



THE UNIVERSITY OF ARIZONA

Research, Discovery
& Innovation

The Southern Arizona Space Ecosystem

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Arizona's History with Spaceflight





Arizona's History with Spaceflight





Steward Observatory founded in 1916





Ranger VII mapped sites for Apollo (1964)





Mars Phoenix Lander

UA was prime on
\$400M NASA
Mars lander



First Mars mission led by a public university



UA is prime on
\$1 billion NASA
asteroid sample
return mission



OSIRIS-REx



Goal:
First US mission
to return an
asteroid sample
to Earth.

*In orbit around Bennu.
Launched September 2016.*



No Humans Past Low Orbit since 1972

***We've literally* been going around in circles in Low Earth Orbit for 47 years.**





Even Moses Only Wandered 40 Years!





Traditional NASA Centers



Emerging “New Space” Clusters





Deloitte SAzSE Study

Southern Arizona Space Ecosystem Feasibility Study — August 2018





Our Challenge to Deloitte

Is it feasible for Southern Arizona to develop the infrastructure, talent pool, and associated resources to increase interaction with space companies, research entities, and industries with the goal of creating an increased and sustainable space industry presence in the region?



Our Challenge to Deloitte

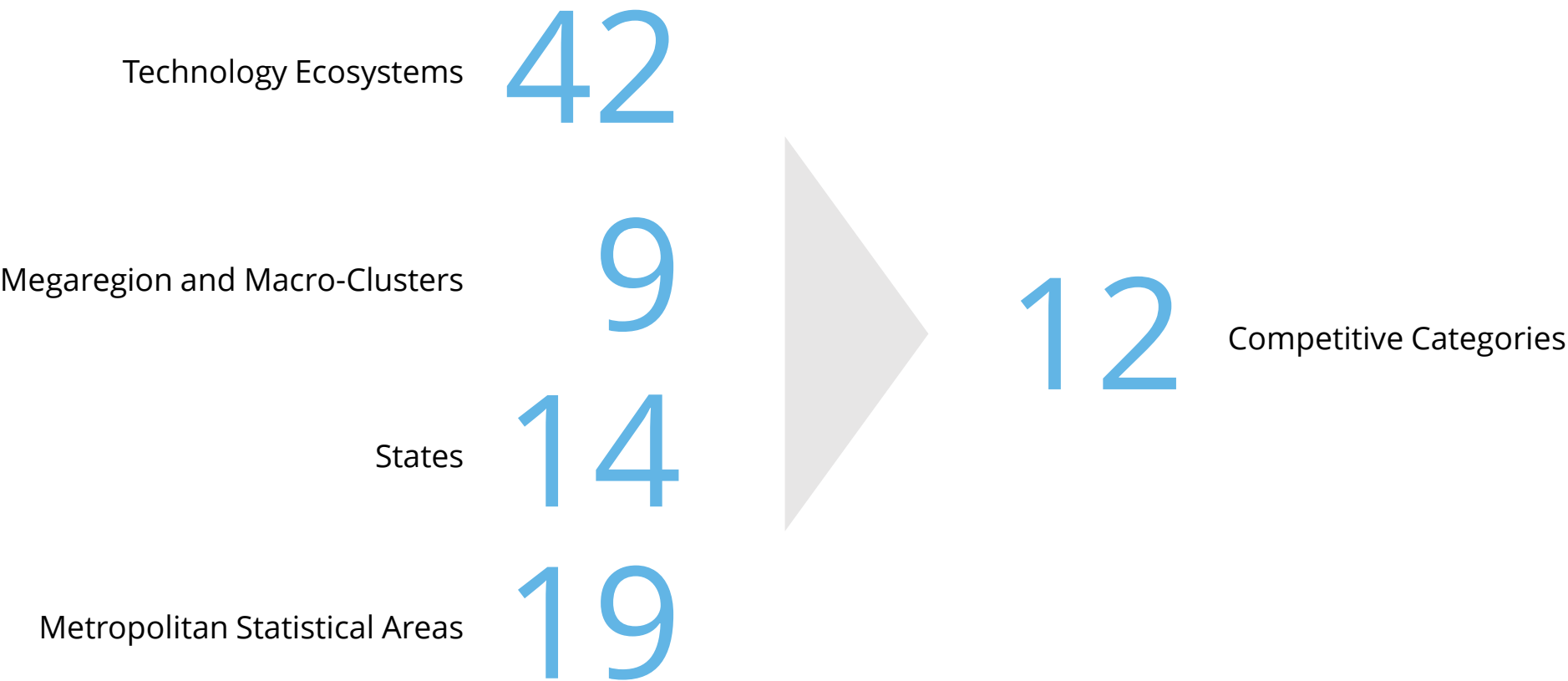
Is it feasible for Southern Arizona to develop the infrastructure, talent pool, and associated resources to increase interaction with space companies, research entities, and industries with the goal of creating an increased and sustainable space industry presence in the region?

If so, how?

The competitive landscape was assessed through a series of benchmarking and analysis efforts.

Analysis by Category

Benchmark Development



The competitive landscape was assessed through a series of benchmarking and analysis efforts.

Analysis by Category

Technology Ecosystems

42

Megaregion and Macro-Clusters

9

States

14

Metropolitan Statistical Areas

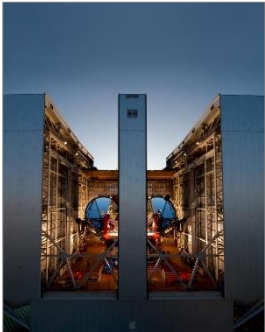
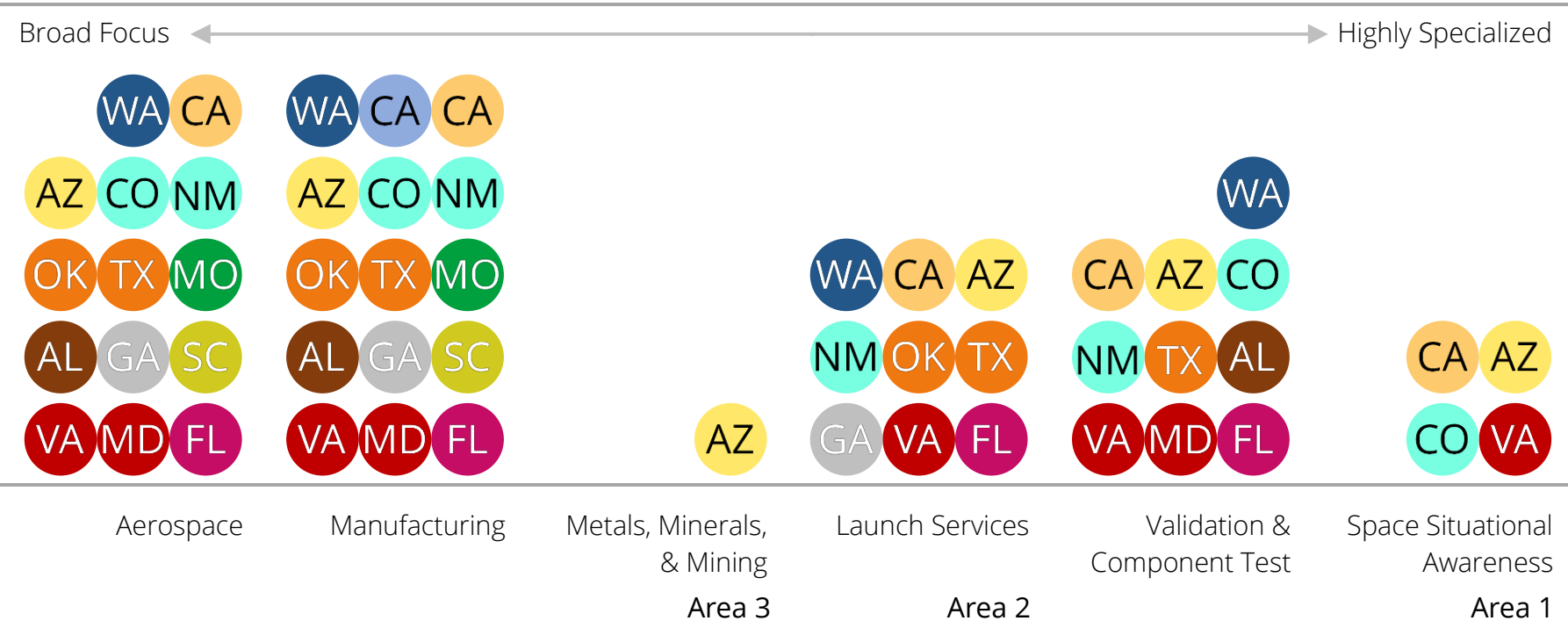
19

Benchmark Development



Competitive Analysis Sample

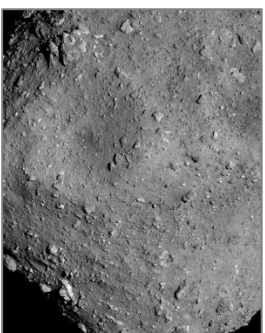
Comparison of Select Focus Areas by State



Area 1



Area 2



Area 3

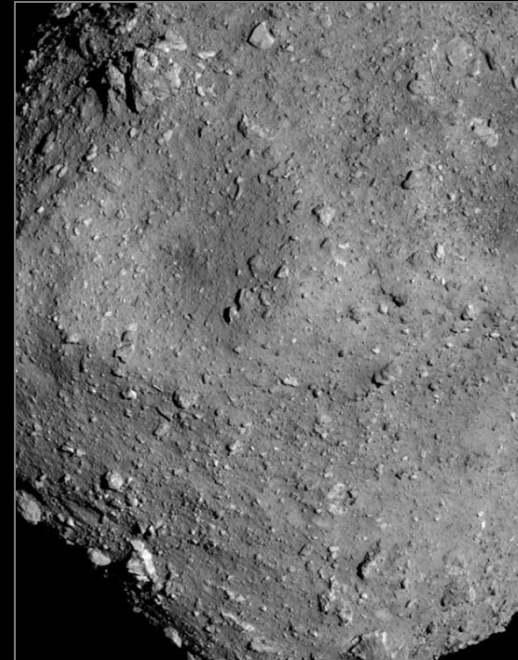
We conclude that it is feasible to create a more robust and expanded space-focused ecosystem in Southern Arizona. To best position the region for success, the following 4 focus areas should be addressed:



**Area 1 |
Space Situational Awareness**



**Area 2 |
Launch Services &
Manufacturing**



**Area 3 |
Metals, Mining, Minerals and
Resources**



**Area 4 |
Enabling and Supporting
Technologies**



Deloitte SAzSE Recommendations



Deloitte.

Southern Arizona should focus on four areas:

Space Situational Awareness

Launch Services and
Manufacturing

Metals, Mining, Minerals, and
Resources

Enabling and Supporting
Technologies

Space Situational Awareness

Understand & predict natural and man-made objects in space... and their intent.

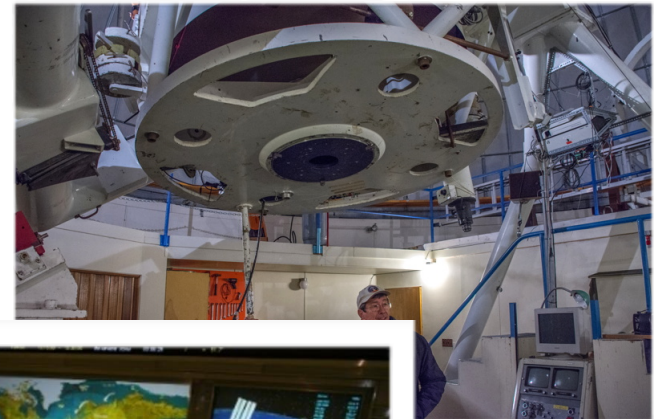
Debris mitigation

Collision prevention

Space asset protection

Planetary defense

Space traffic management





Launch Services and Manufacturing

Developing systems and infrastructure to deliver payloads:

To the stratosphere

On suborbital trajectories

To low Earth orbit

To deep space

Deloitte.



Vector Space Systems



WorldView



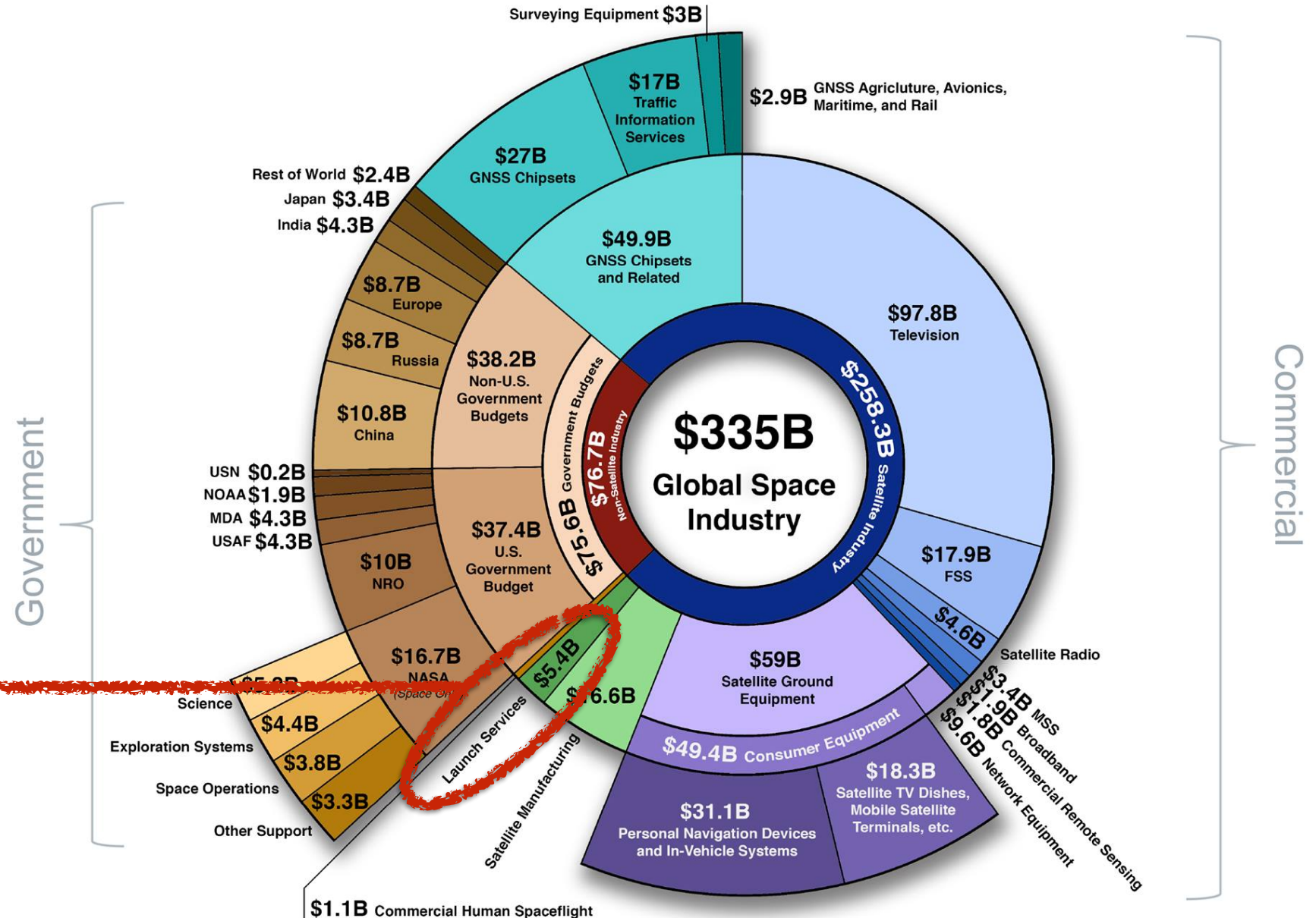
Raytheon Missile Systems





Global Space Industry

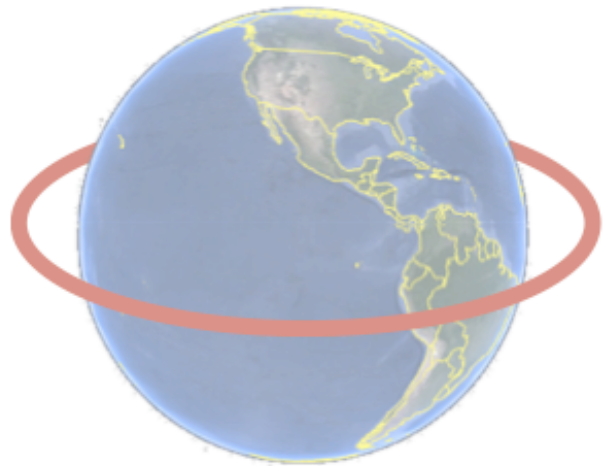
The entire launch sector is less than 2% of the global space industry!



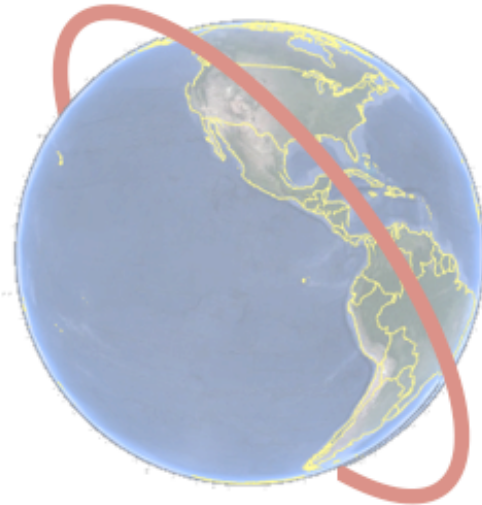


Desirable Orbits for Satellites

Best for large commsats in high orbit,
GPS satellites, ISS research, etc.

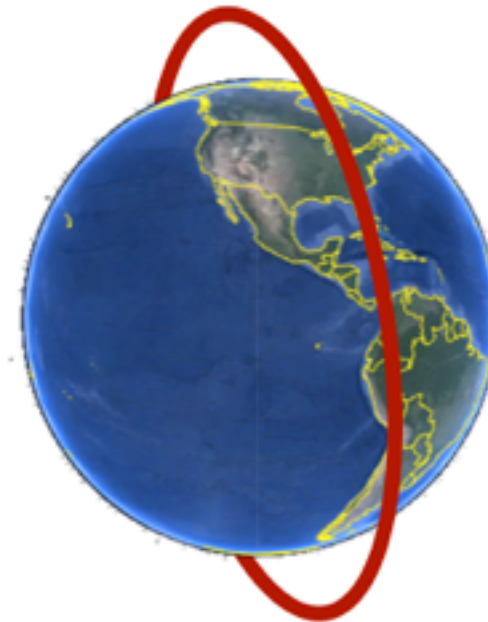


**Equatorial
Orbit**

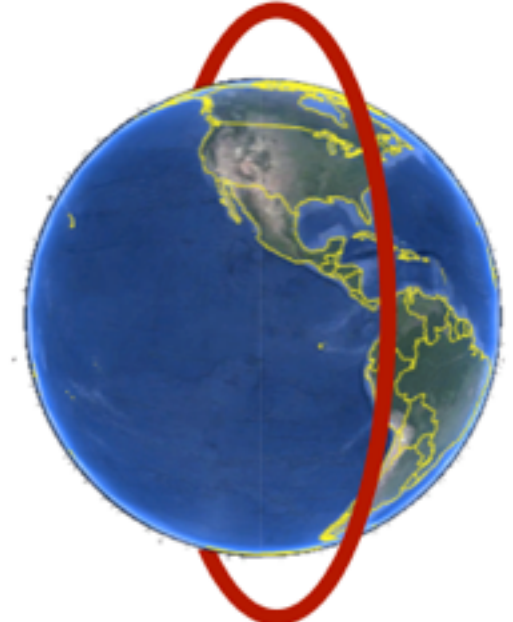


**International
Space Station**

Best for swarms of small satellites:
Telecomm, imagery, many other apps...



**Sun
Synchronous**



**Polar
Orbit**



Potential for a Sonoran Spaceport



Polar and sun-synchronous launch corridors.

Minimal risk, minimal environmental impact.

Rail access from Tucson and Southern California.

Aerospace workforces in Southern Arizona, Hermosillo, and Guaymas.



Metals, Mining, Materials, and Resources

Extracting materials from the Moon, asteroids, and other objects in the solar system.

Converting them into useful forms for use in space.

Maybe bringing some of them back to Earth (*platinum*)...









Enabling & Supporting Technologies

Extended-duration
life support.

Deep-space
navigation.

High-bandwidth
telemetry.

Large telescope
manufacturing and
operations.

Orbital sensors.

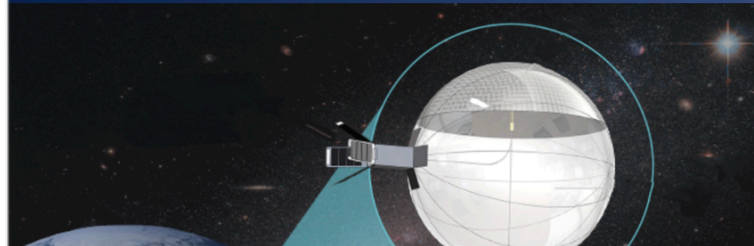
Deloitte.



Biosphere 2



Freefall Aerospace



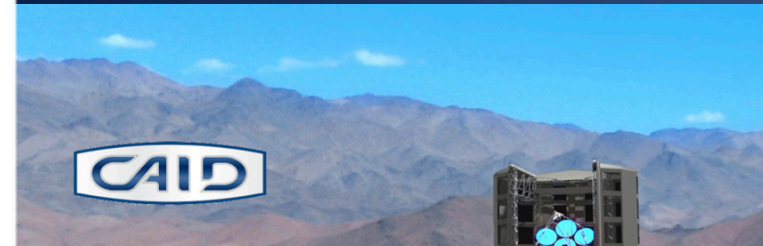
Lunasonde



Paragon Space Development Corp.



CAID



M3 Engineering





Space Medicine Research





Space Law Symposium





Arizona Space Business Roundtable



<https://research.arizona.edu/arizona-space-business-roundtable>



Arizona Space Business Roundtable





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& Innovation

Thank You!

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