

The Engineering of Space Flight Programmes in the Australian Context: a sustainable model

Dr. Douglas Griffin,
UNSW Canberra Space Missions Lead



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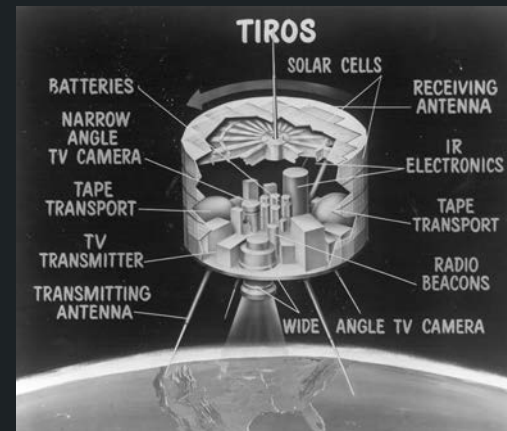
space.unsw.adfa.edu.au



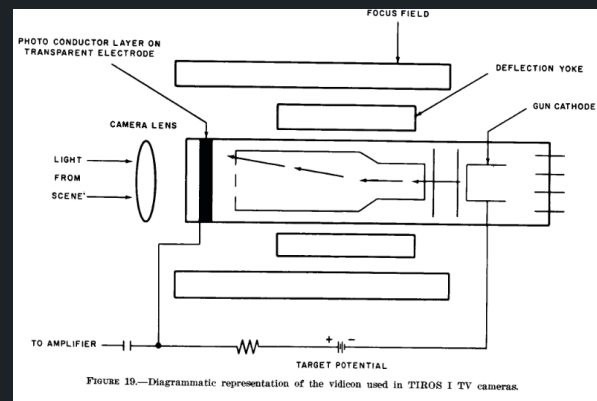
FIRST TELEVISION PICTURE FROM SPACE
TIROS I SATELLITE APRIL 1, 1960



Example of early spacecraft data:
TIROS-1 imagery



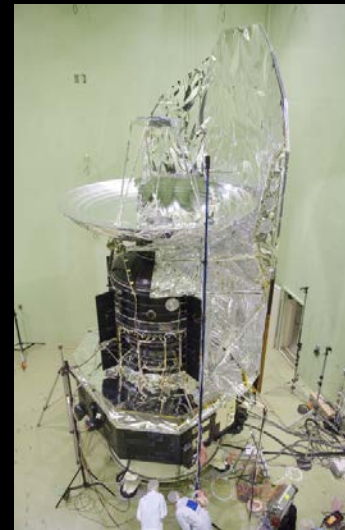
Example of early
spacecraft design



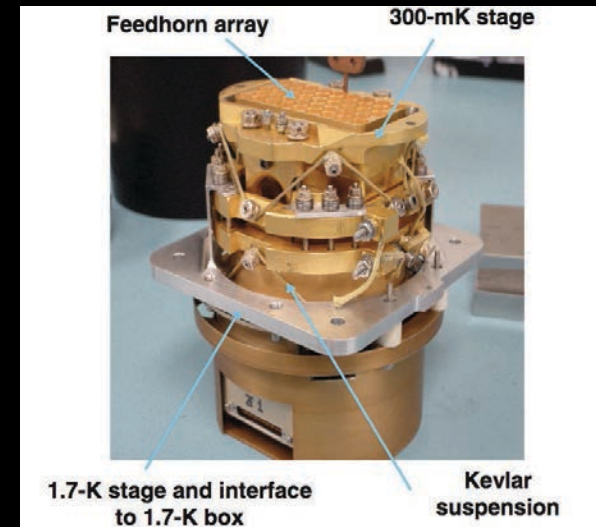
TIROS-1 Detector

Source: NASA Technical Report R-131
*Final Report on the TIROS-1 Meteorological
Satellite System*, 1962

**Eagle Nebula as imaged by the Herschel
SPIRE & PACS instruments**

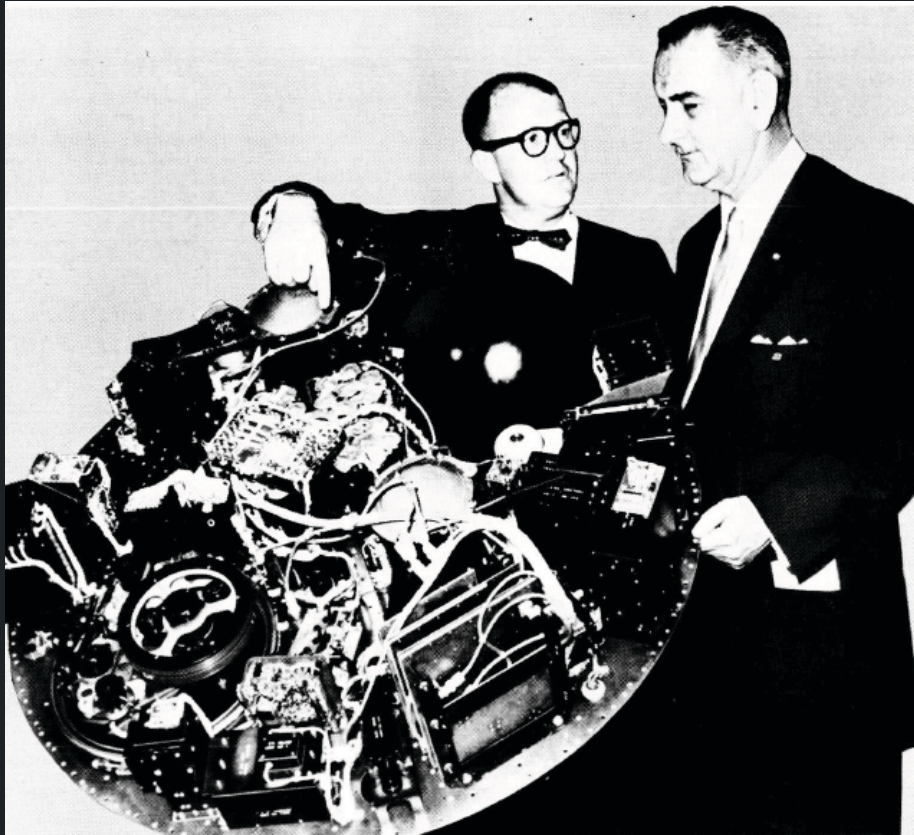


**The Herschel Space
Observatory**

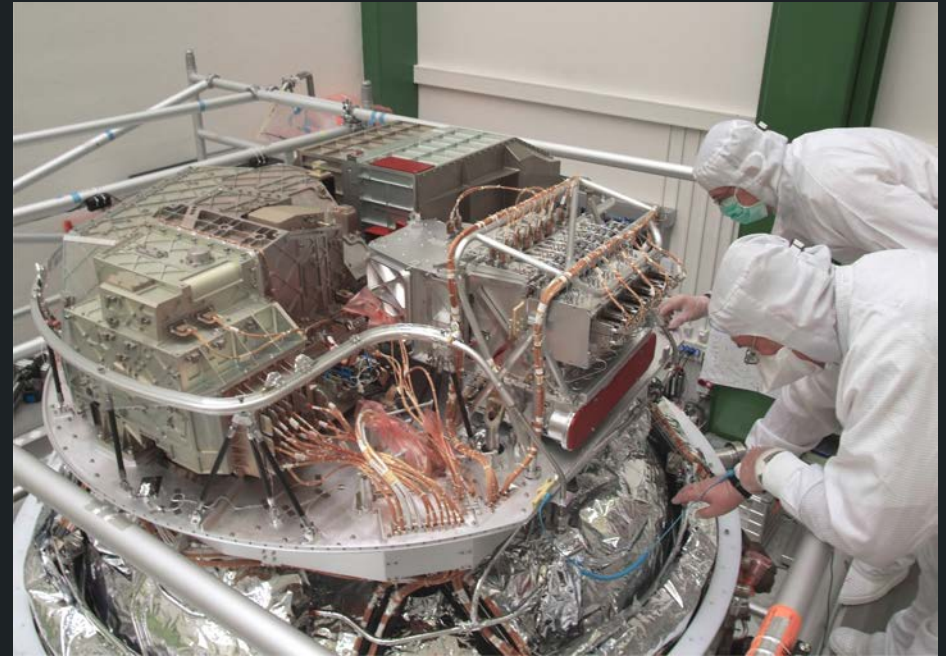


**Herschel/SPIRE
Detector Array**

Source: A&A 518, L3 (2010) - DOI:
10.1051/0004-6361/201014519
Eagle Nebula: ESA



**Clean room practice
Back then...**



**Clean room practice
now...**



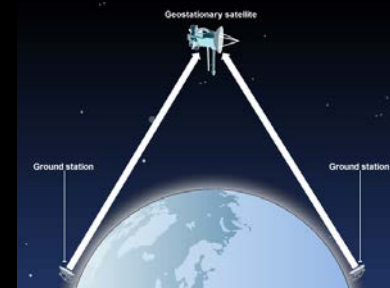
Exploration of the
Solar System



Astronomy
& Science



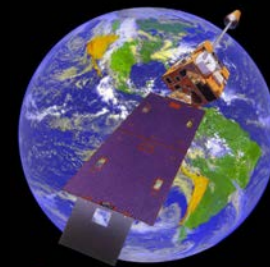
Climate monitoring



Communications



Navigation -
GPS



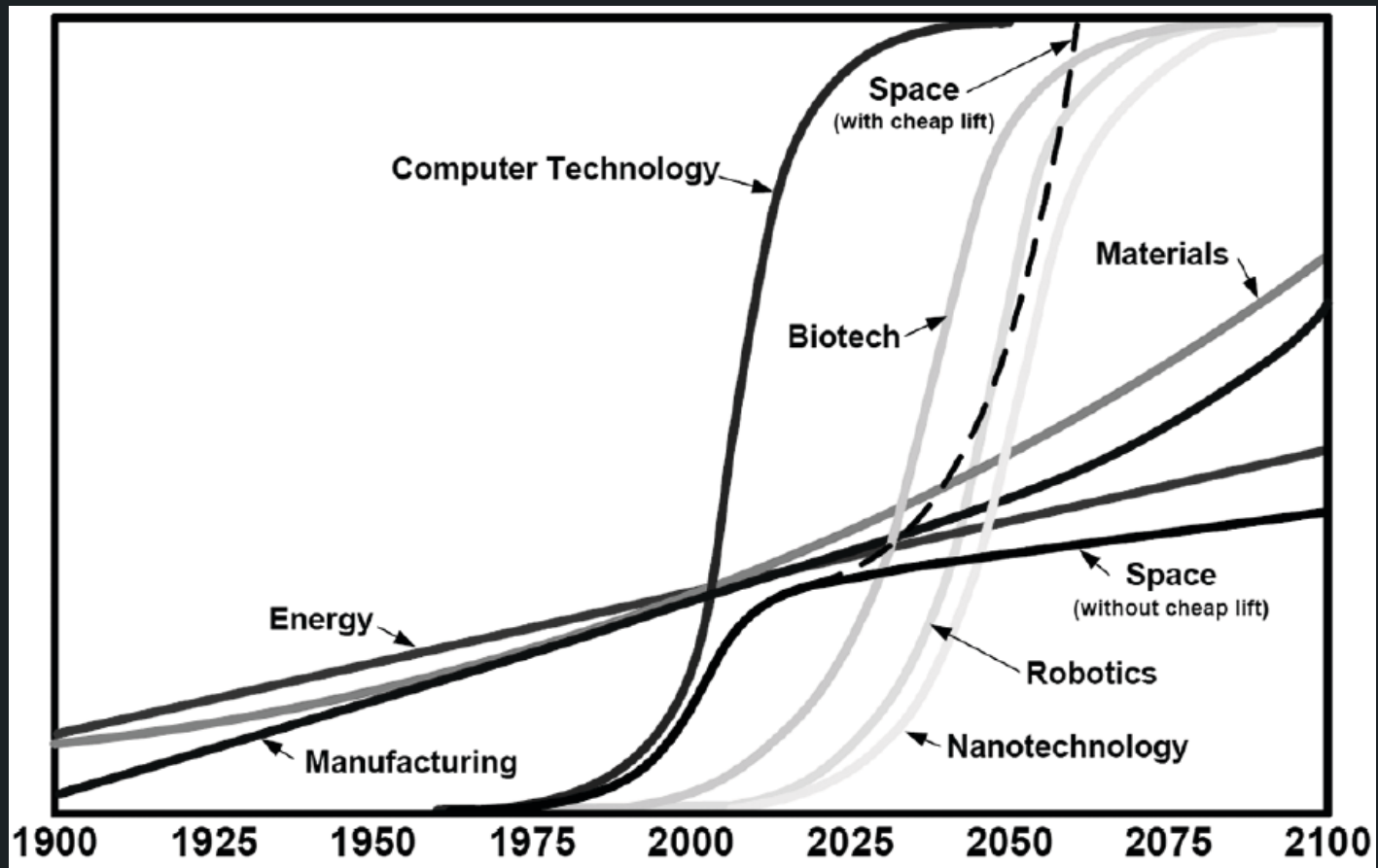
  
Weather spacecraft



**Ongoing
Technology
Development**

***The Engineering of Space Flight Programmes in the
Australian Context: a sustainable model – Technology Push***

- 1. Be early adopters of new terrestrial technologies (but
Caveat Emptor)*
- 2. Adopt world leading Australian niche technologies*



Source: New Technologies and
the World Ahead - The Top 20
Plus 5

James H. Irvine and Sandra
Schwarzbach
The Futurist, May-June 2011,
Vol. 45, No. 3

Investment Type	2000-2005 (millions)	2006-2010 (millions)	2011-2015 (millions)	Total 2000-2015 (millions)
Seed/Prize/Grant	\$640	\$286	\$328	\$1,254
Venture Capital	\$186	\$373	\$2,300	\$2,859
Private Equity	\$240	\$900	\$695	\$1,835
Acquisition	\$0	\$568	\$1,651	\$2,219
Public Offering	\$0	\$0	\$23	\$23
Total Investment	\$1,066	\$2,127	\$4,997	\$8,190
Debt Financing	\$0	\$3,969	\$1,098	\$5,067
Total with Debt	\$1,066	\$6,096	\$6,095	\$13,257

Source: Start-up Space: Rising Investment in Commercial Space Ventures

The Tauri Group, January 2016



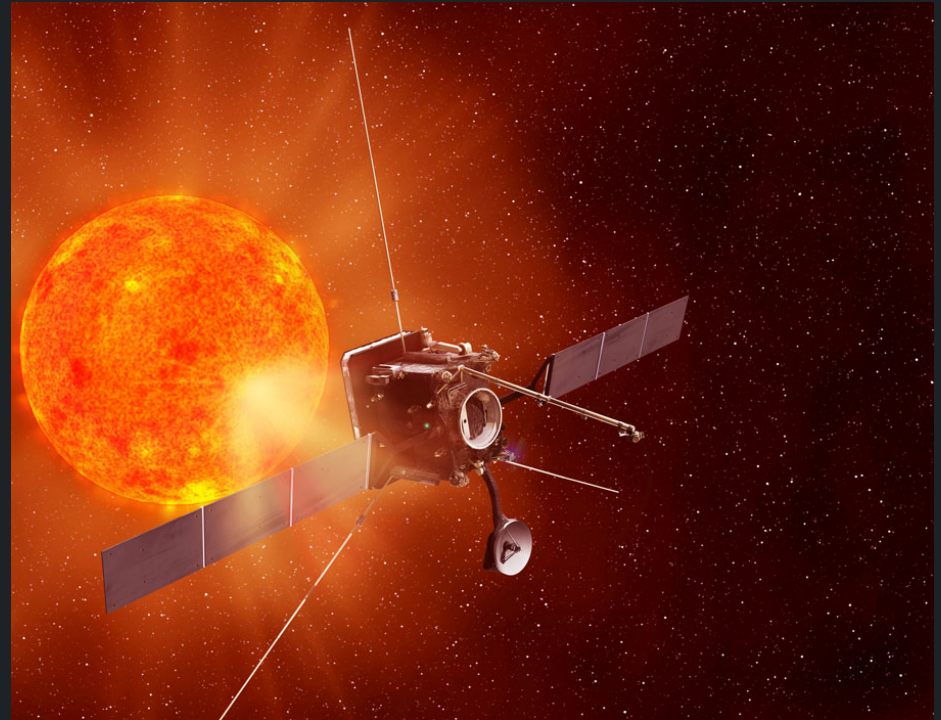
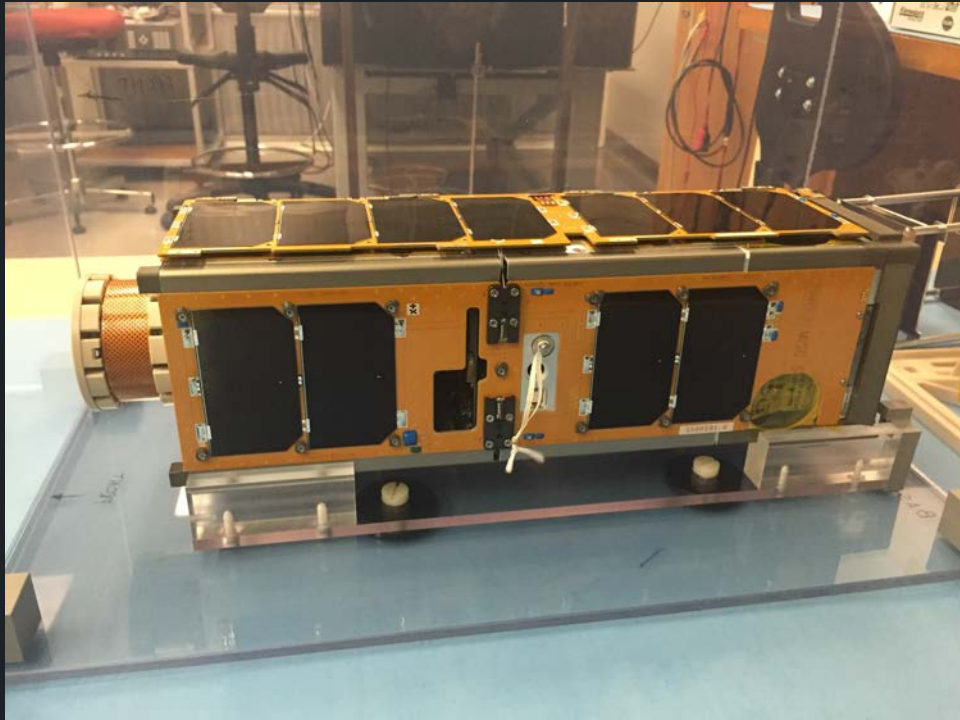
**Ongoing
Technology
Development**

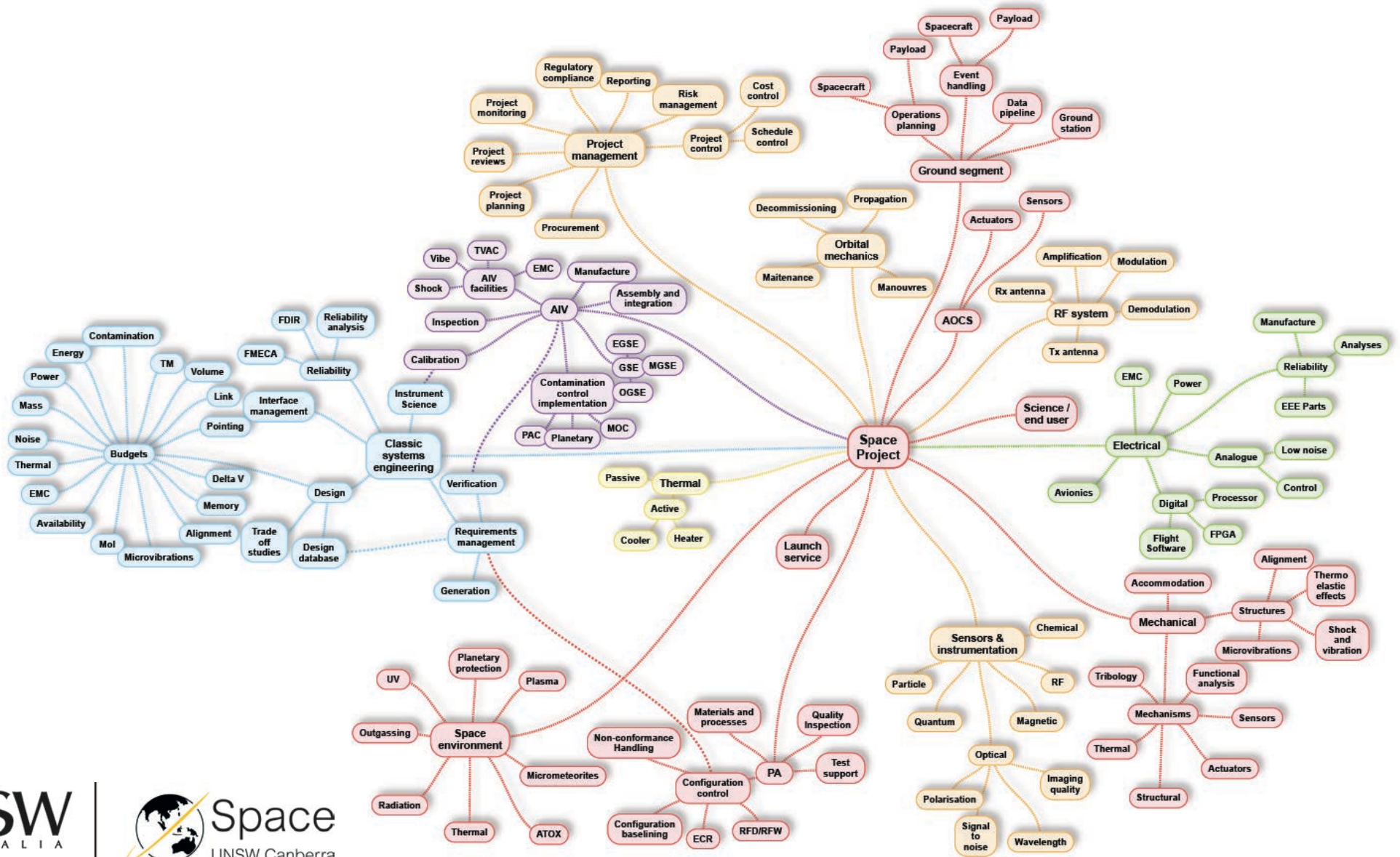


**Critical mass of
Capability &
Infrastructure**

***The Engineering of Space Flight Programmes
in the Australian Context: a sustainable
model – Critical Mass of Capability***

- 1. The payloads and mission concepts need to solve real needs*
- 2. Tap into International Networks and Supply Chains*
- 3. Collaboration & co-operation*
- 4. Focussing on Commercial applications can unlock investment*





UNSW
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Space
UNSW Canberra



"... as we embark on the 21st century we have found that the 20th century has given us a volume of knowledge and skill that is beyond what any individual can simply hold in their head, can know how to deliver on, and simply do it on their own. The volume of knowledge and skill has exceeded our individual capabilities."

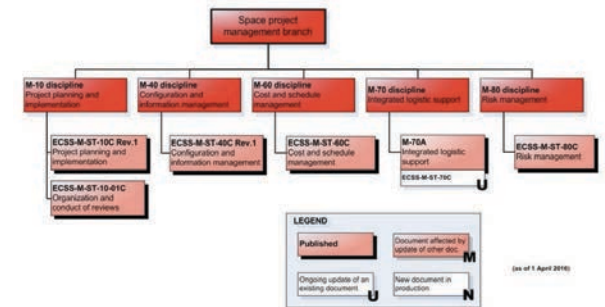
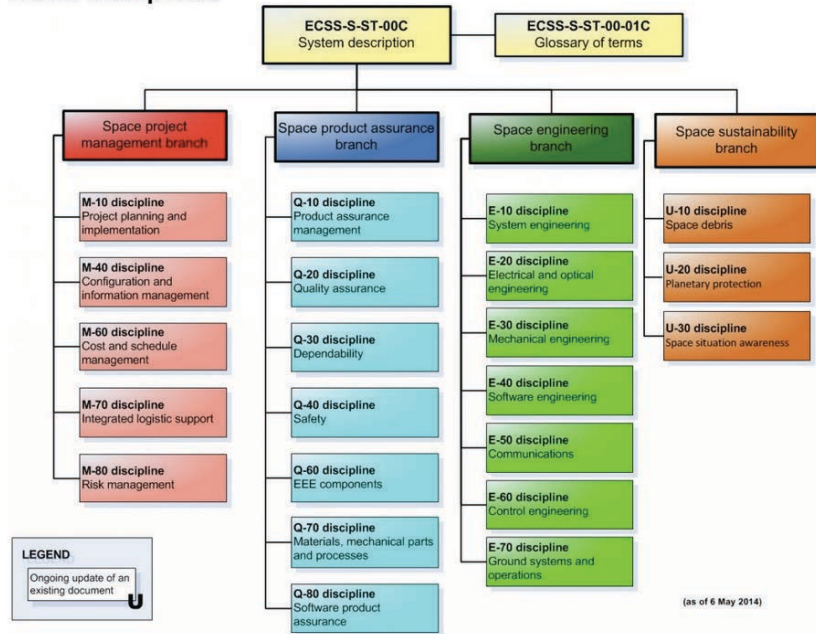
"...discipline makes daring possible."

Source: 2014 BBC Radio 4 Reith Lectures

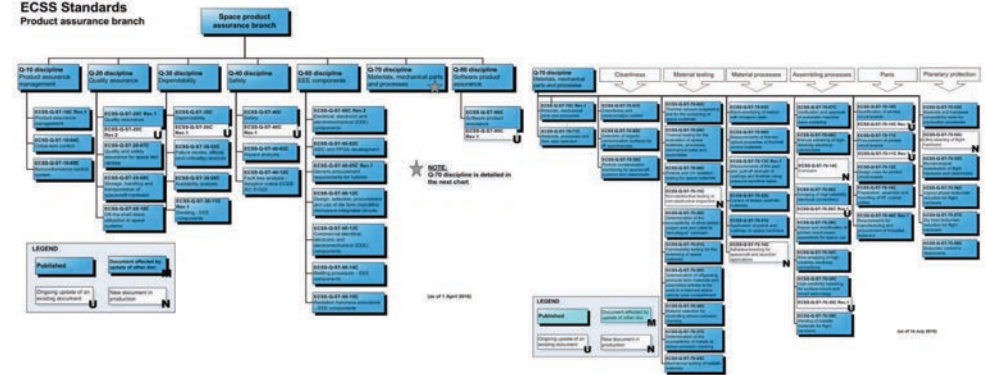
The Century of the System

Dr Atul Gawande: The Future of Medicine

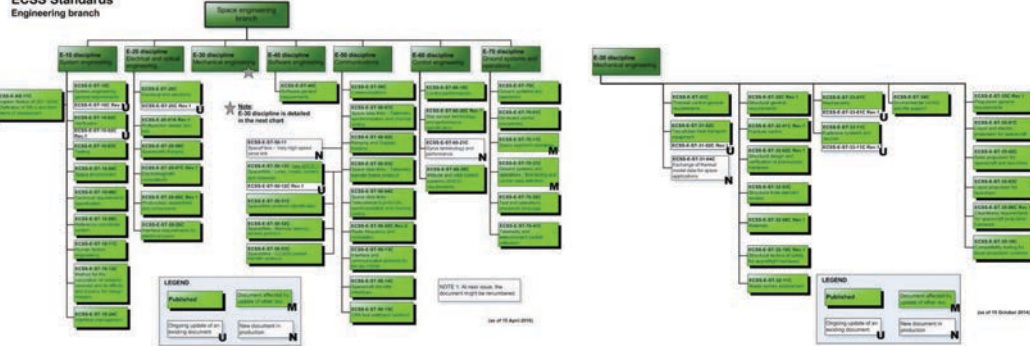
ECSS Disciplines



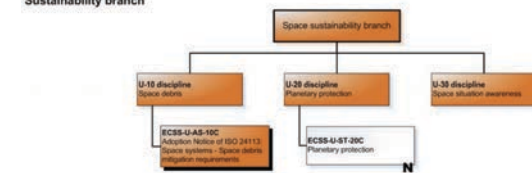
ECSS Standards



ECSS Standards



ECSS Standards



“Systems engineering is not a rule book. It is a set of principles, and a set of methods ... There is almost nothing that we must do in systems engineering. There are things that we choose to do, or choose not to do, for exactly the same reason - to produce the best outcomes on the balance of probabilities.”

Robert Halligan,
Project Performance International

Sustainable Australian Space Programme



**Ongoing
Technology
Development**

**Critical mass of
Capability &
Infrastructure**

**Space
Engineering
Body of
Knowledge (BoK)**

*The Engineering of Space Flight
Programmes in the Australian Context: a
sustainable model – Space Engineering
BoK*

- 1. Wisely and judiciously apply the hard
won lessons from other Space
Programmes*

Sustainable Australian Space Programme



**Ongoing
Technology
Development**

**Critical mass of
Capability &
Infrastructure**

**Space Engineering
Body of Knowledge
(BoK)**





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Dr Douglas Griffin
ASRC 2016