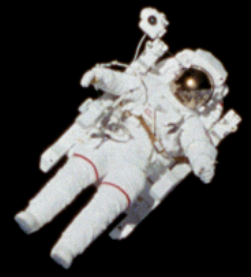
UNSW SYDNEY



NewSpaceConnect

Ideation Session

About this document

- Business Cards 3
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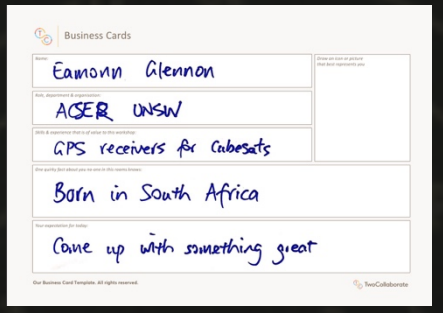
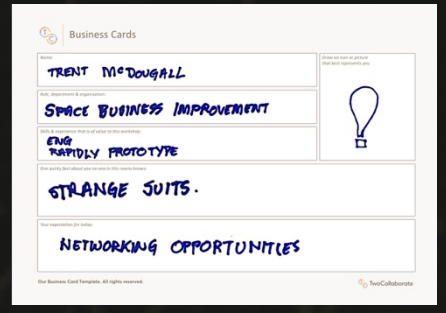
This document is the physical repository of the co-design process. It will be iterated and shared every time we develop new insights on the preparation of the session.

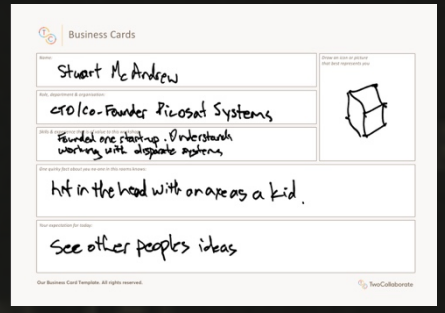
Its main purpose is to constantly make sure we remain aligned and to trigger new conversations. Our approach is about bringing people together to create something unique.

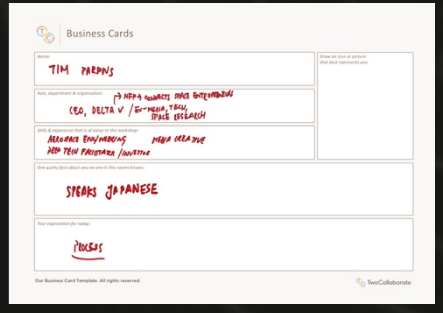
Business Cards

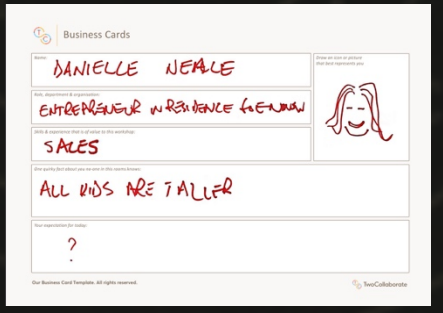
Participants were asked to find someone in the room they didn't know, or would like to know better, and complete the business card template on their behalf:











Introduction

Context

In conjunction with the ACSER conference, we hosted an ideation session, to brainstorm solutions to 6 problem statements, which potentially will result in a FlashBuild in space.

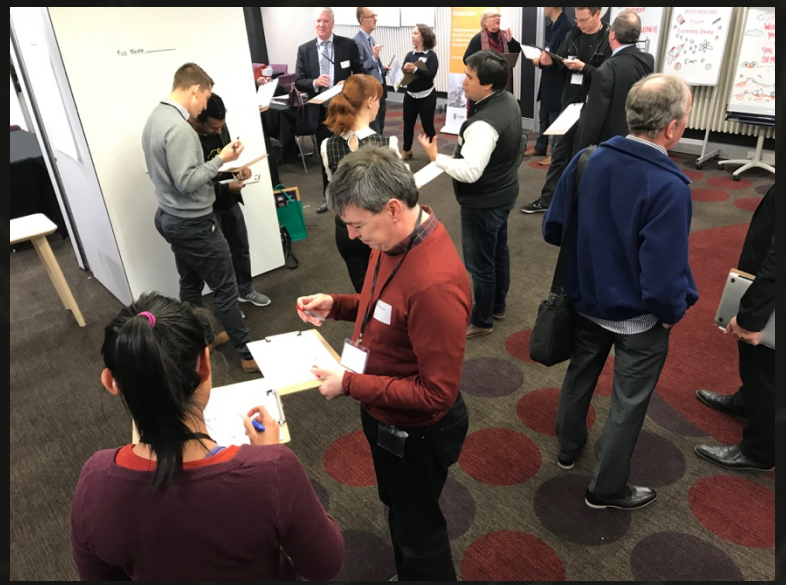
We are focused on providing the support to help commercialise research, foster innovation and knowledge exchange.

The objectives of this program are:

- TechVouchers to support industry and UNSW collaboration
- Other larger funding opportunities like CRC-P's
- New connections and friendships developed while building the NewSpace Ecosystem
- Amazing marketing and PR opportunities for all who participate
- Grow the regional start-up sector and create innovation clusters across the State

Problem Statements

- We are looking for an out-of-the-box idea for an experiment to run this October during a 5km rocket launch test. We would love to include an industry partner who has neve thought of being to space before! Maybe our farmers from FarmConnect?
- We would like to explore centralised ground control and other shared services fo cubesats. We are interested in which protocols would be considered best practice for this if legacy ones could be abolished for both data and security optimisation.
- How can we use AI in the predictive maintenance of satellites? Are there lessons to be learnt from other utility industries and super computers like IBM's Watson or UNSW's Silicon Quantum Computing . Will this lead to more divergent designs for special use satellites or a one size fits all design?
- We want to put a blockchain mining rig in space to mine coins. We know this may no make too much sense, but that's what a ash build is all about. We can use this as a metaphor to explain computers in space, cyber security, photovoltaics and other grea Australian made technologies!
- We are really interested in getting a legal and philosophical point of view on the militarisation of space. Currently, the US is pulling out of policies and accords and looking to make a Space Force. What are the risks and ramifications of this becoming the nex battlefield?



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Problem Statements

Introducing our 5 problem statements to bring the challenge to life

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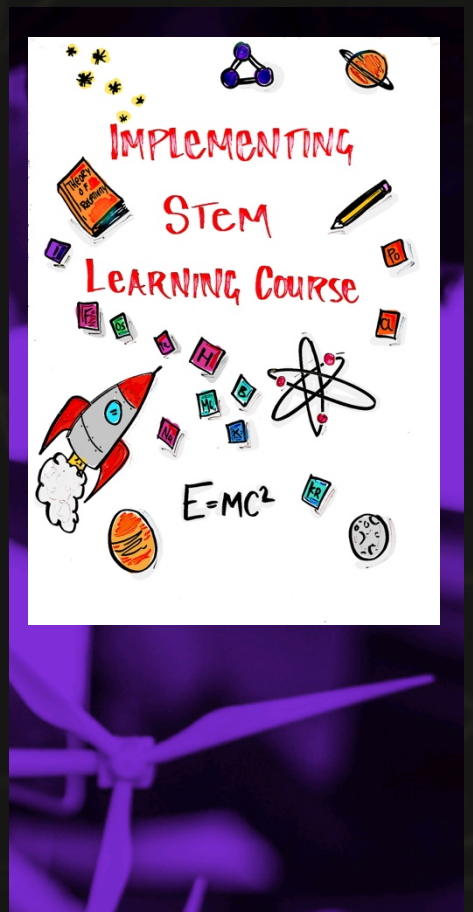

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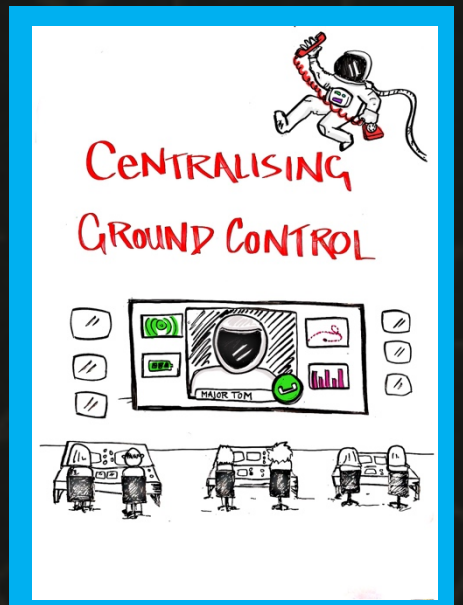


3

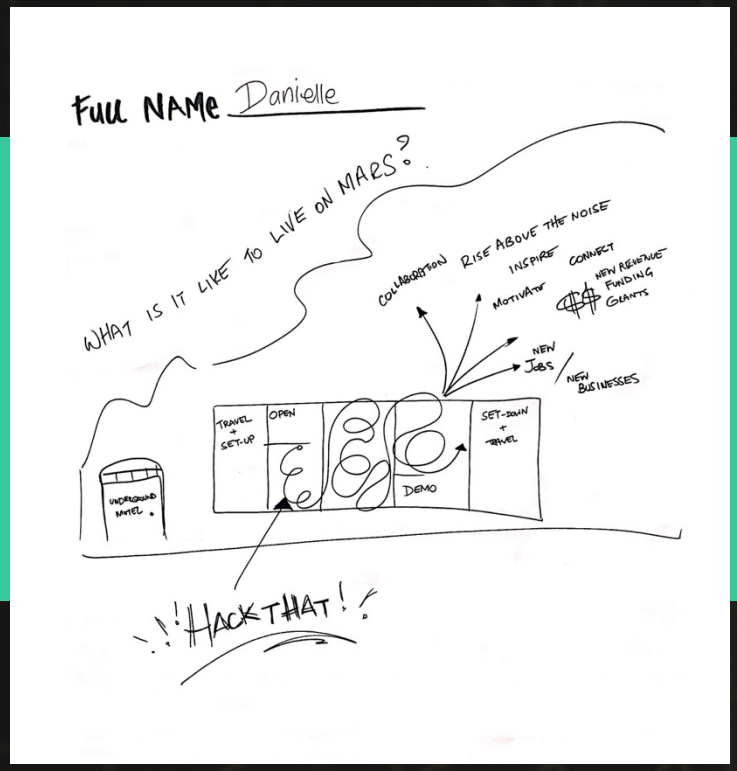
4

5

Individual Perspectives

After we provided the program objectives, and the context, we asked participants to define their perspective of success, and how they saw their role in this opportunity

1



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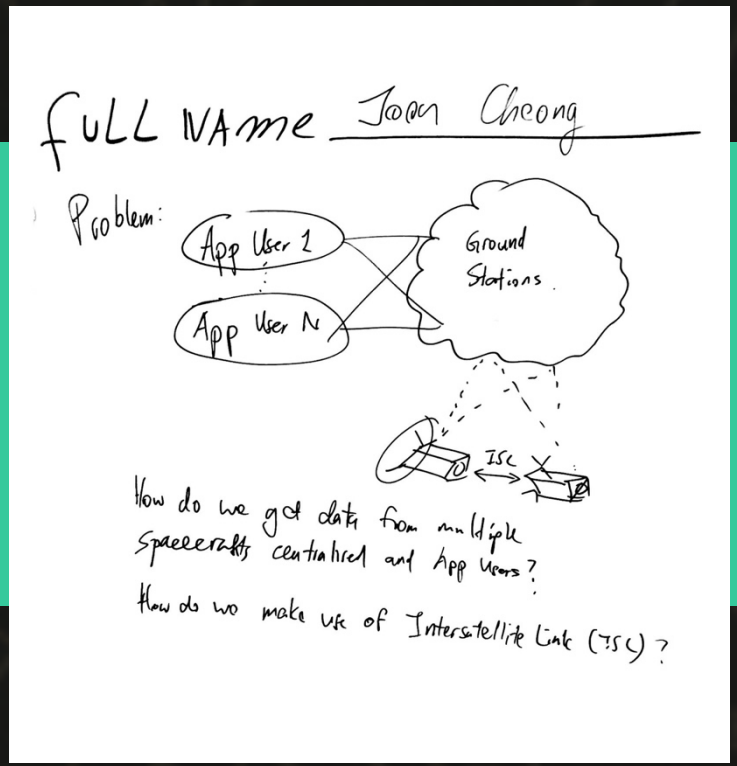

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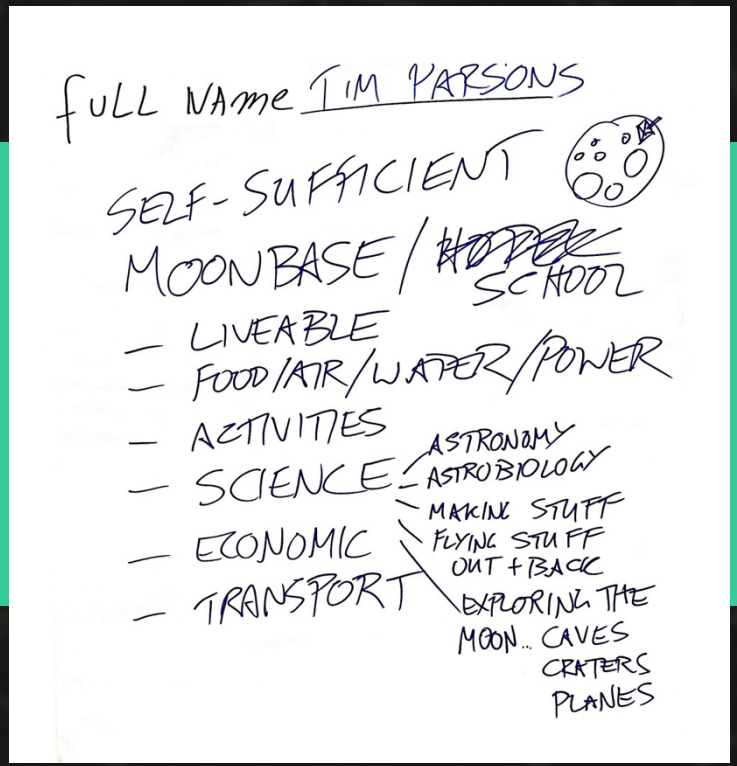


Individual Perspectives

4

FULL NAME Stuart McAndrew

Problem: Develop applications for space-borne sensor networks / nodes.

Resources: - 1 or more Picosatellites to be launched into LEO with relatively short lifespan
- Flatsat Development platform

Outcomes (of hackathon) = - Mission Concepts
- Prototype Payloads
- Apps?

5

FULL NAME ELIAS ABOUTANIOS

Ideas for a "Space-a-thon":

1- Problems for space or using space?
2- For space:
- de-orbiting payloads
- Space-traffic management

(Suppose we are in a future time when a great many spacecraft are flying in Low Earth Orbit → how do you deorbit spacecraft while avoiding collisions?)

3- Spacecraft that sense their environment
Predicting collisions → Machine learning?
4- Inter-satellite communications links for collision avoidance?

6

FULL NAME _____ Paul Alino.

Network of Ground Stations

Problem: How can we centralise a set of pre-existing ground stations in a cost efficient and reliable way?

Issues:
- Hardware differences;
- Comms differences; UHF, optical,
- Software, both ground & on-orbit.
- Satellite coverage.

Potential Solutions:
- Japan / ESA's OGS → optical ground station network attempts to achieve, several OGS connected by fibre.
  - ↳ Could we do something similar for UHF?
  - ↳ Could this be made portable?

Individual Perspectives

7

Full Name _____ Andrew Dempster

Not one of your problems:

- How do we articulate the "big picture" space project that is a common cause to inspire people in space?

(focus CSRO 20 workshop outcomes)

- Participants - the whole sector
- Outcome (product): A plan supported by the space agency
- Resources: just people? But people with influence

Ground segment unification

→ Policy support?

- Standards - outcome
- Optimisation algorithm for current/future missions & stations.

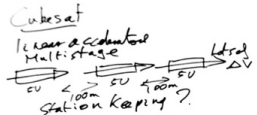
8

Full Name Ediz Cetin

- Through TechConnect & workshops connect with SMEs & Academics/Researchers working in the space domain. Better understand challenges faced by SMEs & how academia help solve them.
- Complete CubeSat built based on Australian capabilities/payloads/systems for (universal) ground station.
- Incorporate space related research & development activity into UG/PG programs.
- Australian Made

9

Full Name Gavin Conibeer



Deployable antennae

5km rocket

- deploy HA balloon
- deploy linear accelerator how will it stay there?

Mars

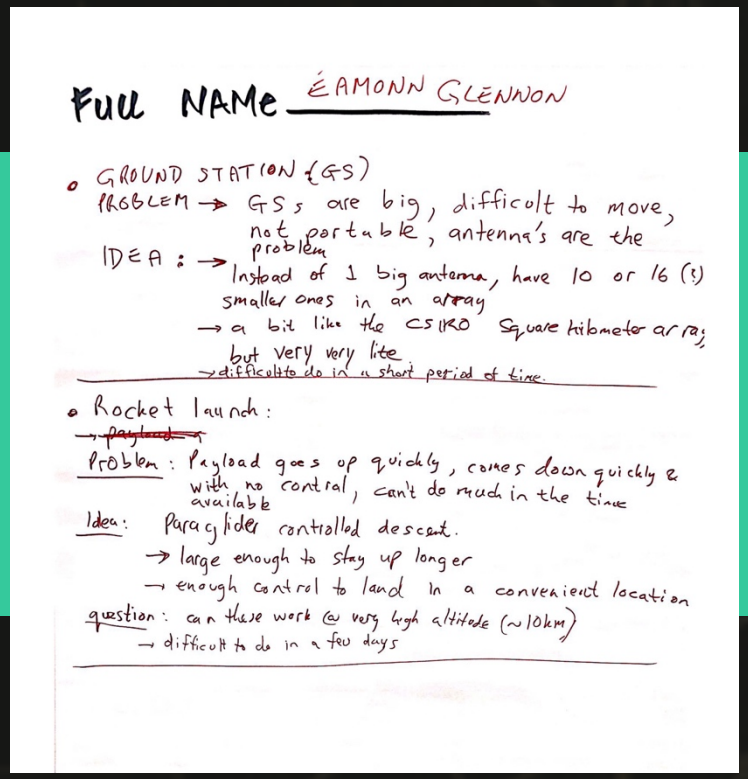
- Solar power tower electric Martian conditions
- use regolith to fabricate mirrors
- Solar thermal/ heating

Ground control

Triangulation from several ground stations

Individual Perspectives

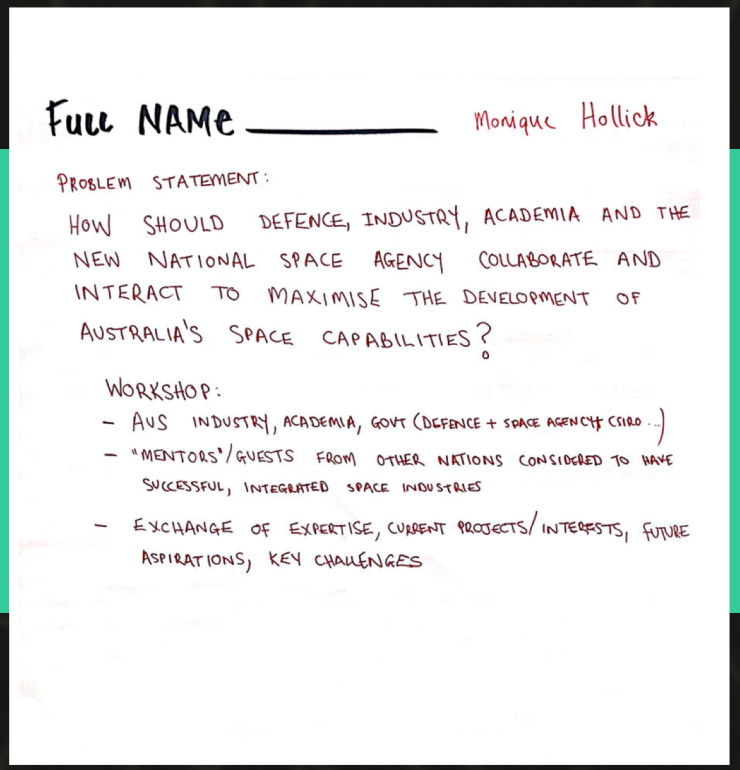
10



Full NAME ÉAMONN GLENNON

- GROUND STATION (GS)
  PROBLEM → GSs are big, difficult to move, not portable, antenna's are the problem
  IDEA: → Instead of 1 big antenna, have 10 or 16 (?) smaller ones in an array
  → a bit like the CSIRO Square Kilometer array but very very lite
  → difficult to do in a short period of time.
- Rocket launch:
  ~~→ payload~~
  Problem: Payload goes up quickly, comes down quickly & with no control, can't do much in the time available
  Idea: Paraglider controlled descent.
  → large enough to stay up longer
  → enough control to land in a convenient location
  question: can these work @ very high altitude (~10km)
  → difficult to do in a few days

11



Full NAME Monique Hollick

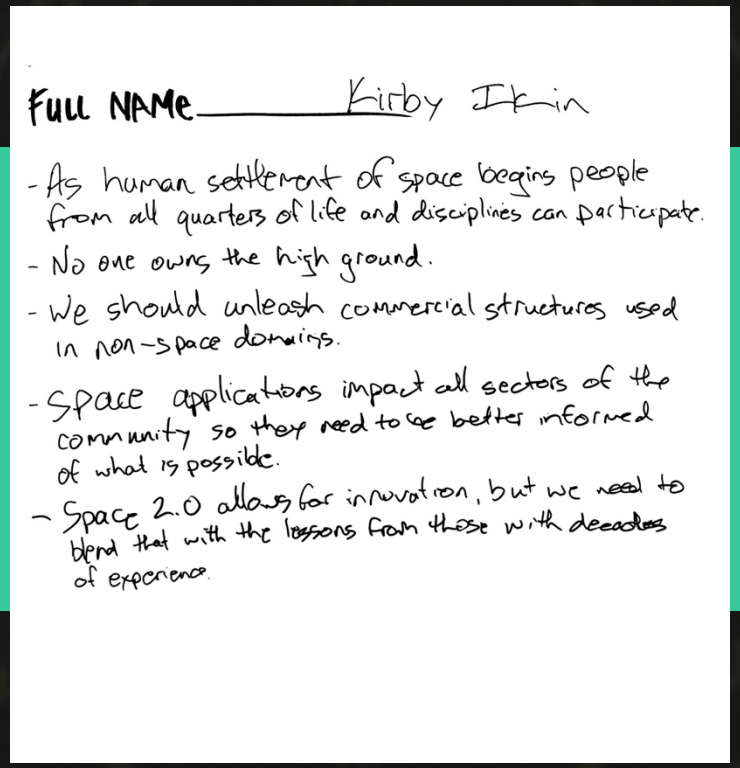
PROBLEM STATEMENT:

HOW SHOULD DEFENCE, INDUSTRY, ACADEMIA AND THE NEW NATIONAL SPACE AGENCY COLLABORATE AND INTERACT TO MAXIMISE THE DEVELOPMENT OF AUSTRALIA'S SPACE CAPABILITIES?

WORKSHOP:

- AUS INDUSTRY, ACADEMIA, GOVT (DEFENCE + SPACE AGENCY + CSIRO ...)
- "MENTORS"/GUESTS FROM OTHER NATIONS CONSIDERED TO HAVE SUCCESSFUL, INTEGRATED SPACE INDUSTRIES
- EXCHANGE OF EXPERTISE, CURRENT PROJECTS/INTERESTS, FUTURE ASPIRATIONS, KEY CHALLENGES

12



Full NAME Kirby Itkin

- As human settlement of space begins people from all quarters of life and disciplines can participate.
- No one owns the high ground.
- We should unleash commercial structures used in non-space domains.
- Space applications impact all sectors of the community so they need to be better informed of what is possible.
- Space 2.0 allows for innovation, but we need to blend that with the lessons from those with decades of experience.

Individual Perspectives

13

Full NAME HIRANYA JAYAKODY

1. Fastest ever cubesat assembly/build in the world?
2. Launch high altitude balloon (30km+ altitude) with,
   - live streaming / telemetry
   - attitude determination & control ← use ADCS developed by Mark from Binusat
   - ~~flight~~ control of the payload after detaching from balloon.
3. 5km - rocket launch - live stream similar to spaceX
4. Build the most compact telescope with highest zoom & quality.
5. Inter-cubesat communication
   or
   Inter - high altitude balloon communication
6. Use machine learning to identify space debris in images captured from ground telescopes.

14

FULL NAME Jannene Kyytsönen

Mars project.
Habitat visit for design & engineering advice
Dialogue with Indigenous Owners
Dialogue with education & tourism sector for their needs from site

15

Full NAME DAVID WINGARD (DST Group)

SUCCESS – novel small satellite payload that could be developed by Australian industry & transitioned to ADF or National Security – possibly launched through Australian industry
- input from operational community
- DST could help facilitate
- general areas
  - communications intelligence, surveillance, reconaissance
  - precision, navigation & timing
  - others?

Barrier – security classification

Individual Perspectives

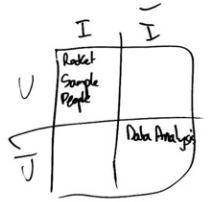
16

Full NAME Trent McDougall

Problem: atmospheric core sampling, what is the human impact/ foot print as a vertical ~~column~~ column. Key locations?

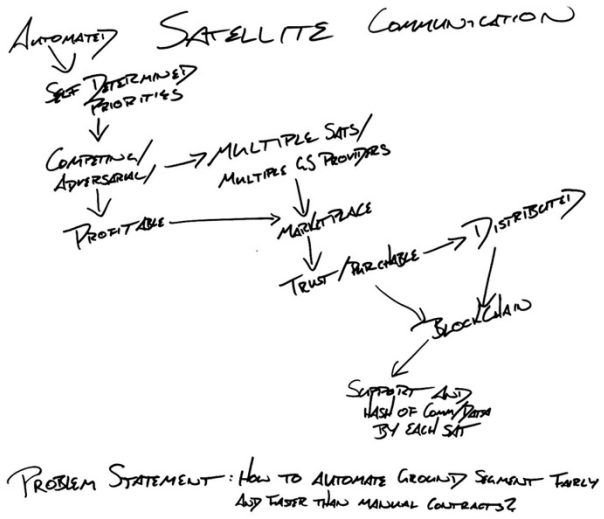
Skills: Electron Microscope.
: Dr Steve Hobbs.
: Rapid Development
Re-purpose astronomy equip.

5km Rocket.



17

Full NAME Aidan O'Brien



PROBLEM STATEMENT: HOW TO AUTOMATE GROUND SEGMENT FAIRLY AND FASTER THAN MANUAL CONTRACTS?

18

Full NAME MORGAN RENNIE

SUCCESS
- Leveraging space connect to build STEM interest in next gen workforce (particularly girls)
- Opportunities for companies (new & existing) and industries to transition into space
- Opportunities for regional communities to be "space hotspots"
- Australia [NSW] recognised as a(n) player in the international space community

Individual Perspectives

19

Full NAME KEITH ROSARIO

Confession: Non-commercial ! STEM ii

AIM: Develop something that can be used by kids Yr 6-12 to stimulate STEM interest on a national level – interest in Space.

Idea: Use a "space" asset to involve kids over a defined period eg ISS, cubesat, high-altitude balloons.

Because: Space Agency has been announced, and we need more kids to take up STEM career.

For example: every school builds/gets a radio TX that they can use on multiple "space asset" passes to get a "density" image – one-time or progressive.

Output: A terrific picture of every school across Australia that participated. A sense of national participation. A focus on space. A news coverage event think NASA sponsored eclipse tracking across USA.

Flash build: The "kit" every school will need
The "system" that every kit will work with

20

Full NAME BEN SOUTHWELL

— Blockchain (NOT COIN MINING) to achieve consensus in downlinked data (distributed GS). E.G. QB50 beacons

— Free as in freedom GS HW + SW

— If you want cryptocurrency use PoS not PoW

— Machine learning: identify all variables to log/train

21

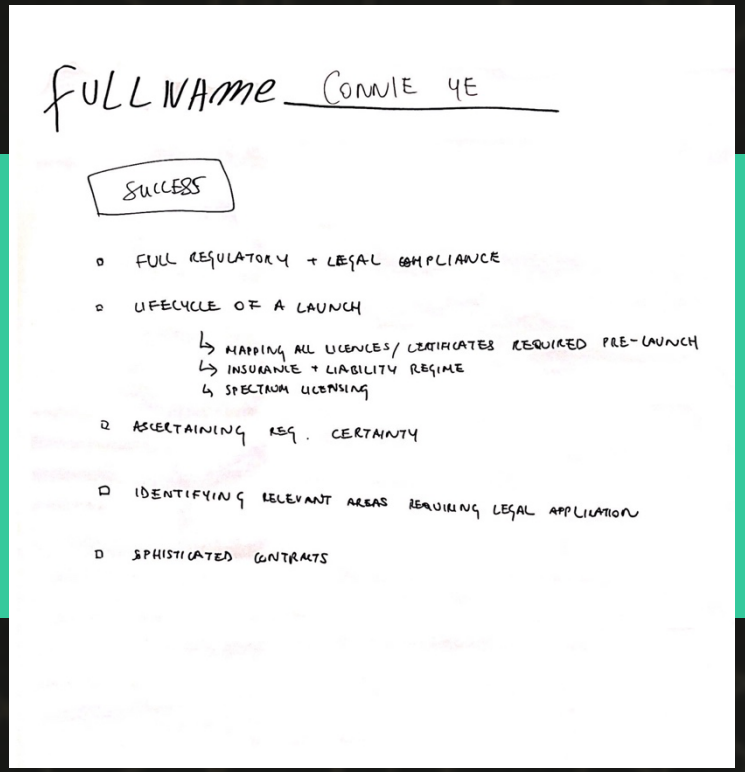
Full NAME Matt Tetlow

Remote sensing application
↳ policies of interest ⇒ what problems do users have
↳ what is the problem space
↳ engage users/researchers

Ground segment/comms
↳ spectrum use/sharing
↳ better than what's done now
↳ large constellations need better use of spectrum

Individual Perspectives

22

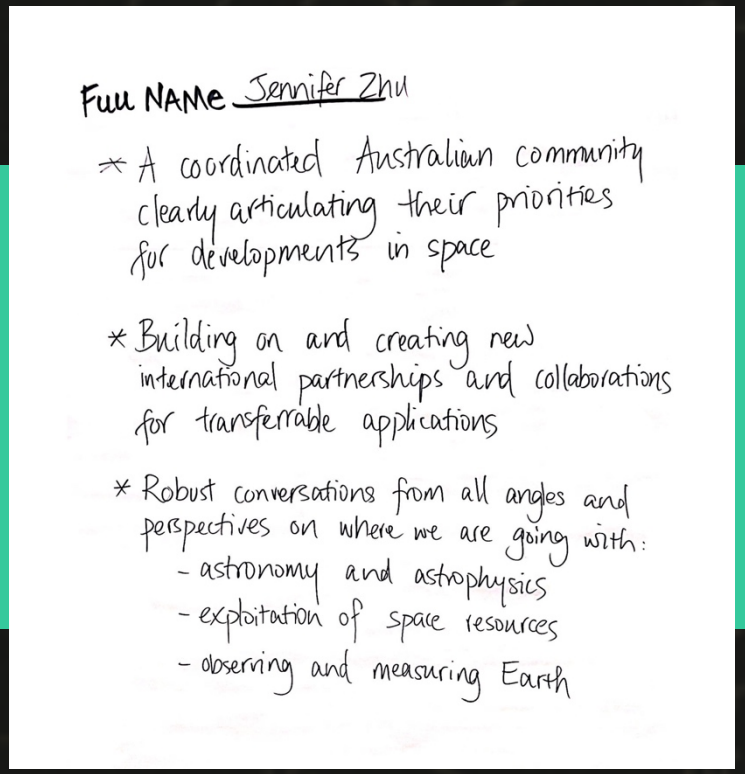


FULL NAME Connie Ye

SUCCESS

- FULL REGULATORY + LEGAL COMPLIANCE
- LIFECYCLE OF A LAUNCH
  - ↳ MAPPING ALL LICENCES/CERTIFICATES REQUIRED PRE-LAUNCH
  - ↳ INSURANCE + LIABILITY REGIME
  - ↳ SPECTRUM LICENSING
- ASCERTAINING REG. CERTAINTY
- IDENTIFYING RELEVANT AREAS REQUIRING LEGAL APPLICATION
- SPHISTICATED CONTRACTS

23



Full NAME Jennifer Zhu

* A coordinated Australian community clearly articulating their priorities for developments in space
* Building on and creating new international partnerships and collaborations for transferrable applications
* Robust conversations from all angles and perspectives on where we are going with:
  - astronomy and astrophysics
  - exploitation of space resources
  - observing and measuring Earth

Idea Generation

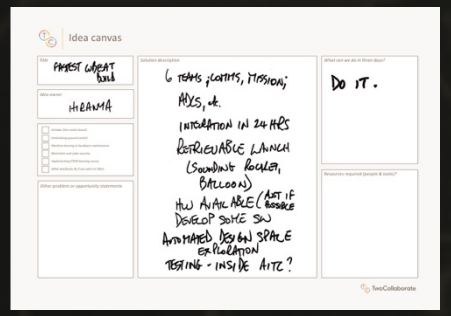
UNSW SYDNEY

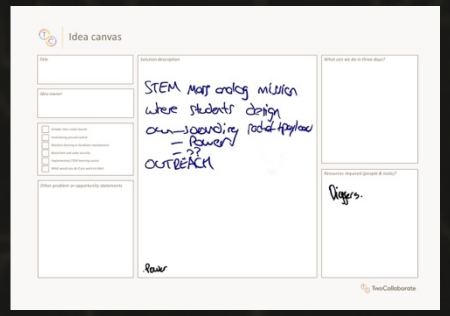
TechConnect

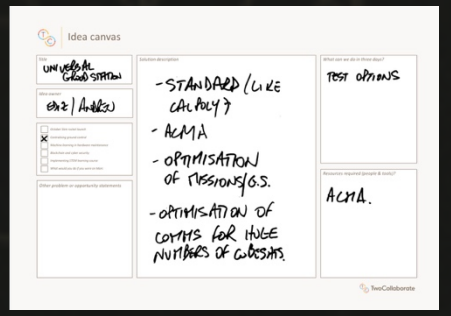
Idea Generation

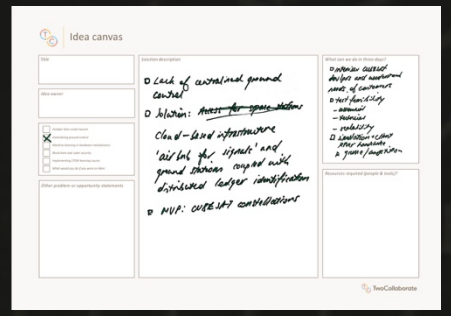
Idea Generation

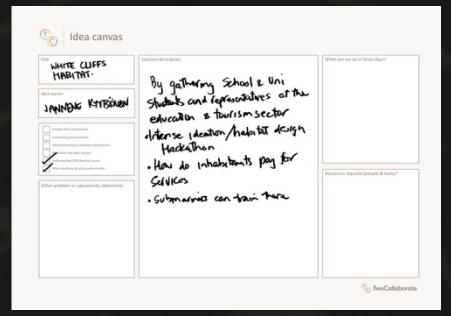
Participants were asked to group and share their insights to collaborate and amalgamate their perspectives in a set of their ‘moonshot’ type of ideas.

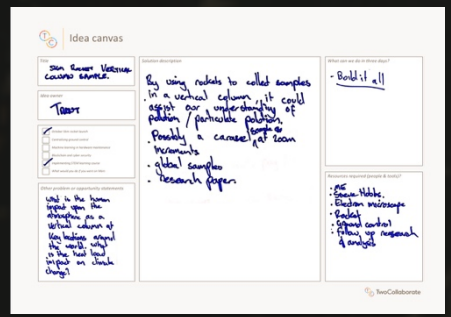


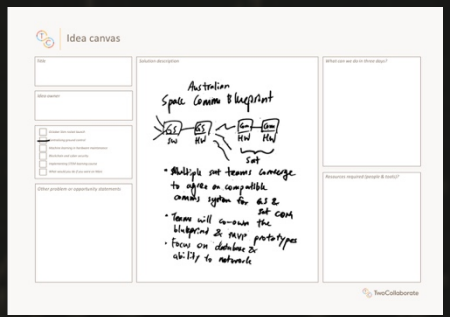


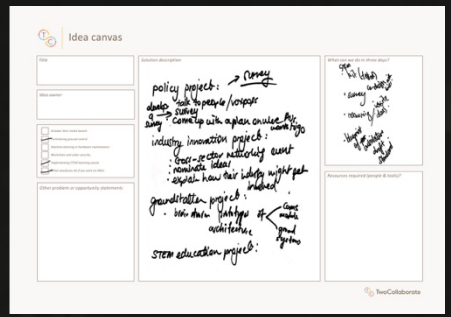


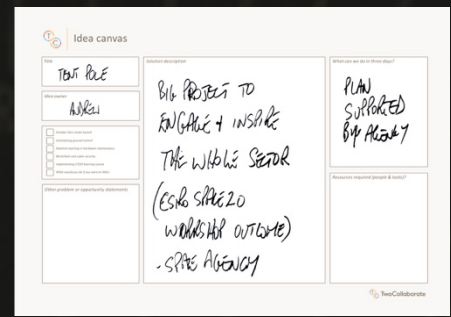


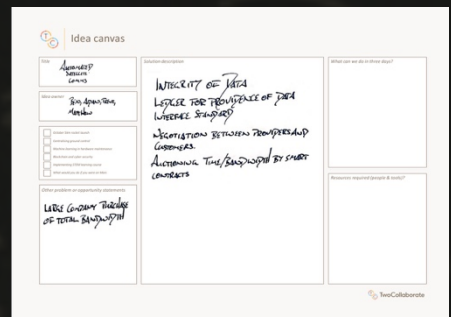


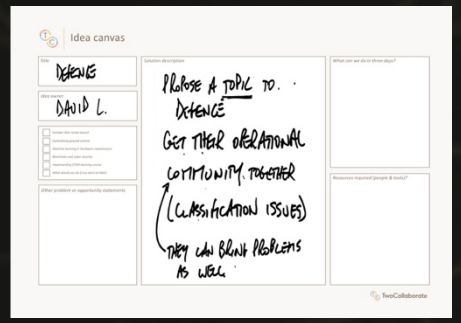


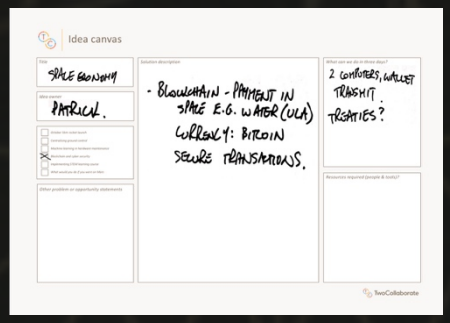


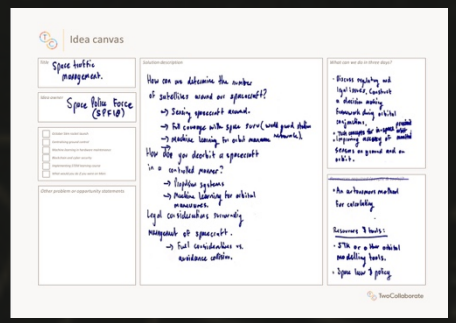




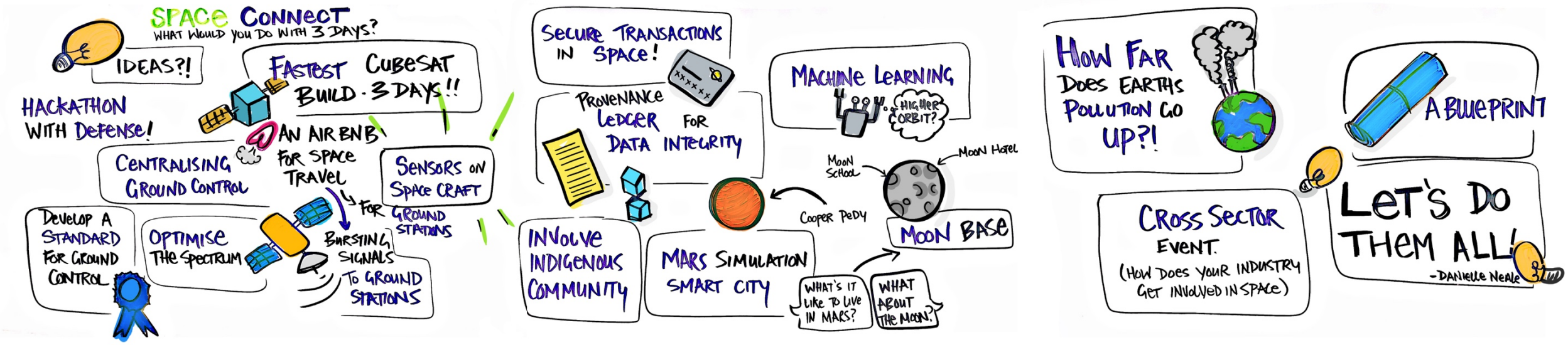








Next Steps


SPACE CONNECT
WHAT WOULD YOU DO WITH 3 DAYS?
IDEAS?!
HACKATHON WITH DEFENSE!
FASTEST CUBESAT BUILD - 3 DAYS!!
AN AIR BNB FOR SPACE TRAVEL
CENTRALISING GROUND CONTROL
SENSORS ON SPACE CRAFT
FOR GROUND STATIONS
DEVELOP A STANDARD FOR GROUND CONTROL
OPTIMISE THE SPECTRUM
BURSTING SIGNALS TO GROUND STATIONS
SECURE TRANSACTIONS IN SPACE!
PROVENANCE LEDGER FOR DATA INTEGRITY
MACHINE LEARNING
HIGHER ORBIT?
INVOLVE INDIGENOUS COMMUNITY
MARS SIMULATION SMART CITY
COOPER PEDY
MOON SCHOOL
MOON HOTEL
MOON BASE
WHAT'S IT LIKE TO LIVE IN MARS?
WHAT ABOUT THE MOON?
HOW FAR DOES EARTHS POLLUTION GO UP?!
CROSS SECTOR EVENT
(HOW DOES YOUR INDUSTRY GET INVOLVED IN SPACE)
A BLUEPRINT
LET'S DO THEM ALL!
-DANIELLE NEALE