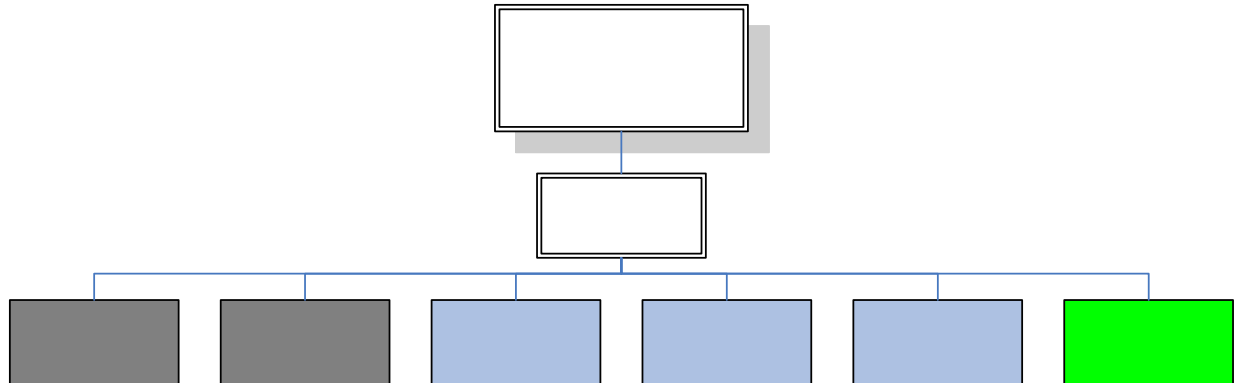
- Facilitates investment & access to major space programs for Australian companies
- Helps integrate Australian capability into the global Space Industry supply chain

Ultimately, the aim of the agency described here is to thrust Australian industry & academia further into the global space industry & operations.

#### F. Fully Fledged Australian Space Agency

Achieving what has been described in Section 6.5 would be an achievement, but it is possible to go further. It could be demonstrated to the government that a fully fledged space agency would be in Australia’s best interests.

Figure 2 shows a possible structure for an ‘operating model’ of such an agency. It could be structured in close proximity to the Cabinet, and/or Defence, allowing space to be developed as a national area of importance. It also facilitates a ‘whole of government’ approach to space policy.



**Figure 2: Proposed structure for a fully-fledged space agency**

The proposed structure sees seven major units that the Agency would be involved around. This model is adapted from the Norwegian Space Centre<sup>5</sup>. The structure includes:

1. The Research Unit: would be responsible for setting & communicating a national space research agenda to external or partner organizations. The research unit would also be responsible for education promotion schemes.
2. Industry Unit: Coordinates the ‘Team Australia’ approach to integrating Australian firms into the global supply chain, and includes negotiation on involvement in international programs and resolution of international export issues
3. Earth Observation, Communication & Navigation Programs: These units relate to space operations that are potentially of interest to Australia, and would be resourced to act as research organizations in their own right. Additionally, these units could plan and organize the appropriate measures to meet Australia’s requirements in these areas, plans for future Australian involvement & partnership in international programs in these fields, and also carries out research into the national & regional requirements of each of these fields.
4. Infrastructure: this unit could potentially plan for the effective use & maintenance of existing space related infrastructure (including Woomera, space vehicle tracking centers, observatories, and the like), as well as plan for & manage projects for the delivery of new infrastructure. This unit is an enabling unit to make sure the agency can meet its objectives.

Additionally, consideration could also be given to Australia taking the lead in some relatively major programs, or having a ‘Prime Integrating’ nation status for major space systems. A “program” could be a cooperative initiative with other Asian partners, and could be ‘simply’ hardware-integration programs, such as autonomous launch vehicles, satellites and probes, on behalf of other nations. Perhaps Australia could even fund some major launch programs itself.

### VII. Conclusion

When considering space, there are a significant number of activities. software & hardware development (avionics & electrical systems); space-structures; vehicle & system integration; recovery systems; life support; safety systems; mechanical systems; propulsion; measurement & instrumentation; communications; design & management; astrobiology, and; astronomy just to name a few.

Australia has had an important history and heritage in the global space environment. The opinion of the authors is that this heritage should continue – not because of a ‘boyhood fantasy’, but because it would place Australia as a nation in the international spotlight for advanced technology. The spin-offs from space research have been applied in many areas of life, and if Australia develops some useful IP, the nation could do very well out of that.

There are many challenges associated with establishing an Australian Space Agency – many which are perceptions that need addressing. There are many questions that need to be answered – is there really a role for Australia to play in the global space industry, and can Australian involvement be financially profitable? There are also other issues such as the large number of interest groups that exist, and the need for the ‘un-silo-ing’ of Australia’s knowledge capability. The Australian space industry needs a plan to combat those challenges, and to establish an environment that will foster the establishment of a formal government-led space agency.

What is presented in this paper is by no means the only way to achieve that objective – it isn’t complete in itself, and is open for debate, improvement, and use in other ways. The ‘blanks’ need to be filled in by those who have a vision for the future of Australian involvement in space – probably any reader of this paper.

It is up to those people to inform others of the importance for an agency, and taking some strong leadership to see it happen. However, the authors believe that this is something that can work in Australia’s interests. Australia has some of the best engineering capability in the world – its time to take that capability to the world, and take advantage of it.

## References

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  - <sup>5</sup> Norwegian Space Centre, URL: [Hhttp://www.spacecentre.no/H](http://www.spacecentre.no/H) [Cited 16 Oct. 06]