



## **ASRI submission to the Senate Inquiry into the Current State of Australia's Space Science and Industry Sector, April 2008**

### **INTRODUCTION**

The Australian Space Research Institute (ASRI) is understandably concerned with the current state of the Australian space industry. Space technology programs have long been the indicator of the technical competence of a nation, and with the rapid growth of space programs in many countries, including those of South East Asia, Australia's position as a technically advanced nation is facing unprecedented competition.

Years of passive policies by the Australian Government have failed to create a sustainable Australian space industry. ASRI believes that a lack of confidence in Australian innovation is largely responsible for this situation. Industry has not been at all visionary in its attempts to enter the commercial space business, so must take some of the blame for the lack of industry growth. This paper examines the opportunities and benefits Australia could derive from pro-active development of the Australian space industry, and the barriers, either real or imagined, that have hampered development of the space industry in Australia.

### **BENEFITS TO THE AUSTRALIAN ECONOMY**

#### **HIGH TECHNOLOGY INDUSTRIES**

Australia has traditionally relied on the export of minerals and primary produce to generate wealth. However, each year Australia faces increasing competition for the supply of similar commodities from emerging economies that can offer cheap labour and have few other options to improve their standard of living. At the same time, there has been an explosion in the worldwide demand for high technology goods and services. These products are not as susceptible to competition from emerging economies and are very highly value-added.

The countries that have embraced new technology development have therefore generated independent wealth. Those that have not, including Australia, face serious long term current account deficits as the value of their exports wane and the quantity and value of the imports of these new technologies escalate. Such deficits impact upon the standard of living that is sustainable in Australia. It follows that if Australia wishes to maintain or improve its economic circumstance, it must develop broad-based and internationally competitive high technology industries.

#### **BENEFITS FROM A SPACE INDUSTRY**

A space industry is well placed to address some of the difficulties set out above; it is at the pinnacle of high technology industries generally and is therefore in a position to lead industrial renewal and regeneration. Perhaps more importantly, if properly managed, a space industry can have an exceptionally high public profile and therefore the potential to influence far more broad-reaching changes to community attitudes in science, technology and innovation.



A prosperous space industry offers:

- Production of high value-added export and import-competing goods and services such as satellites and payloads, launch vehicles, components and subsystems, and data analysis services;
- Increased production in feeder industries such as in aviation, information technology, exotic materials, chemicals, engineering and construction;
- Indirect products such as improved and expanded industrial infrastructure, capabilities, resourcefulness and innovation;
- "Spin-off" benefits to other industries through the innovative use of space technology in otherwise unrelated processes or products;
- Benefits to Australian industry generally, including:
  - national product prestige and enhanced image;
  - increased industry confidence and capability;
  - encouragement of industry participation and collaboration in high technology areas.
- Benefits to the wider Australian community, including:
  - inspiration and incentive for education at all levels;
  - greater diversity and a higher standard of career opportunities for future generations;
  - reduced outflow of highly qualified/skilled individuals through expanded career opportunities within Australia;
  - national pride and status;
  - international interest and attention.

ASRI believes that these benefits are self-evident, but Australia has failed to develop public sector policies and mechanisms, or private sector opportunities to exploit them.

## BARRIERS TO DEVELOPMENT OF AUSTRALIAN SPACE INDUSTRIES

### LACK OF OPPORTUNITIES ?

Few would question that high technology goods and services are a boom industry worldwide, and that the market will continue to grow. There is clearly enormous potential in the market for existing products to expand and for the development of new products. The market for space products and services is likely to follow this trend.

Lack of present and future opportunities cannot be the reason for the lack of development in Australia. The opportunities do exist and will continue to arise. The problem is that Australian industry is not taking up the opportunities, or not taking them quickly enough before the efforts of other countries overtake.

### AUSTRALIAN CONSERVATISM

Australia lacks the confidence in the ability of its workforce, products and services to compete with those of other countries. This results in consumer preference for imported products, complacency and a lack of support for those who try to compete. As a consequence, Australian industry is more



conservative than its foreign competitors. Australian industry tends to shy away from investing in new technologies, at least until the profitability of doing so has been long established. The problem that ensues is that Australian industry is a market follower, not a market leader; it tries to participate and compete in new opportunities either too late and from a disadvantaged position, or often not at all. The result is poor performance in many high technology industries in Australia.

## DIMINISHING KNOWLEDGE, SKILLS AND EXPERIENCE

Although the standard of education in Australia is high, there is only a limited quantity of persons with sufficiently developed, specialised and relevant technical knowledge, skills and experience in space technology and applications. This is primarily due to the low level of relevant activity. The shortage of knowledge, skills and experience adds to the lead-time, cost and/or imported component involved in actioning any opportunity. As a result of the Anglo-Australian Joint Project at Woomera, Australia developed some of the most highly skilled aerospace technicians and professionals in the world. Unfortunately, most are now retired and the number of remaining technicians and professionals with relevant knowledge, skills and experience is now dwindling through loss of momentum.

Even in the current climate of limited professional opportunities for those with relevant knowledge, skills and experience in space technology and applications, there is still an extant requirement within Australia to be an 'informed customer' of space technology and applications. This requirement exists because a limited, appropriately skilled workforce is still required to appreciate the boundaries of what is possible, to assess the risks and vulnerabilities of courses of action, and to evaluate acquisitions for fitness of use and value for money, regardless of whether goods and services are procured from Australia or elsewhere. It is important to note here that ASRI has provided the knowledge, skills and experience for several key positions in national security, infrastructure related space technology, and aerospace design and analysis, and these individuals were typically assessed as the only suitable applicants for these positions.

## LIMITED ACCESS TO SPACE TECHNOLOGY

While international cooperation is championed as a method of sharing effort and risk in other high technology industries, international space technology co-operation is hindered by treaties and instruments intended to limit access to dual-use goods, even when they are to be used in strategically benign applications such as civil or scientific applications.

The diffusion of launch vehicle technology is limited by the Missile Technology Control Regime (MTCR) because of the close relationship between space launch vehicles, and ballistic and cruise missiles. Despite the MTCR's intention not to hinder civil space cooperation, strict enforcement of MTCR guidelines, probably as a disguise for high technology protectionism, typically limits access to launch vehicle technology within a host country only to representatives of the technologies' country of origin. While the public is lead to believe that the hosting of foreign space launch vehicle capability in Australia would "revitalise the Australian space industry" this was unlikely to ever be the case. The 'quarantining' of launch vehicle technology from the host country has been an unpublicised condition of all recent Australian space launch initiatives. It should be noted that no country has ever received the benefit of launch vehicle technology diffusion through the hosting of turnkey foreign launch vehicle technology on its soil. True mutual benefit can only be derived in the shared development of



new launch vehicles, and beyond ASRI, no such project has been proposed or conducted in Australia since the 1970's.

Additionally, Australia's key ally and trading partner, the United States, classes space technology as sensitive military equipment by placing it on the US Munitions List, regardless of the nature the application. Permission for US companies to supply space components or sub-systems, or even to participate in discussions with potential customers or collaborators must be given by the US State Department, which provides the US Government with a foreign policy tool to limit the diffusion of advanced space technology concepts for foreign benefit. The licensing conditions placed on the acquisition of US space components can be used to limit cooperation between Australia and any other nation.

## LIMITED INFORMED DEBATE

The avenues for informed debate on space issues in Australia have decreased over the past 10 years. Of the two biennial space conferences conducted in Australia over the last 20 years that focus on space technology applications and development opportunities, only one continues to operate independently, and the remaining conference will experience ongoing difficulty attracting enough delegates and presenters to remain viable.

This lack of information exchange creates an environment dominated by 'sound bites' rather than erudite discussion. One such 'sound bite' is that "Australia and Mexico are the only top-ranking OECD countries without a national space agency". In fact even this sobering statistic is no longer true. Mexico began the formation of national space agency in 2007; the proposal passed the Lower House of the Mexican Parliament in early 2008 and is due to be debated in Mexico's Upper House later in 2008.

The lack of broad-based activity in Australia also supports only a limited number of highly stove-piped communities of excellence in space related activities, such as the remote sensing community, the space science community, the satellite communications community and the launch vehicle community. Rather than being supportive of space industries in general, these communities are forced to compete against each other for a limited amount of funding and public recognition. ASRI believes that there are have always been opportunities for Australia across all space technology communities, but it has been nearly 15 years since a study identifying opportunities across all communities has been conducted. Some argue that because of the inherent stove-piping of the limited number of expert contributors to past studies, a truly impartial study without pre-conceived conclusions of the merit of any particular community's entitlement for support has never been conducted.

A further product of the stove-piping of opinion on space related issues is the debate over launch vehicle related opportunities for Australia. While it is true that government and public opinion of launch vehicle opportunity development has been soured by the failure of proposals to launch imported launch vehicles from Australia, the high-end services that these proposals aimed to supply represent only a proportion of the global market. ASRI believes that an overlooked sector of the global launch market is in the provision of sub-orbital scientific payload services, for which Australia was a leader in the 1970's, featuring several indigenous designs. The existence of the Woomera Test Facility still gives Australia a strategic advantage in this area, and a domestic market created by the Australian Hypersonic Initiative, which will require numerous launches over the next decade, provides Australia with an opportunity to develop a sub-orbital capability that would ultimately be sought by customers



globally. Unfortunately, the consideration of opportunities in sub-orbital launch service provision have been absent from the public debate for at least the past decade.

The proposition that a space industry is in our national interest is not always readily accepted by the general public. The powerful images left by the manned orbital and lunar missions of NASA, whilst inspiring, tend to colour the public's immediate impression of what a space industry is about. The reaction that follows is that a space industry is both a luxury that Australia cannot afford, and well outside our capabilities. It is therefore important, if popular opinion in Australia is to be supportive of industry development initiatives, that the general public be better informed and educated as to the nature of the opportunities and the benefits they offer.

## LACK OF VISIONARY LEADERSHIP

The Menzies Government and subsequent governments in the post-WWII era were strongly allied to the British Crown. The prevailing view was that Australia's prime role was one of subservience to British Commonwealth interests. Our population also held an assumption that anything from overseas was better than anything produced locally. Australians were reluctant to compete with foreign goods in anything other than the agricultural sector. When Britain seriously attempted competing in space technology from Woomera in the 1960's, the strategic guidance used to the direct effort came from British and other foreign interests. Australia invested billions of dollars – in today's terms – in building the ground-based infrastructure to service these foreign programs. The pattern continued through the European Launcher development Organisation (ELDO) era of the 1970's, though Australia did make some groundbreaking developments in computational analysis and instrumentation, through what is now the Defence Science and Technology Organisation (DSTO). Despite deserved accolades, these achievements were reactive, rather than as a part of any coordinated vision, and not championed by any particular federal government or policy.

When the major foreign-based projects and technologies withdrew from Woomera in the 1970's, Australia was left with a huge investment in ground-based infrastructure that it was not able to properly utilise. In the years that followed some of the infrastructure was sold for scrap. As the remaining infrastructure deteriorated, questions arose as to how to generate a return from it. The notion of commercial viability began to usurp national interest as the dominant criteria. Again the response was reactive; instead of focussing on national interest and vision, the approach was one of salvaging a return from past investment. By doing so, the mistake of previous governments was perpetuated. Not surprisingly, the responsible authorities, lacking any fresh vision, were only able to complete paper studies and a few "technology demonstrator" projects. The vision and budget allocated by the Fraser, Hawke and Keating Governments was insufficient to achieve much more than those token efforts.

Under the Howard Government, there was limited interest, let alone vision for Australian development of space technology and applications. Even the meagre \$6 million funding for a limited central authority – the Australian Space Office – was cut in the mid-1990s. The austerity of Howard Government policies lead to significant in-fighting between the parties over the diminishing pool of financial support. The surviving industry players are now highly specialised, but extremely limited in capability.



## ASRI'S CONTRIBUTION TO SPACE TECHNOLOGY EDUCATION

### ABOUT ASRI

ASRI is a non-profit organization run entirely by member volunteers. ASRI is entirely funded through member contributions and the support of corporate sponsors. ASRI's primary goal is to develop and advance skills, knowledge and experience by conducting, encouraging and promoting applied research in the field of space engineering and technology.

ASRI attains its objectives through a practical, rather than a theoretical approach. This is reflected in the tangible program achievements to date. For this reason ASRI is unique in Australia and enjoys a high profile and level of popularity with the public and media. Major milestones such as the unveiling of full-scale vehicle mock-ups, static engine test firings and regular Woomera launches attract media attention and have resulted in many secondary school participants choosing to undertake tertiary studies in aerospace and related engineering disciplines and sciences.

The existence of ASRI itself is testimony to the growing disappointment in, and lack of vision of Australian Government policies relating to space technology and applications. ASRI's objectives are consistent with most of the other remaining participants in the Australian space industry, however the motivation behind ASRI programs is to provide education, experience and career opportunities to those wanting to work in the Australian space industry. At the moment there are very few opportunities to pursue such careers in Australia, and ASRI fills this void in the hope that a sustainable Australian space industry will one day prosper.

### ASRI PROGRAMS

Since 1995, ASRI has operated a Small Sounding Rocket Program (SSRP) using surplus Sighter and Zuni rockets gifted by the Commonwealth. ASRI has conducted over 120 launches of these rockets featuring payloads provided by Australian and international secondary and tertiary students, and research institutions such as CSIRO and DSTO. In addition to practical experience in payload design and construction, SSRP has provided practical experience in launch vehicle operations that are not provided elsewhere in Australia.

The affordability and accessibility of SSRP makes it a unique program internationally. When the International Space University (ISU) – a prestigious, independent tertiary institution headquartered in France – held its eight week Space Studies Program (SSP) in Adelaide in 2004, ASRI provided launch opportunities for three SSP-designed payloads. This was the first, and possibly the only time, that the ISU was able to offer real launch opportunities to one of its SSPs, and the ISU was able to treat its students to a world-class educational experience.

SSRP will continue to conduct two launch campaigns at Woomera per year, until the service life of its Sighter and Zuni inventory is exhausted, whereupon the rockets must be destroyed. This may facilitate the end of SSRP, and one of Australia's most successful indigenous launch programs, because ASRI has been unable to secure the support to deploy a replacement launch vehicle.

ASRI's educational AUSROC program has been in operation since 1989, and comprises the development of a series of launch vehicles culminating in the launch of a microsatellite into earth





orbit. Three AUSROC launch vehicles have been developed and launched, one is in the construction phase, and others are in various stages of design. To date, in excess of 100 students from 10 Australian universities have been involved in this 'hands-on' program. Many of the program's past graduates now hold senior positions in the Australian and International aerospace engineering sectors as a direct result of their AUSROC experience. The AUSROC program is one of the most advanced initiatives of its type in the world. It is one of the most ambitious high technology education programs ever undertaken in Australia, and has developed a network of support from Government, academia, industry and the Australian public.

The ASRI satellite program is uniquely positioned to encourage and foster the development of domestic capability to design, manufacture and operate satellite systems through cooperation with universities, industry and other interested parties. ASRI's involvement with major Australian universities has helped to develop satellite technology as an educational tool with which to train young engineers in space systems design, construction and operation. The skills they develop are highly sought after and most of these engineers leave Australia to pursue a career in space technology, an unfortunate reality which sees them join many of the brightest young Australians going overseas because of limited domestic opportunities.

ASRI's aim is to develop, build and operate Australian satellites, to ensure that Australia is represented in space as an equal with other nations and that as a nation, we have a modest domestic capability to satisfy commercial, academic and national security needs.

## RECOMMENDATIONS

Australia as a nation has now found a unique identity. For the greater part, it has moved on from the attitudes that prevailed and affected the outcome of events in the 20<sup>th</sup> century. Australia is looked to as a leader, not only by smaller nations in our region, but also by the global community. Current generations of Australians do not hold the attitudes of subservience of the post-WWII era, and expect the nation's leadership to be independent, forward thinking, visionary, and focussed on Australia's national interest.

Yet our nation has almost completely foundered in the industry that is generally recognised as providing some of the strongest inspiration to our children - the space industry. The cost of that is being felt in the shortages of highly educated engineers, scientists and technicians. We have fallen well behind the standards and achievements of comparable nations. But the current leadership still has the opportunity to be remembered for doing something notable in this field.

ASRI believe that the passive, risk-averse policies of the Australian Government should not be allowed to continue uncorrected, as they will perpetuate the underperformance of Australian space industries, and will possibly result in an eventual collapse of a relevant knowledge, skills and experience base for space technology and its applications in Australia. Therefore ASRI proposes the following recommendations:

1. That the Australian Government immediately completes an aggregate survey of the constituent entities of the Australian space industry, grouped by and including all space activity communities, using information provided to the Senate Inquiry and from other independent sources, to develop a holistic view of the true state of the Australian space industry;



2. That the Australian Government identifies opportunities offered by, or through these entities which supply the benefits of a prosperous space industry as previously identified, and that these opportunities be further evaluated for their comprehensive merit rather than singular, reactive considerations;
3. That the Australian Government, through direct consultation with the entities, identifies common barriers that restrict enterprise growth and prevent opportunity development within each community, and collectively across all communities. Any barriers that are deemed to be in common with industries outside the scope of this enquiry should be referred to the concurrent Review of the National Innovation System for parallel consideration.
4. That the Australian Government establishes a national statutory body to represent the full spectrum of Australian space interests at the domestic and international levels, and that this body also be charged with the development and promotion of opportunities in the Australian space industry across all of its constituent communities, and the elimination of the barriers to growth as previously identified;
5. That this body be adequately resourced to provide through-life facilitation of projects and programs that are of national benefit and significance, and that this body has the ability to refer individual projects and programs to Government for specialised funding consideration where no appropriate funding exists under established mechanisms.

This submission was authorised for release by the ASRI Board of Directors in an out-of-session meeting on 18 April 2008.

Signed on behalf of the ASRI Board of Directors:

Original Signed

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