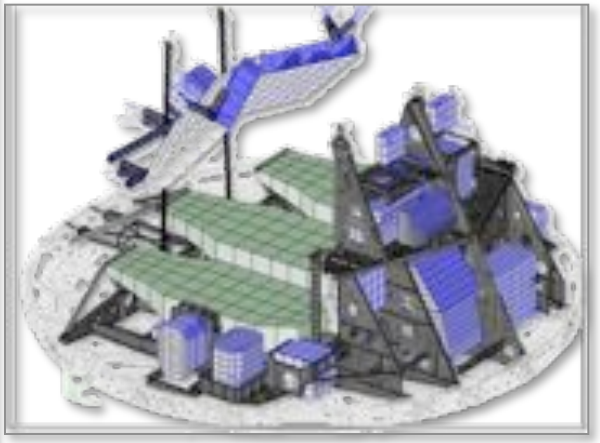
EXCALIBUR • ALMAZ™



Unmanned Reusable Orbital Science Spacecraft

Program Overview and Solicitation of Interest

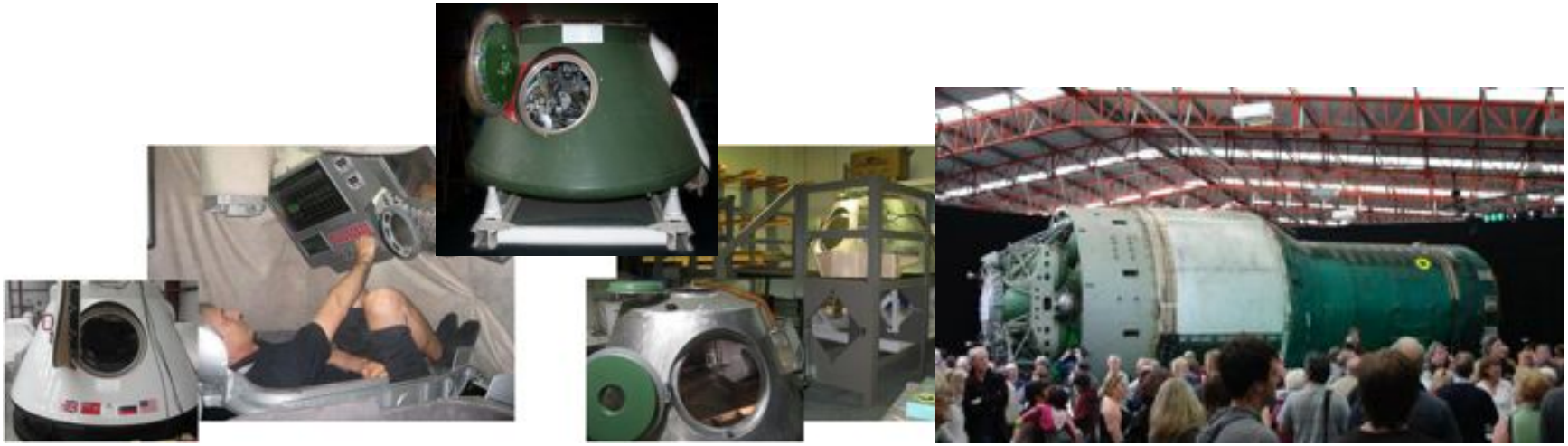
APRSAF-19 December 12, 2012

Purpose of Presentation

- Describe the capabilities of our reusable orbital space science laboratory.
- Solicit expressions of interest from customers and business partners.

Excalibur Almaz Limited

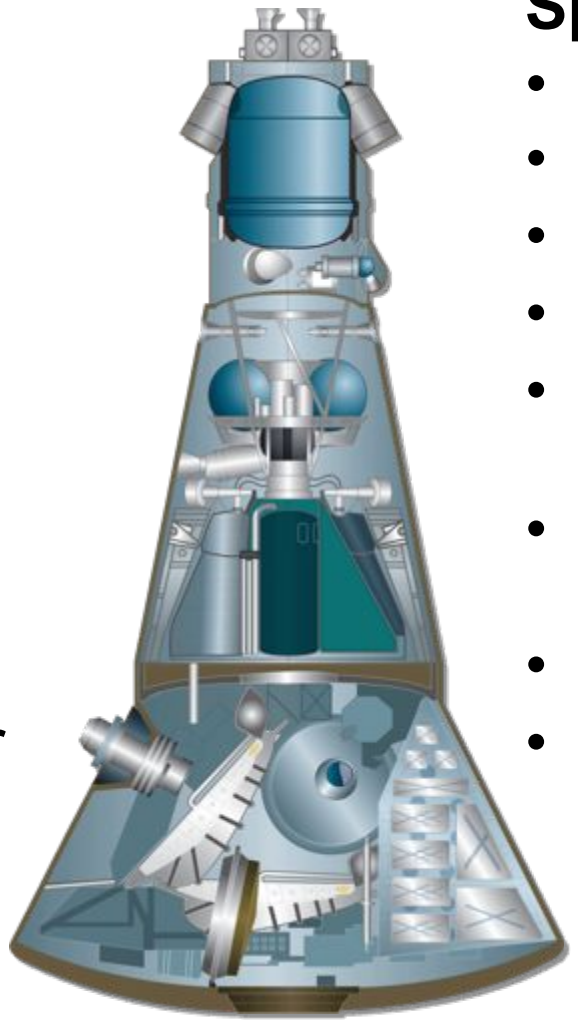
- Excalibur Almaz Limited is a private, international space exploration company formed in 2005 that is adapting proven Russian space technology for private spaceflight. We are an Isle of Man company, part of the British space segment. Through our US subcontractor, EAI, we work with NASA in the ISS commercial crew program.
- We own four reusable reentry vehicles, each capable of making up to 15 trips to and from Low Earth Orbit. We will equip one of these reusable capsules as an unmanned space science laboratory.



Reusable Reentry Vehicles

Features

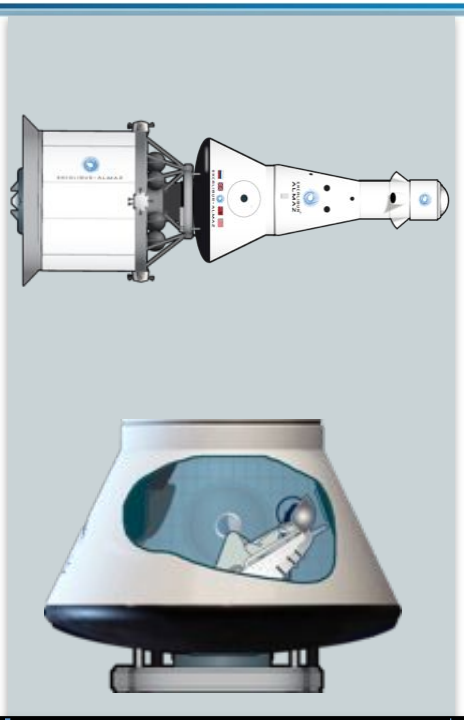
- Reusable
- Autonomous or piloted
- Emergency Escape System
- Parachutes and retrorockets
- Can land on ground or water

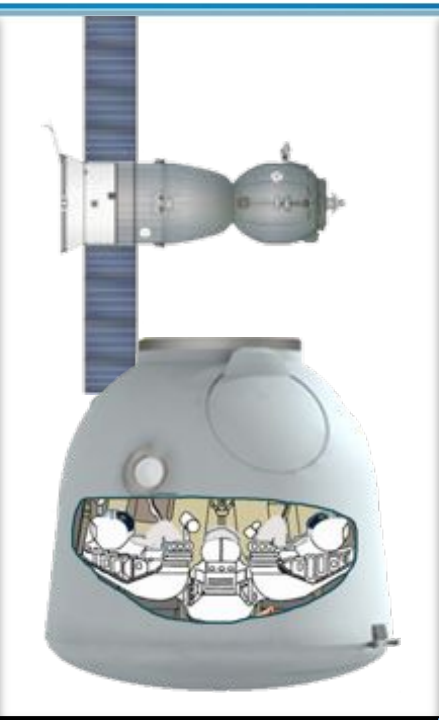


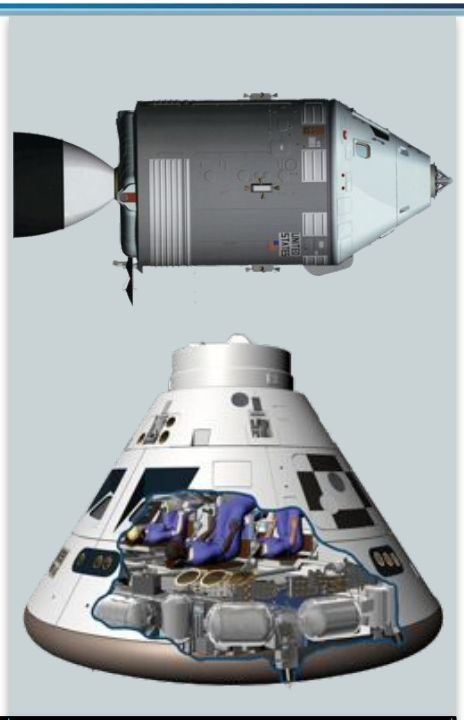
Specifications

- Crew 3
- Launch: ~8,000 kg
- In Orbit: ~4,200 kg
- Landing: ~4,000 kg
- Internal Volume: ~8 cubic meters
- Habitable Volume: ~4.56 cubic meters
- Length: 3.64 m
- Diameter: 2.79 m

Spacecraft Size Comparison

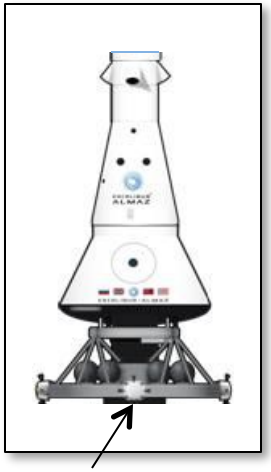






	Almaz	Soyuz	Orion
Crew Size	3	3	4 to 6
Reentry Vehicle Internal Volume	4.5 M^3	4 M^3	8.9 M^3
Habitation/Cargo Module Internal Volume	13 M^3	6.5 M^3	N/A
Total Habitable Volume Available	**17.5 M^3** *(with Service Module)*	**10.5 M^3**	**8.9 M^3**

Science Lab Spacecraft Description

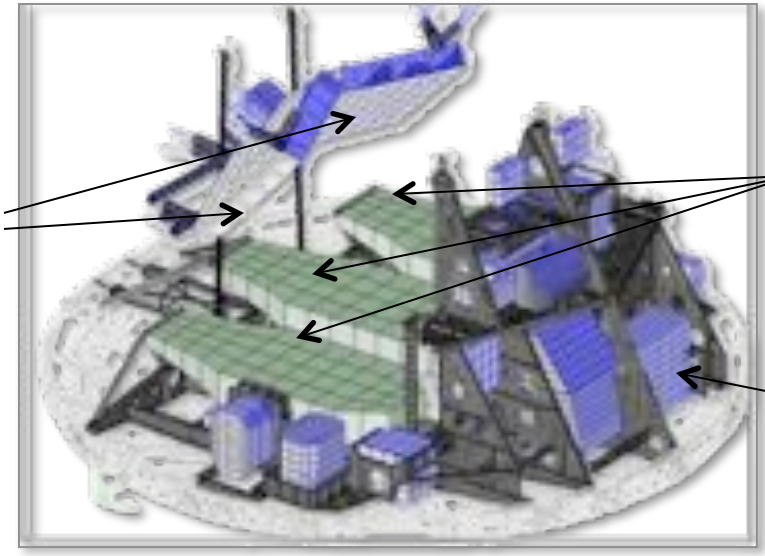


• Total Vehicle Mass	~8,000 kg
• RRV Mass at landing	~4,000 kg
• Total internal pressurized volume	~8 m^3
• Estimated Payload mass capacity	~1,000 kg
• Payload Power available	300 watts*
• Re-Entry Vehicle Length	~2 m
• Re-Entry Vehicle Diameter	~3 m

** Maximum payload power available*

Unpressurized Experiments
(Mount in cylindrical tunnel)

Pressurized Experiments



Radial Experiment Mounts
(2 shown for clarity)

Soft Ride Pallets (3)
(Attenuation system limits accelerations experienced by experiments)

Experiment Racks
(Sized to support Nano Racks and/or other ISS Pressurized payloads)

Program Responsibilities

- Excalibur Almaz
  - Overall program management
  - Program integration
- Systems Integration Provider
  - Spacecraft development
  - Spacecraft Integration and test
  - Mission support
  - Spacecraft refurbishment
- Launch Service Provider
  - Spacecraft launch processing
  - Spacecraft launch
  - Mission operations
  - Spacecraft recovery

EA's Display Capsule (flown twice)

EA's Isle of Man Facility

EA's Unique Approach

- EA program is based on modification of an **existing and proven** reusable spacecraft
  - EA's spacecraft development program begins with a spacecraft reusable asset that is owned by EA
  - Modification requirements have been studied for non-crewed and crewed flight
  - Overall investment to date > $45 million US
- Physical assets currently owned by EA
  - 4 Reusable Re-entry Vehicles
  - 2 Space Station pressure vessels
  - 1 Engineering Evaluation Unit mock-up of Reusable Reentry Vehicle

All assets are in EA possession and located in the Isle of Man

EA's Unique Approach (Cont'd.)

Non-crewed flight test program completed

- 9/9 Successful entries and soft landings
- One RRV has flown 3 times and another RRV flew twice
- One operational flight (175 days attached to Salyut)

EA RRV reusability is estimated at up to 15 times per unit by original Manufacturer NPOM

Equivalent flight demonstration program in 2012 US dollars would exceed $ 1 billion

Space Science Services Offered

Microgravity Science Flights to LEO lasting 5-15 days

•Excalibur Almaz will utilize its Reusable Reentry Vehicle (RRV) outfitted as a “free-flying” lab that provides microgravity science flights to LEO.

- The service will include end-to-end integration services for the transport of customer payloads to and from LEO. The experiments will "plug and play" into standard structural, power, thermal and telemetry interfaces in the spacecraft laboratory bus.
- EA's team of payload experts using proven and simplified processes will work with customers through the complete service lifecycle of experiment design, integration, launch, on-orbit operation and return.
- Experiments or production facilities can be flown in space for two weeks. Price for time and mass in zero g is lower than parabolic flight per kilo x second of zero g.

1000 kilograms of payload per capsule lab flight.

THANK YOU FOR YOUR ATTENTION

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