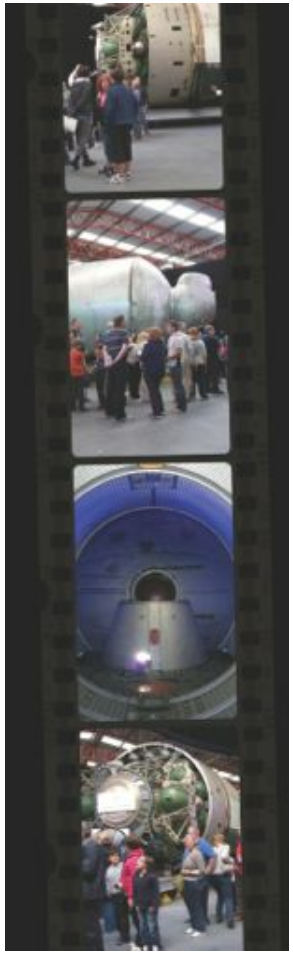
Royal Aeronautical Society
3rd European Space Tourism Conference

London – June 19, 2012

EA Supports Commercial Space

- EA presented its technical heritage and mission plans at the International Space Development Conference of the US National Space Society in Washington (May 27). The video is available on our web site www.excaliburalmaz.com
- EA is presenting its business and marketing plans and exhibiting its twice-flown spacecraft at the Royal Aeronautical Society. You are invited to inspect the spacecraft at the nearby Queen Elizabeth II Conference Centre.
- EA will exhibit two 90 cubic meter -lunar spacecraft at the SPACE Conference that will be held on the Isle of Man on July 9th



Is There a Commercial Market?

- We hired Futron to do four comprehensive space market studies from 2009 to 2011. Here are the main results:
- Commercial dedicated unmanned scientific research missions can be profitable now.
- LEO commercial manned flights can be profitable from $20 - $35 million, but at the current $63 million per seat LEO manned flight requires government subsidy.
- Cislunar commercial manned space missions can be profitable at $100 - $150 million per seat. From 2015 to 2025 there could be up to 29 private and sovereign government explorers in this market.
- Complete access to these studies is available if you work with us.

Futron Study

The baseline demand for this market indicates that, over the ten year study period, from 2013 through 2022, total demand will reach 29 lunar passengers at a price point of $100M per passenger.

In this view, it is anticipated that the demand generated by the earliest purchasers for this service, those in the "pioneer" group which is very strong in the initial development phase of this market, will be fully addressed by the year 2017.

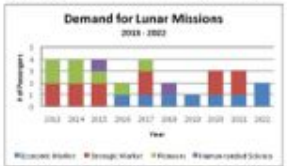
However, strategic buyers will have a steady and recurrent positive impact on this market's overall development throughout the study period.

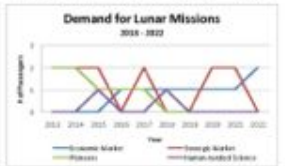
The requirements generated by economic or consumer based market buyers develop slowly in the early market, but grow steadily over time and are supplemented by requirements for human-tended scientific research and experiments during this period. The detailed results are provided in Exhibit 6 below.

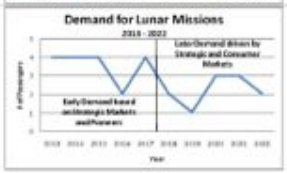
Exhibit 6: Demand Development for Commercial Circumlunar Human Spaceflight By Year

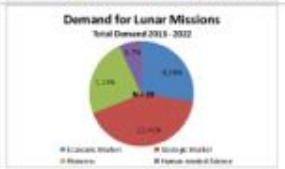
Lunar Market Demand Forecast Baseline

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	10-yr total
Economic Market	0	0	0	1	1	1	1	1	1	2	8
Strategic Market	2	2	1	0	1	1	1	2	1	1	12
Pioneers	2	2	1	1	1	0	0	0	0	0	7
Human-tended Science	0	0	1	0	0	1	0	0	0	0	2
Total - Baseline	4	4	3	2	3	3	2	3	2	3	29









In considering the range of demand, which might reflect alternative market development scenarios, Futron evaluated the impact of various drivers that could alter the pace of demand development in this emerging market. In the aggressive forecast, it is anticipated that the market demand develops much earlier than in the base case and, as a consequence of early success, demand develops more robustly throughout the period, particularly in the economic or consumer-driven sector of the market. Strategic buyers and demand generated by the need for scientific research continue to contribute to this demand scenario at a steady pace. However, the more robust, earlier development of strong consumer demand

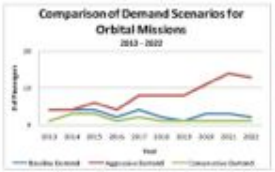
virtually eliminates the pioneer participation almost entirely. **Total demand for the ten year period in the aggressive forecast view reaches 80 passengers.**

By contrast, the conservative market demand forecast presents a scenario in which the economic or consumer market develops much more slowly and, while strategic buyers participate in the early phase of development, their participation is more limited overall. In this forecast, the requirements for scientific research are eliminated. The total demand in the conservative view is 15 passengers. The comparative range of demand development is provided in Exhibit 7 below. The price sensitivity of the lunar market demand is provided in the Economic Market 10 year Demand Table below and shows the relative demand at two price points, i.e. $100M and $75M per passenger for various groups of high-net worth individuals.

Exhibit 7: Comparison of Demand for Commercial Circumlunar Human Spaceflight By Year

Lunar Market Demand Forecast - Conservative

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	10-yr total
Total - Conservative	1	1	1	1	1	1	1	1	1	1	10
Total - Baseline	4	4	3	2	3	3	2	3	2	3	29
Total - Aggressive	4	4	4	4	5	5	5	11	11	11	80



Economic Market
10-year Demand, 2013 - 2022

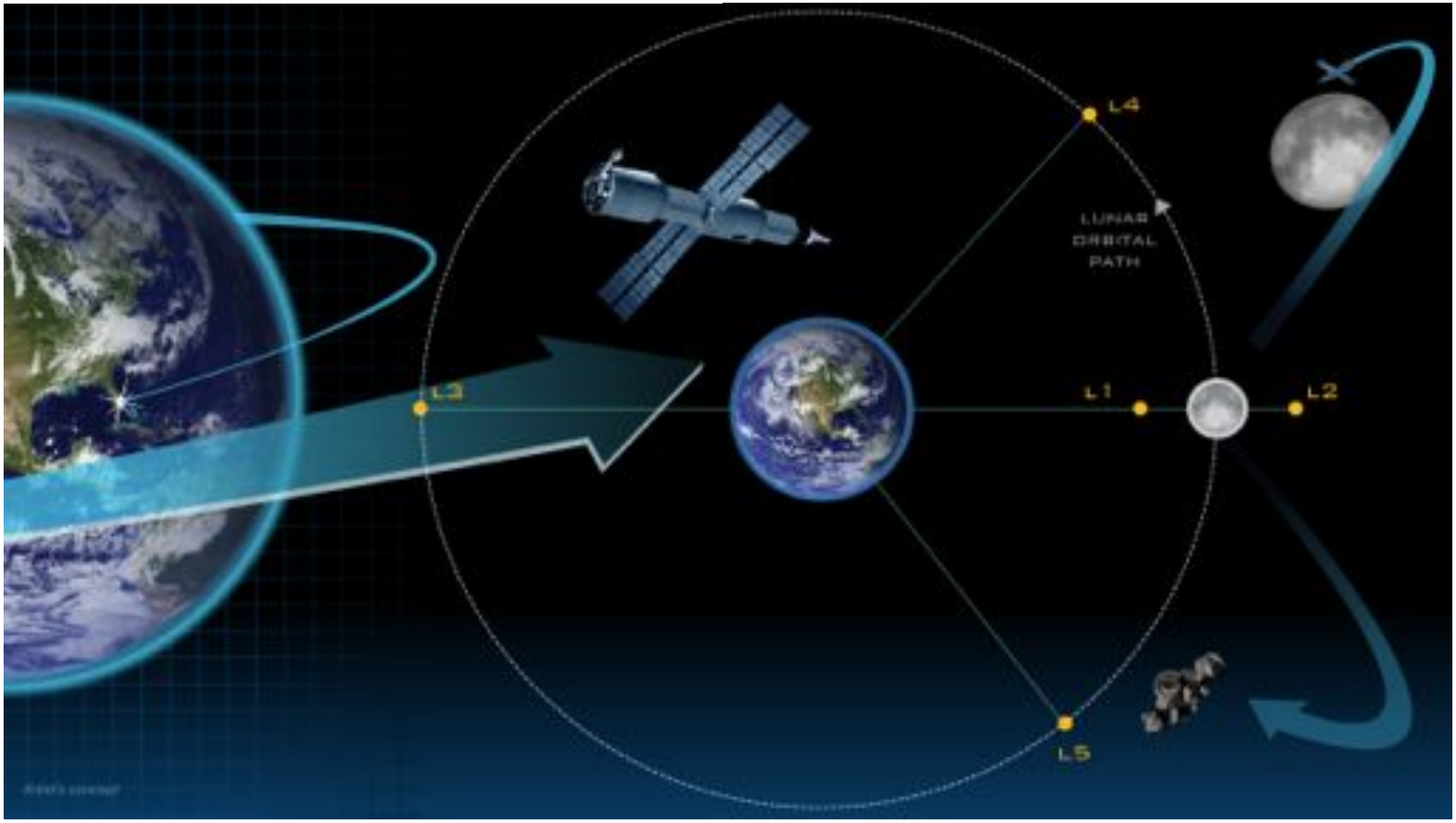
Priced @ US$100M	$100M	$200M	$300M
35-year Uptake	26	11	6
40-year Uptake	18	8	5
45-year Uptake	14	6	4
Priced @ US$75M			
35-year Uptake	147	67	34
40-year Uptake	104	47	26
45-year Uptake	77	33	18

Assumptions for Circumlunar Market Demand Scenarios

Assumption	Conservative	Baseline	Aggressive	Notes
Net Worth	Static US$300M	Static US$300M	Static US$300M	Additional sensitivity analysis included in Appendix I: Data Tables
Adoption Rate	Static 40-years	Static 40-years	Static 40-years	Additional sensitivity analysis included in Appendix I: Data Tables
Start Year	Static 2001	Static 2001	Static 2001	2001 based on first commercial traveler aboard ISS
Physical Fitness	Static 37%	Static 37%	Static 37%	Based on Zogby survey
Price Point	Static US$100M	Static US$100M	Static US$100M	Additional sensitivity analysis included in Appendix I: Data Tables
Target Market	Dynamic 5,602 – 11,547 (2013 – 2022)	Dynamic 5,602 – 11,547 (2013 – 2022)	Dynamic 5,602 – 11,547 (2013 – 2022)	Based on analysis of World Wealth Report, market size changes YoY
Level of Interest	Static 0.04%	Static 0.04%	Static 0.04%	Based on Zogby survey, et al; additional sensitivity analysis included in Appendix I: Data Tables
Strategic Buyers	Dynamic 4 Passengers	Dynamic 12 Passengers	Dynamic 14 Passengers	Based on exogenous analysis and scenarios, crowding out impacts aggressive scenario

Cislunar Space

Conservative business assumptions yield a three year ROI for commercial cislunar space operations that is in excess of 50%.



EA is seeking Partners, Customers and Investors

EA will offer the following services:

Core Services

- Passenger sales
- Crew and Cargo transportation
- Payload transportation, deployment and recovery
- Tele-science/research
- Remote sensing
- Geological evaluations/ mapping

Additional Services

- Charter missions
- Advertising/Sponsorship
- Entertainment
- Astronaut training

We are learning from NASA

We are working with NASA on Commercial Crew

We Lead an Experienced Team

Commercial Space is both international and multinational:

- "Military and industrial corporation JSC "MIC "Mashinostroyenia" (JSC MIC Mashinostroyenia), the legal successor of Federal State Unitary Enterprise "NPO Mashinostroyenia" is one of the leading space and rocketry companies of Russia. JSC MIC Mashinostroyenia, as a prime contractor in the multi-discipline cooperation, providing the National Armed Forces with advanced military equipment and collaborating with foreign partners.
- Number 1 in Europe, Astrium employs 17,000 men and women in five countries: France, Germany, the UK, Spain and the Netherlands. 17,000 professionals chosen from among the very best, all passionate about space and driven by the great adventure of our time – bringing the infinite potential of space down to Earth for the benefit of mankind.

We are proud to be an Isle of Man Company

Reasons to be an IOM space company:

- As a self governing UK Crown Dependency, IOM government is a firm and creative supporter of commercial space business
- GDP of 3.5 billion pounds; anticipates 1.1 billion in space related turnover
- Of 54 world satellite companies, 30 are on Isle of Man
- Political and Economic stability is recognized by the USA and worldwide
- Access to the City of London
- 0% corporate tax; 10% personal income tax

We are part of the British Space Sector

The Space Sector is a real British Success Story:

1. 8 billion pounds in 2012
2. Employs 25,000 people
3. Supports a further 60,000 jobs indirectly
4. Has more than doubled in size over the last decade
5. Growing at 15% rate for the last few years
6. Employment could reach 100,000 by 2020

Our Unique Approach

We utilize a most cost effective- least risk developmental approach

1. **Leverage proven space systems and design = lowers our systems development risk**
2. **Take advantage of other's investment in NRE = reduces our development costs**
3. **Not starting with a clean sheet approach = shorter time to 1st flight**

EXCALIBUR ALMAZ

Excalibur Almaz leverages past investments of previous developed space and systems to lower development risk and development costs.

Over the past 7 years EA has:

- Purchased four RRVs and two Station Pressure Vessels
- Performed numerous technical feasibility and design studies related to the RRVs and their subsystems as well as launch vehicle compatibility and overall program architecture
- Acquired State Department licenses for the hardware and for the technical services and export licenses from Russia to use the equipment in space.
- Performed tasks in response to our NASA Space Act Agreement
- Performed several recent market studies that indicate the ability to earn a reasonable return on investment by selling the crew positions and space services, as we progress from LEO to Lunar. The baseline demand for this market indicates that, over the ten year study period, from 2013 through 2022, total demand will reach 29 lunar passengers at a price point of $100M per passenger.

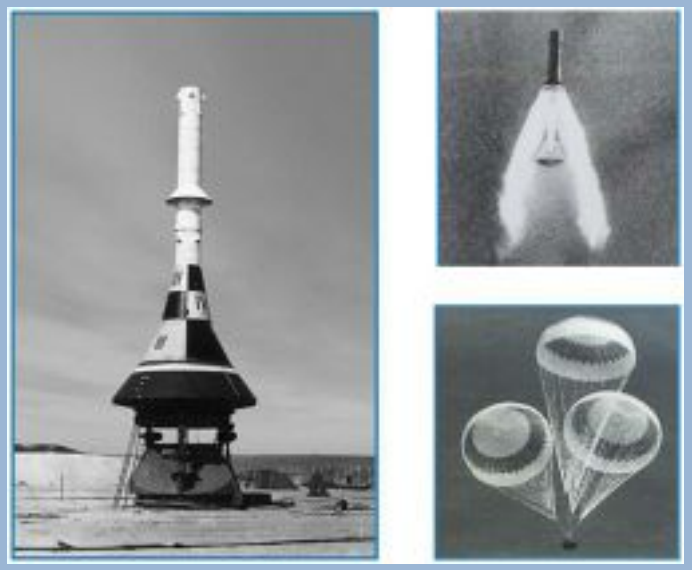
Our Goal

- Our goal is to create an affordable commercial space program.

Critical Elements of EA's LEO Crew Transportation System Elements are at Technology Readiness Level 9

Emergency Escape System (ESS)

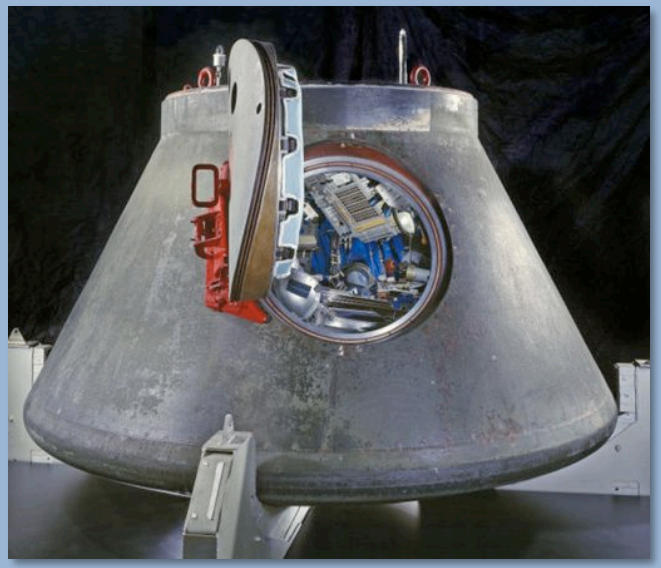
- Fully ground and flight tested
- Successful in-flight use (LV Explosion at L+53 sec)
- Built by same company that builds Soyuz EES
- EAI will purchase identical units to those tested



EA is the <u>only</u> commercial spacecraft program with a flight qualified EES

Non-crewed flight test program completed

- 9/9 Successful entries and soft landings
- One RRV flew three times, one flew twice
- One operational flight (175 days attached to Salyut)



EA RRV reusability is estimated at up to 15 times per unit

Necessary Elements of a Human Space Transportation System

The ACME Space Program

A proven emergency escape system

A proven space craft capable of earth reentry

An "in-space" service/propulsion module

A human rated launch vehicle

There are big challenges with high risk and high costs to develop and prove a human space transportation system

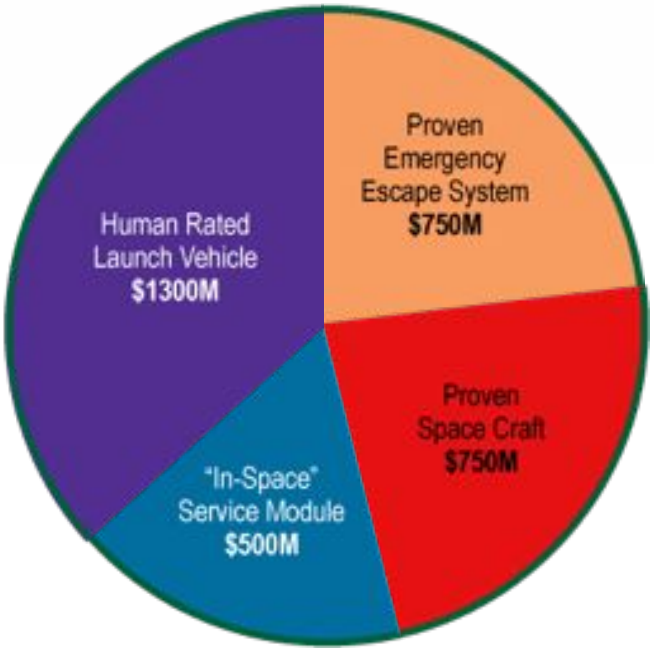
Development Cost Viewpoint

The ACME Space Program

- *Proven Emergency Escape System*

- *A proven space craft capable of earth reentry*
- *An "in-space" service/propulsion module*
- *A human rated launch vehicle*

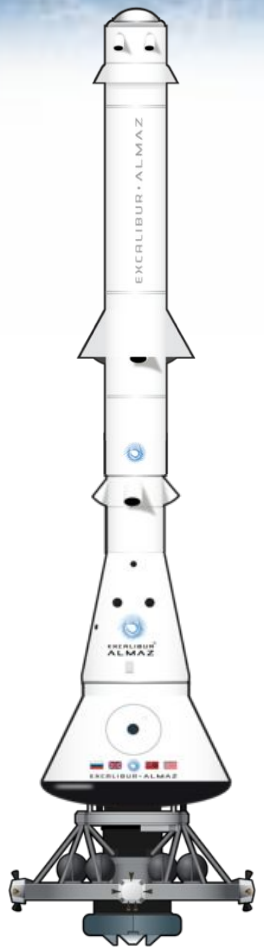
  Non-recurring ($800M pad, $500M human rating) Mike Gass Briefing to to the Review of U.S. Human Space Flight Plans Committee – June 2009



$ US 3300M

No matter how you slice the pie it takes a lot of capital

Existing Value of Our Architecture



A proven emergency escape system

Our system is proven, one pad test one proven escape during proton failure, we are ready to build to print

A proven space craft capable of earth reentry

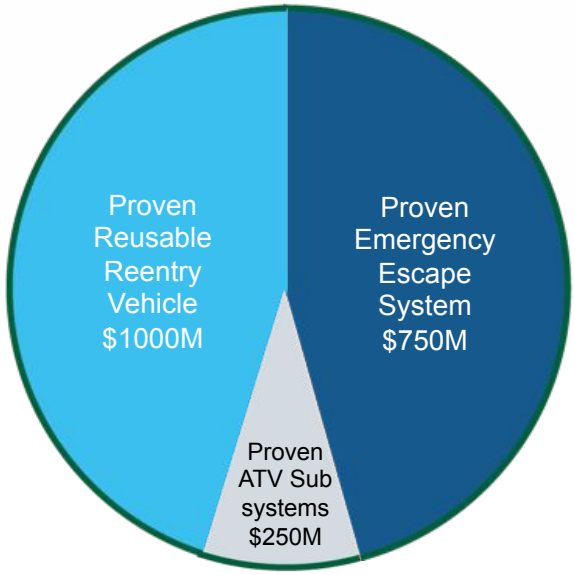
Our proven space reusable reentry vehicle, 9 successful reentries - reusable up to 15 times

An "in-space" service/propulsion module

Our Intermediate Stage will use proven subsystems with ATV heritage

A human rated launch vehicle

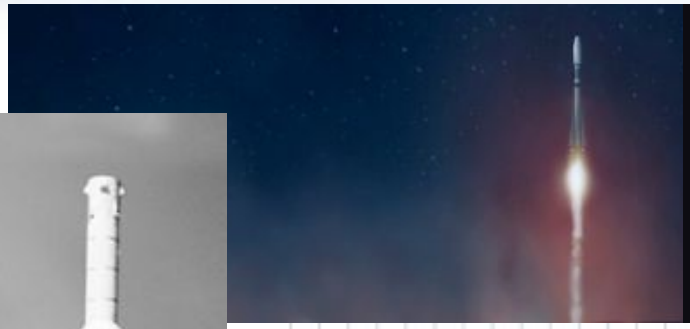
We will purchase this service= $0 development costs

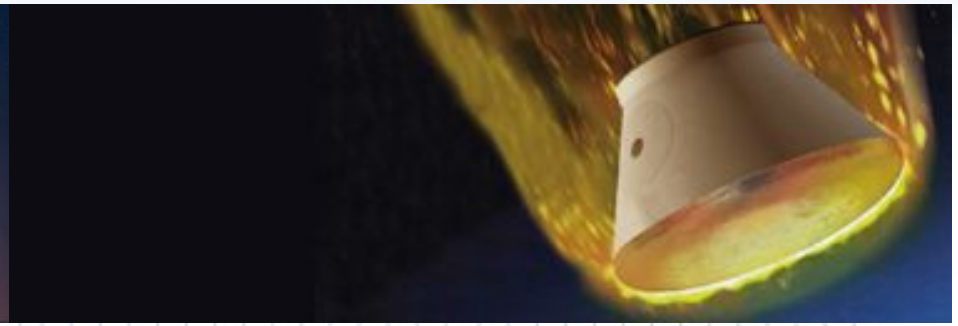


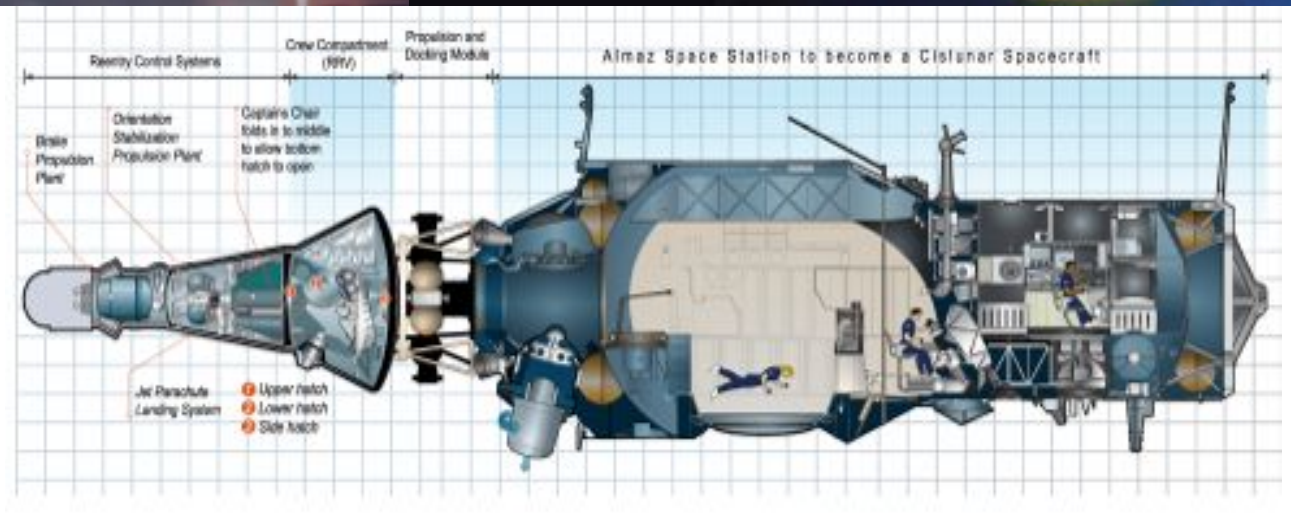
$ US 2000M

We have a huge head start with a proven reusable reentry vehicle and emergency escape system

Technical Hurdles



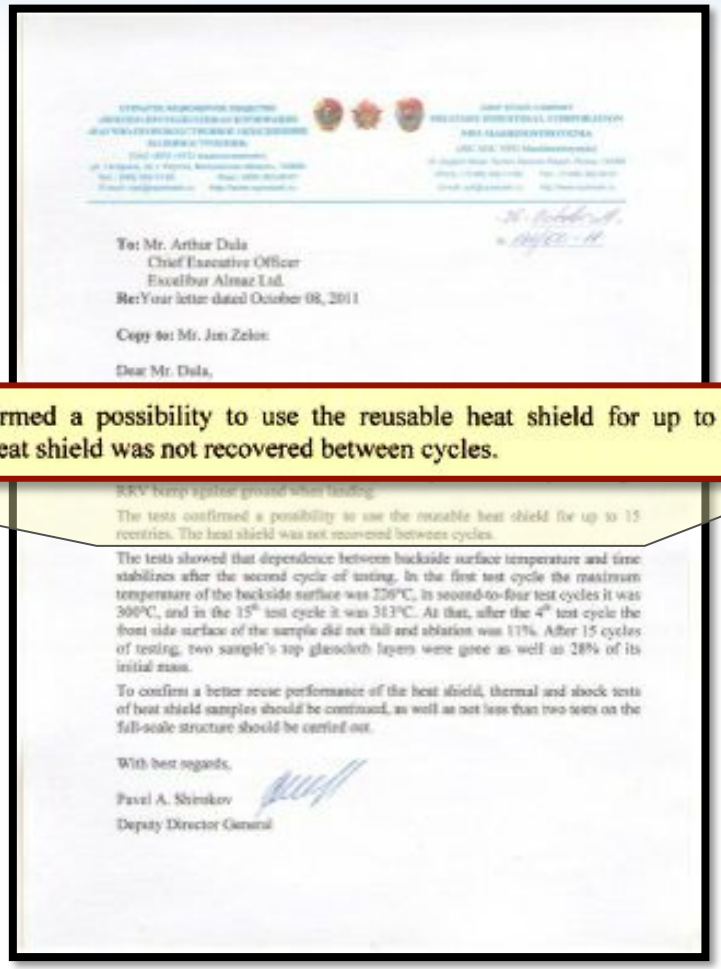




This is rocket science and it is challenging!

Excalibur Almaz Owns Six Spacecraft

- **Four Reusable Reentry Vehicles**
  - Mass ~ 3 metric tons (capsule only)
  - Conic shape ~ 3 meters maximum diameter
  - Habitable volume ~ 4.5 cubic meters
  - Flown 9 times to orbit and returned safely
  - Spacecraft are now at EA's facility on the Isle of Man
  - Spacecraft can be reused 15 or more times



To: Mr. Arthur Dula
Chief Executive Officer
Excalibur Almaz Ltd.
Re: Your letter dated October 08, 2011

Copy to: Mr. Jim Zelon

Dear Mr. Dula,

The tests confirmed a possibility to use the reusable heat shield for up to 15 reentries. The heat shield was not recovered between cycles.

The tests showed that dependence between backside surface temperature and time stabilizes after the second cycle of testing. In the first test cycle the maximum temperature of the backside surface was 226°C, in second-to-four test cycles it was 300°C, and in the 15th test cycle it was 313°C. At that, after the 4th test cycle the front side surface of the sample did not fall and ablation was 11%. After 15 cycles of testing, two sample's top glasscloth layers were gone as well as 28% of its initial mass.

To confirm a better reuse performance of the heat shield, thermal and shock tests of heat shield samples should be continued, as well as not less than two tests on the full-scale structure should be carried out.

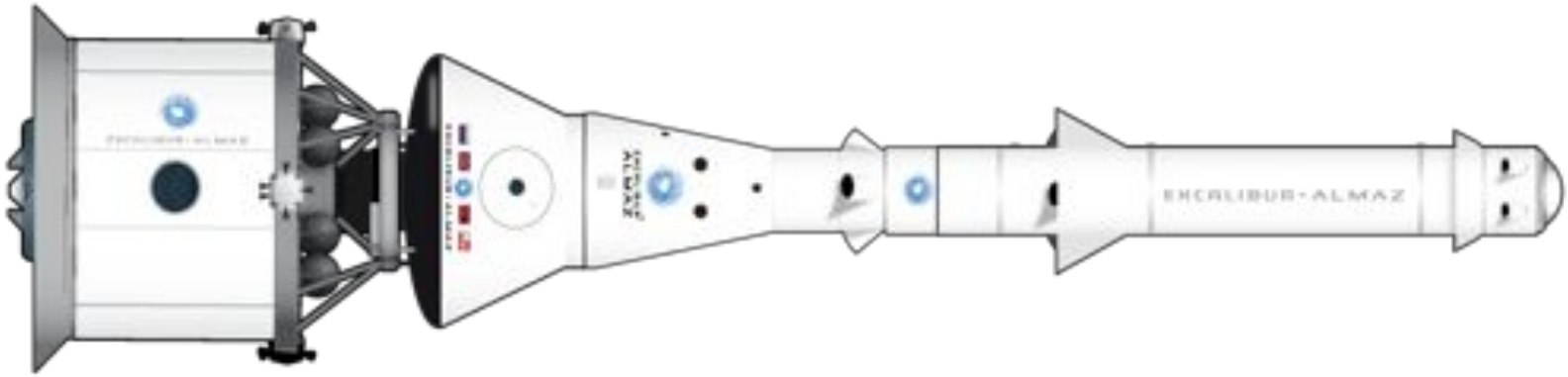
With best regards,

Pavel A. Shirokov
Deputy Director General

Excalibur Almaz's Approach is Unique

Our approach

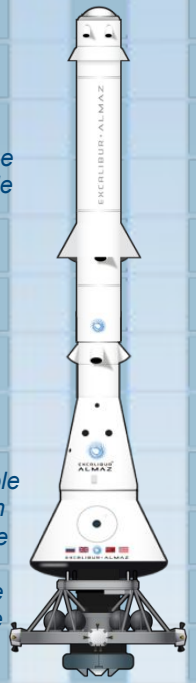
- Begins with proven hardware
- Progresses to develop a modular transportation system based on proven equipment and launch vehicle capabilities



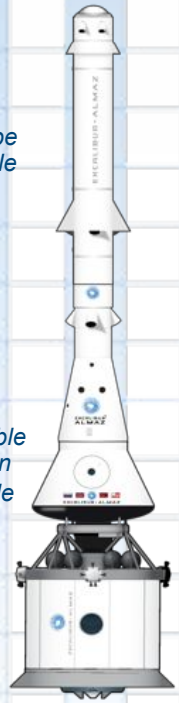
EA's Crew Transportation System for LEO is Based on a Modular Architecture Employing Proven Equipment and Design Methods

Spacecraft Modular Architecture

Crew Transport Configuration



Tourist Configuration



Pressurized Cargo Configuration

Pressurized & Unpressurized Cargo Configuration

This transportation system provides the lowest development risk approach to create the first step in the infrastructure needed to meet EA's vision of providing commercially viable business activities in space, including asteroid and lunar mining, research and lunar and planetary exploration.

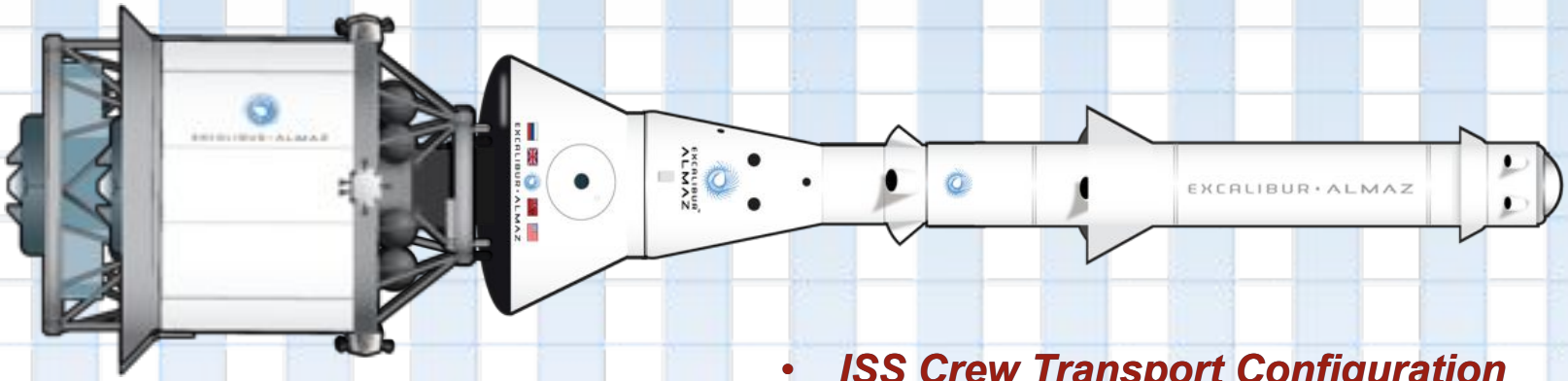
Capabilities

Spacecraft Modular Architecture

Pressurized/Unpressurized Module

Reusable Return Vehicle

Escape Module

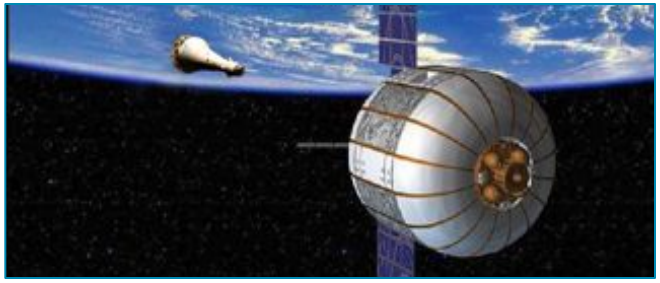


- *ISS Crew Transport Configuration*
- *Tourist Configuration*
- *Pressurized Cargo Configuration*
- *Pressurized & Unpressurized Cargo Configuration*

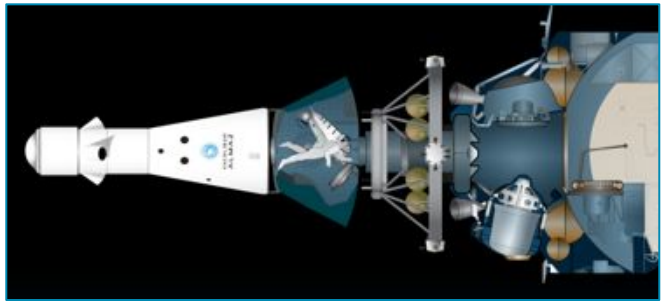
Markets

Unmanned affordable dedicated scientific research missions

- Affordable human transportation including tourism



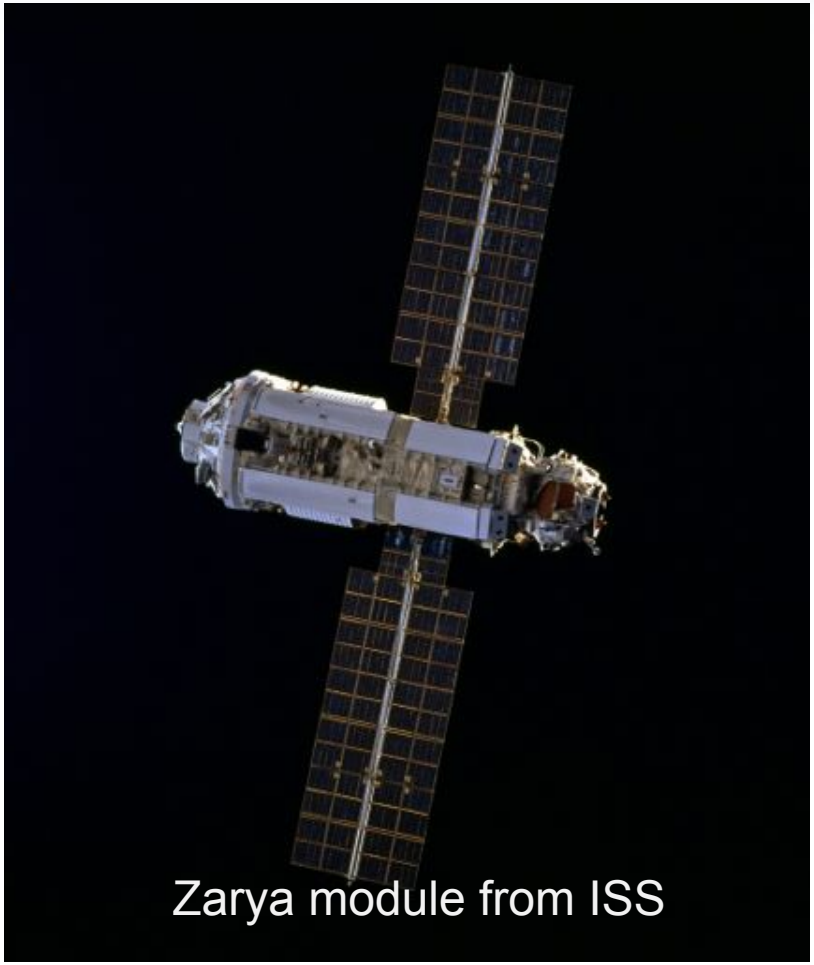
- Cargo delivery and return



- Chartered space exploration

EA Spacecraft for the Moon and Beyond

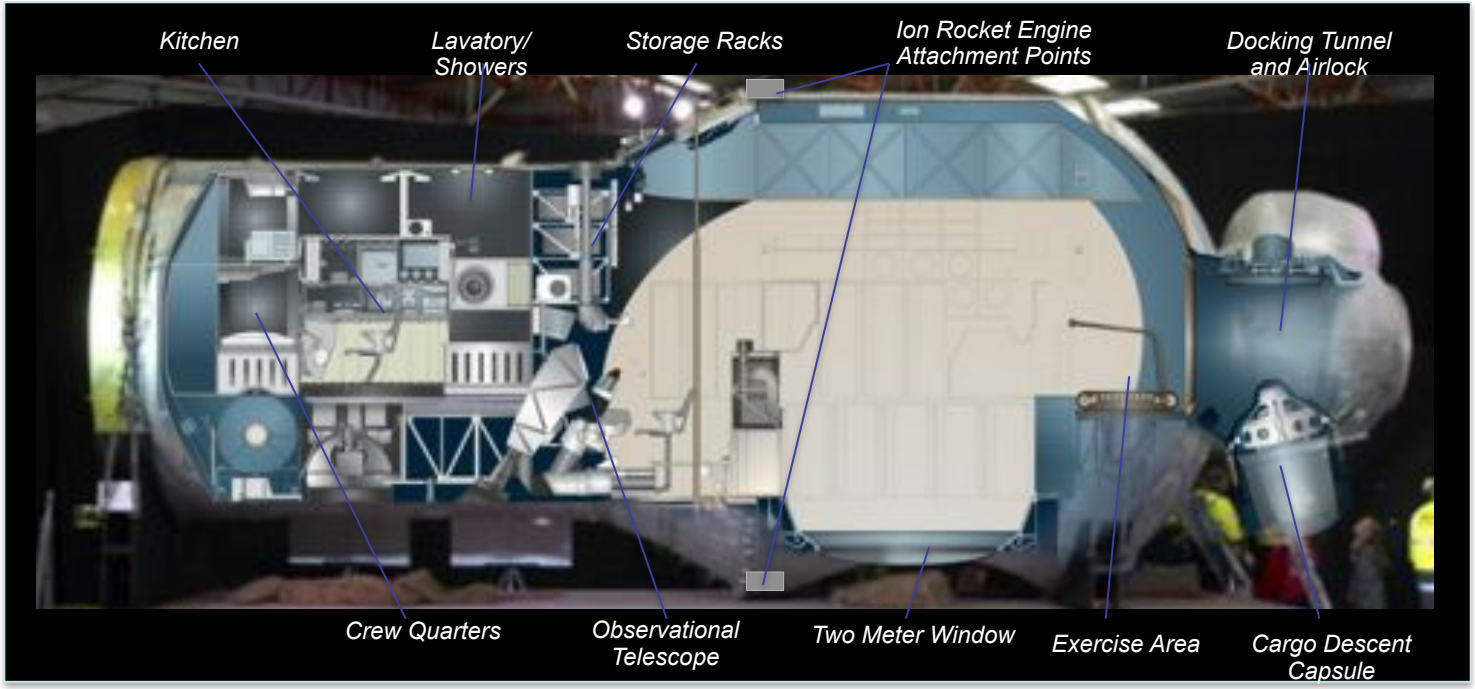
- **Two Space Station frames**
  - ~ 20 metric tons at launch
  - ~ 14 meters long
  - ~ 4.2 meters maximum diameter
  - ~ 90 cubic meters habitable volume
  - ~ 10 to 15 year useful life
  - Spacecraft are now at EA's facility on the Isle of Man
  - Similar space station frames have operated continuously in LEO for many years – e.g. the Salyut & MIR modules and the ISS Zarya module.



Zarya module from ISS

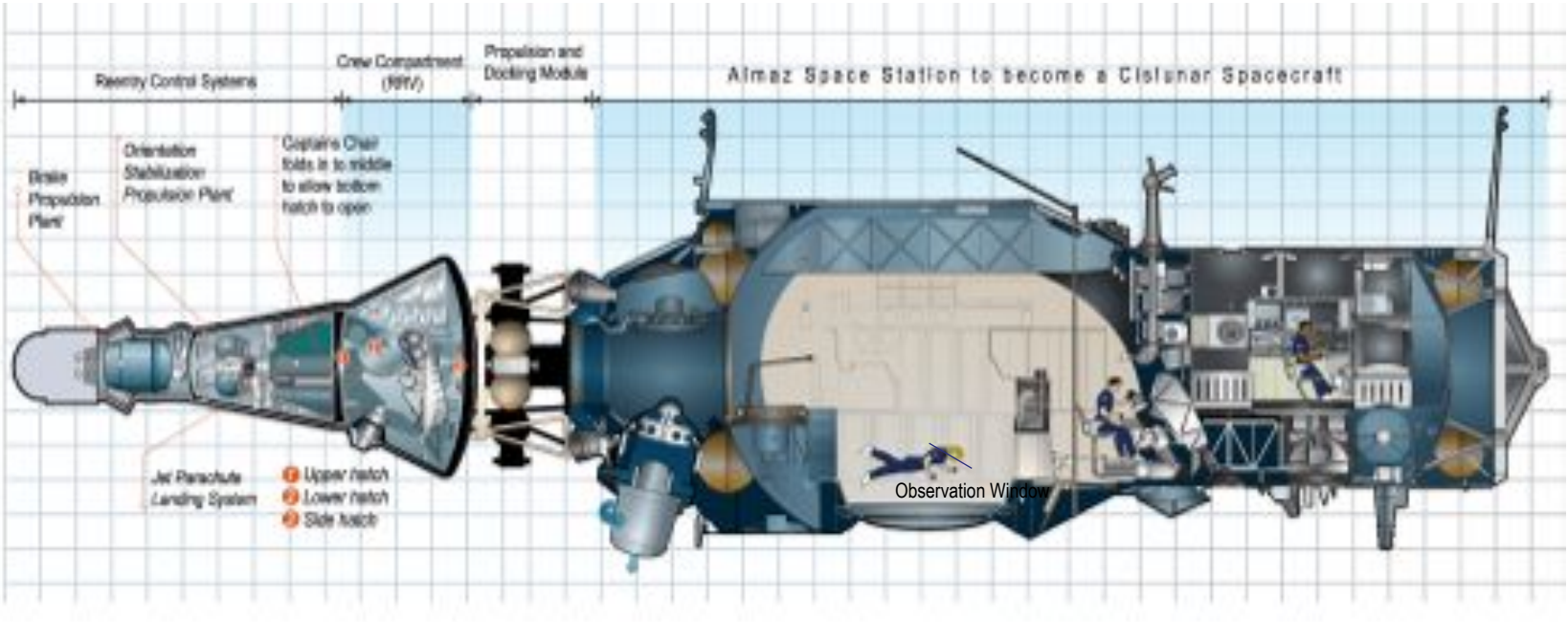
Our Space Station spacecraft modules are comparable to those utilized for MIR and ISS

- EA will verify flight readiness of our existing structures through non- destructive testing, upgrade on-board environmental control, flight control and communication equipment, provide required laboratory equipment and replace the original propulsion system with Hall thrusters, augmented by hypergolic/monopropellant fine attitude control thrusters
- Power will be provided by state of the art solar arrays and batteries

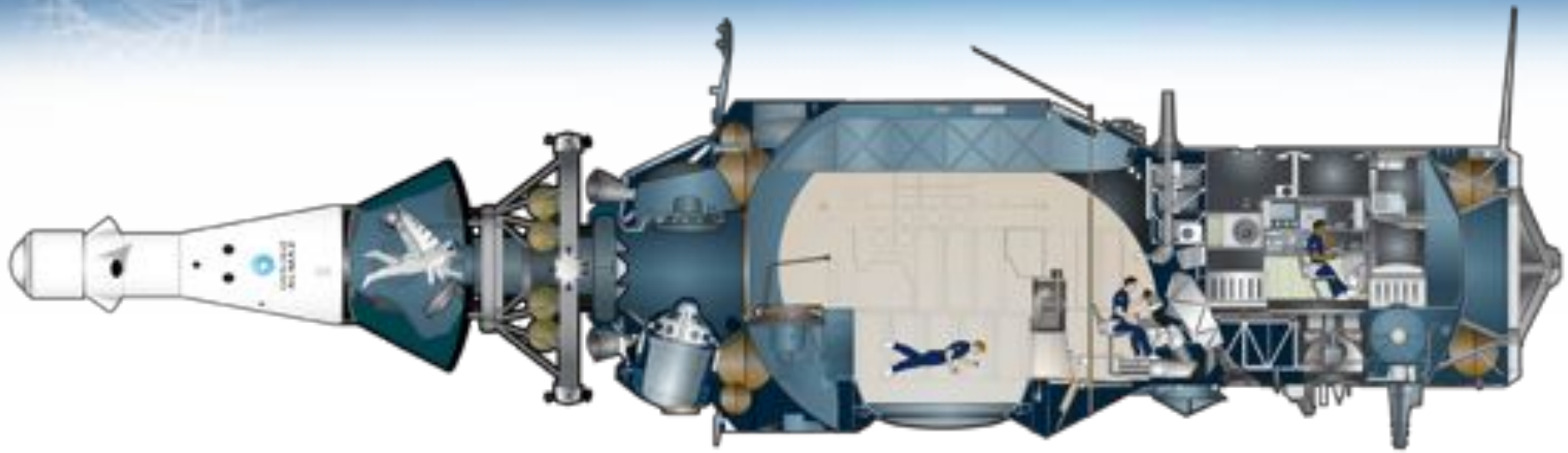


EA Business Objectives

- EA will upgrade and modify our current assets for long-term multi-purpose use
- EA will create a transportation system for products, payloads, logistic support supplies and crew between:
  - Earth and Low Earth Orbit
  - Earth Orbit and Moon/L2

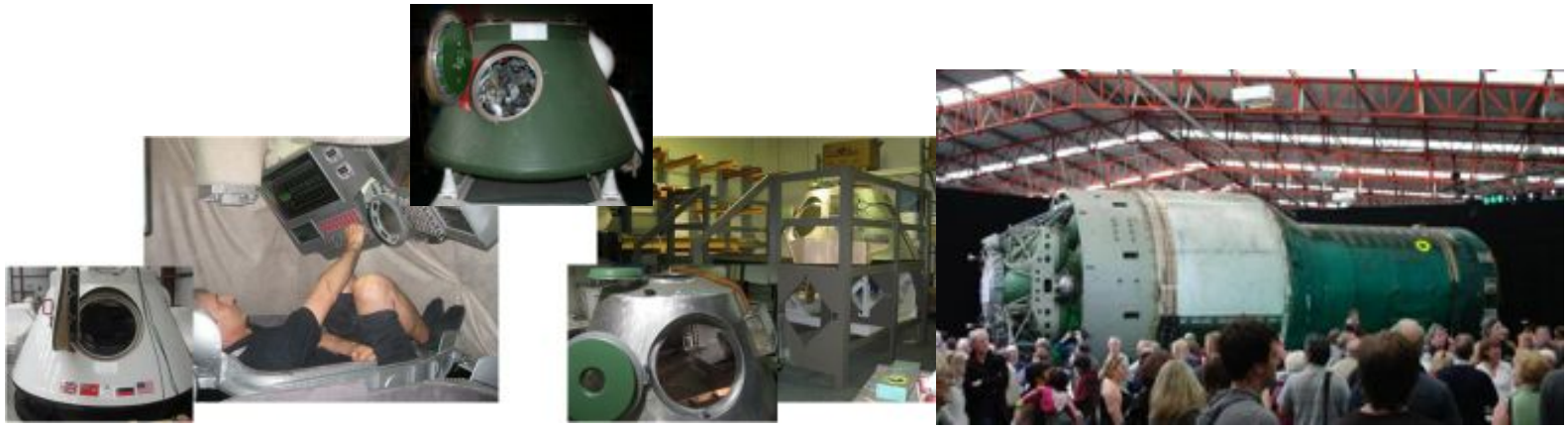


Future Elements of our Architecture



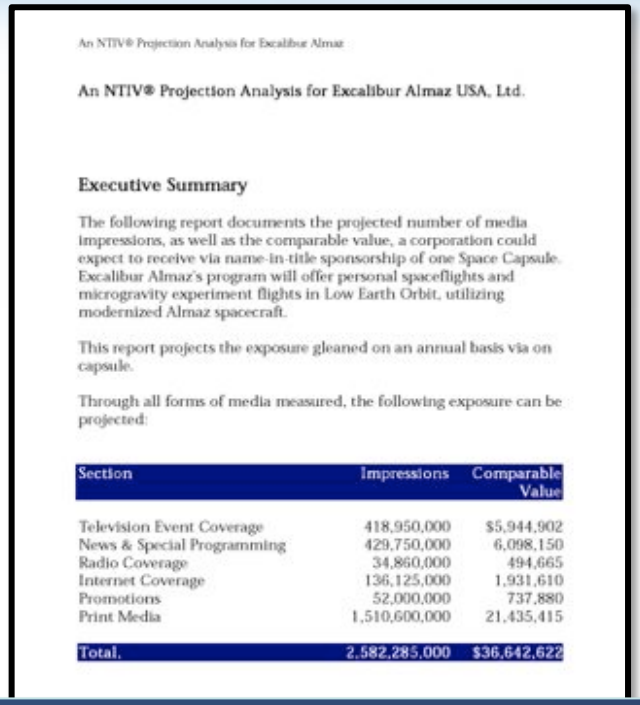
Conclusion

- Excalibur Almaz is a private, international space exploration company formed in 2005.
- The company will provide routine, affordable access to and from space for customers around the globe.
- Using updated and modernized proven legacy space systems and other state of the art technology, EA will offer transportation for purposes of exploration, research, and science.



BACK UP SLIDES

Joyce Julius Capsule Name-In-Title Sponsorship Analysis



An NTIV® Projection Analysis for Excalibur Almaz

An NTIV® Projection Analysis for Excalibur Almaz USA, Ltd.

Executive Summary

The following report documents the projected number of media impressions, as well as the comparable value, a corporation could expect to receive via name-in-title sponsorship of one Space Capsule. Excalibur Almaz's program will offer personal spaceflights and microgravity experiment flights in Low Earth Orbit, utilizing modernized Almaz spacecraft.

This report projects the exposure gleaned on an annual basis via on capsule.

Through all forms of media measured, the following exposure can be projected:

Section	Impressions	Comparable Value
Television Event Coverage	418,950,000	$5,944,902
News & Special Programming	429,750,000	6,098,150
Radio Coverage	34,860,000	494,665
Internet Coverage	136,125,000	1,931,610
Promotions	52,000,000	737,880
Print Media	1,510,600,000	21,435,415
Total.	**2,582,285,000**	**$36,642,622**

This report documents the projected value of name-in-title sponsorship. It values the Excalibur Almaz space capsule for one year at $36,642,622. through all forms of media measured, including television coverage, news and special programs, radio and internet coverage, sponsor promotion, print media and NTIV methodology.

Joyce Julius Space Station Name-In-Title Sponsorship Analysis

An NTIV® Projection Analysis for Excalibur Almaz

An NTIV® Projection Analysis for Excalibur Almaz USA, Ltd.

Executive Summary

The following report documents the projected number of media impressions, as well as the comparable value, a corporation could expect to receive via name-in-title sponsorship of the Space Station. Excalibur Almaz's Space Station will boast the largest window ever found on a spacecraft. Furthermore, it will support several people in orbit for extended periods of time, as well as offer "fly free" periods, producing a remote control, microgravity laboratory.

This report projects the exposure gleaned on an annual basis.

Through all forms of media measured, the following exposure can be projected:

Section	Impressions	Comparable Value
Television Event Coverage	348,600,000	$4,946,634
News & Special Programming	403,750,000	5,729,213
Radio Coverage	52,290,000	741,995
Internet Coverage	121,000,000	1,716,990
Promotions	52,000,000	737,880
Print Media	1,456,000,000	20,660,640
Total.	**2,433,640,000**	**$34,533,352**

The value a sponsor could expect to receive via a name-in-title sponsorship on an Excalibur Almaz' Space Station is $34,533,352. annually.

Media measured was television, event coverage, news and speech programming, radio coverage, internet coverage, promotions, and print media.

Services Offered

***3a. Microgravity Science Flights to LEO lasting 5-15 days*.**

- Excalibur will utilize its Reusable Reentry Vehicle (RRV) outfitted as a lab to provide “free-flyer” Micro-g Lab for microgravity science flights to LEO. The service will include end-to-end integration services for the transport of customer payloads to and from low Earth orbit. Preparing a science experiment or cargo element for flight in space can be an overwhelming task. EA's team of payload experts, along with proven and simplified processes, lead EA customers from experiment design and integration through launch, on-orbit operation, and return. Our team will provide customer-friendly services that are tailored to client needs, be they operationally simple or technically complex.

$ 150,000.00 per kilogram at 1500 kilograms is $225M per capsule lab flight.

Services Offered (cont'd.)

3b. Human Transportation and Microgravity Science Flights to LEO

Excalibur will utilize its Reusable Reentry Vehicle (RRV) as the human transportation "capsule" with a new "habitation/service" module (developed by EADS) for human and microgravity science flights to LEO. The service will include end-to-end integration services for the transport of humans and customer payloads to and from low Earth orbit. Preparing an astronaut for flight in space can be an overwhelming task. EA's team of astronaut trainers, along with proven and simplified processes, lead EA customers from mission design to, flight training and integration through launch, on-orbit operation, and recovery of the flight crew and payloads. Our team will provide customer-friendly services that are tailored to client needs, be they operationally simple or technically complex.

$150,000.00 per kilogram at 2000 kilograms is $300M per flight PLUS 3 seats at $65M per seat is $195M for a total of $495M per flight

Services Offered (cont'd.)

3c. L2 station and ferry flights

Excalibur Almaz owns two Salyut class space station frames flight units that can be modernized, outfitted and deployed to Earth – Moon L2. By leveraging previous capital investments in space qualified systems we can provide an affordable and timely entry into the L2 marketplace. Combined with our Reusable Reentry Vehicle (RRV) and the new intermediate stage we will be able to provide transportation to and from our L2 station.

$150,000.00 per kilogram at 3000 kilograms is $450M per flight PLUS 3 seats at $150M per seat is $450M for a total of $900M per flight

Services Offered (cont'd.)

These conditions will allow us to address the L2 marketplace. There are various service and markets that we will address from L2 namely:

1. Development & certification of deep space operational capabilities at a location that offers ready Earth return. **$150M per docking or test**
2. Serve as assembly point for large space structures.
3. Conduct lunar support operations.
4. Off-Earth sample return quarantine & aggregation facility.
5. Communications & navigation node services.
6. Platform for science from unique L1 or L2 location.
7. Delivery of satellites to L2. **$75M per delivery**
8. Delivery of payloads to lunar surface. **$350M per delivery**
9. Node for media education & public outreach.

Services Offered (cont'd.)

3d. Advertising, branding and promotional opportunities

Businesses spend more than $520 billion on branding and advertising each year, with $7 billion spent on promotional campaigns. Excalibur will address opportunities in the advertising, branding and promotional markets.

Some of the options we will explore are:

- Mass/social media and other promotional opportunities
- Sponsor coverage on TV, radio, print and other media opportunities involving Excalibur Almaz
- Sponsor name & logo placement on our spacecraft and missions
- Sponsor name & logo placemen promotional items, event advertising, signage
- Sponsor promotion on EA website/social media

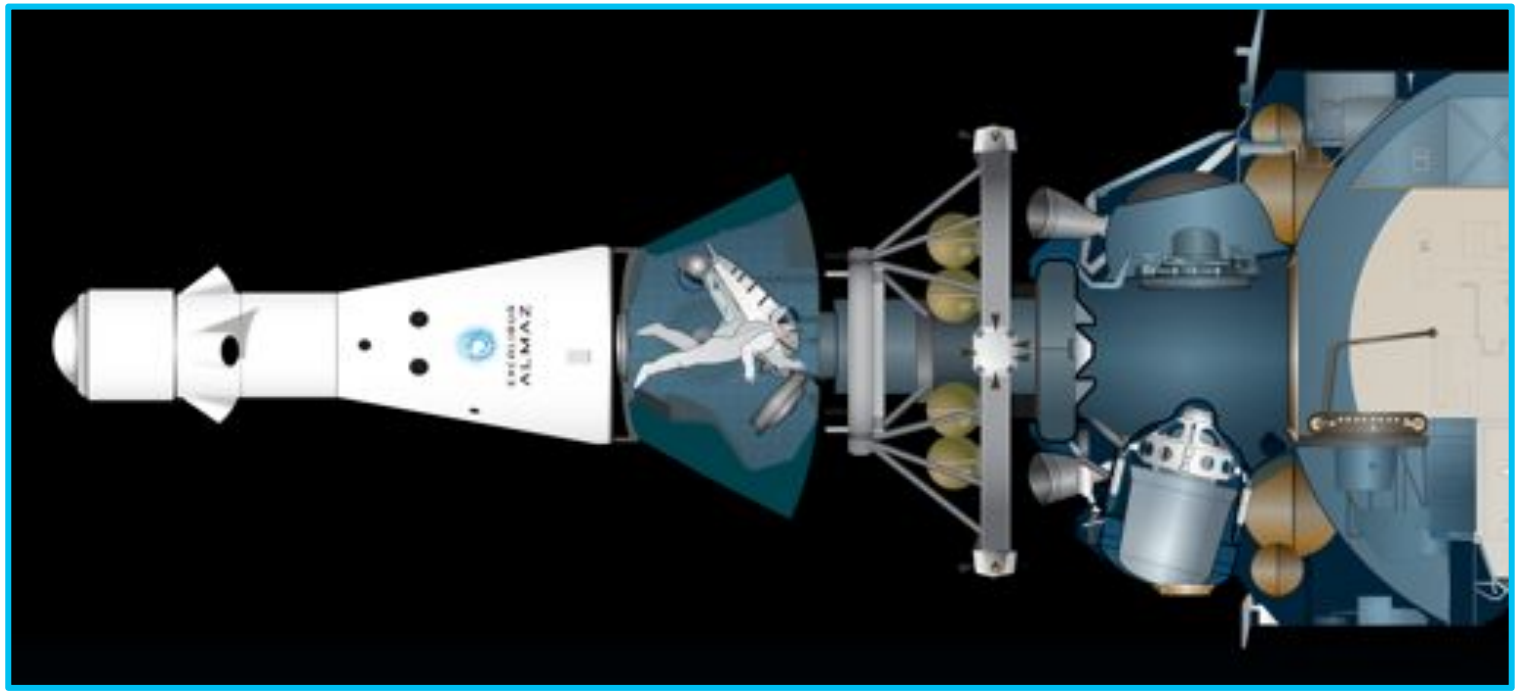
Excalibur Almaz Approach

- Excalibur Almaz approach is to leverage the billions of dollars of past investment by spacefaring nations and apply advanced technology on an as needed basis to develop a space architecture that provides efficient access to space for commercialization, research and exploration.

EA Business Objectives (Cont'd.)

Exploration and Scientific Research

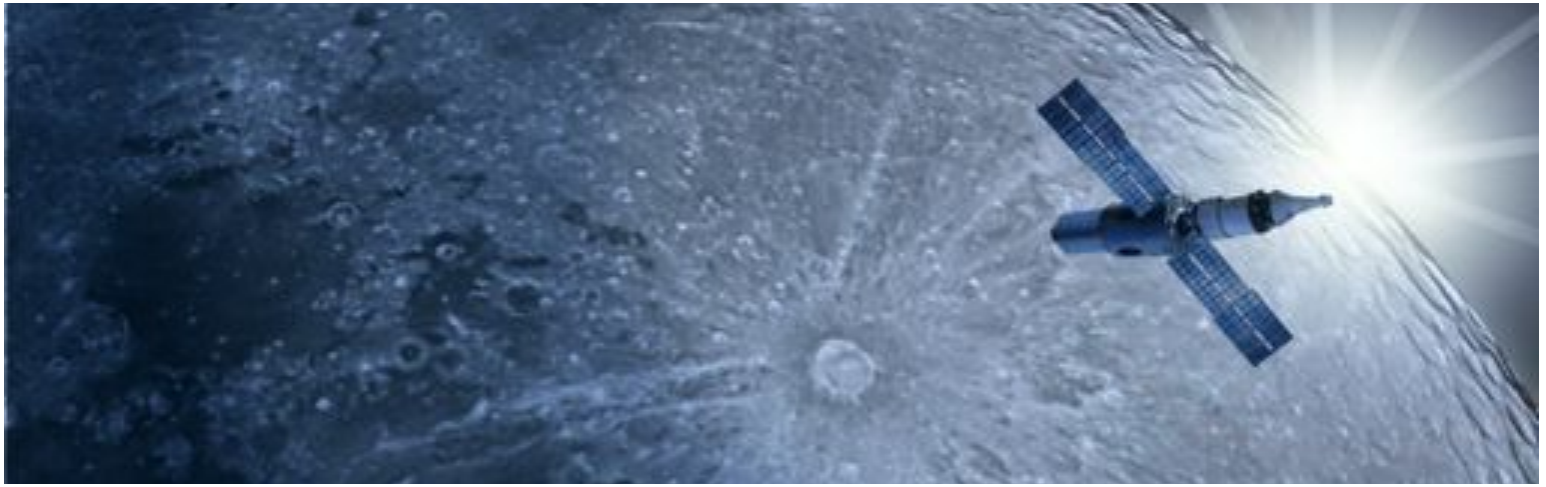
- Provide facilities within the L2 Station and transportation spacecraft to support exploration and scientific research including:
  - Ability to launch and retrieve Lunar and L2 payloads, remote sensing capability, laboratory facility



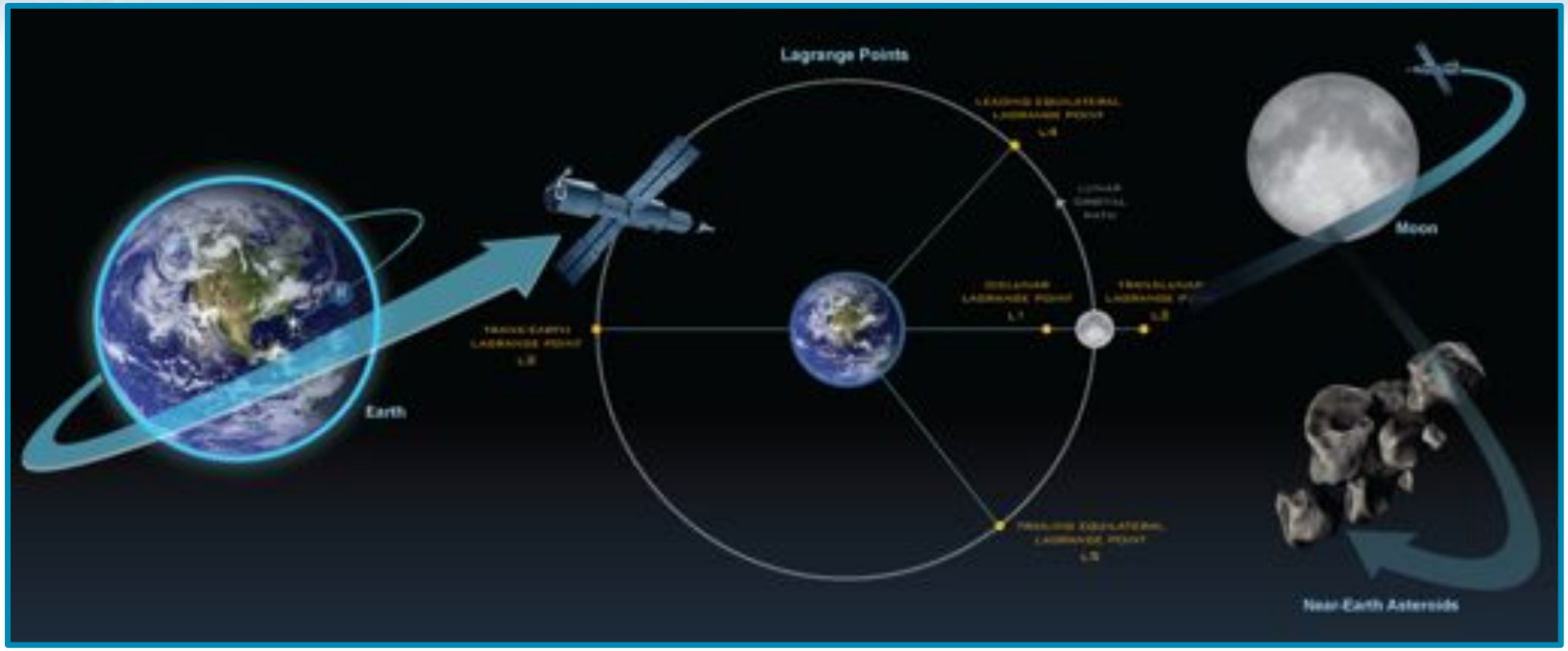
Excalibur Almaz's Approach is Unique

Our approach (cont'd.)

- Utilizes our space station pressure vessel to provide:
  - crew/autonomous access to low earth orbit, lunar transfer orbit, low lunar orbit, L2 and beyond for all forms of space commercial activities



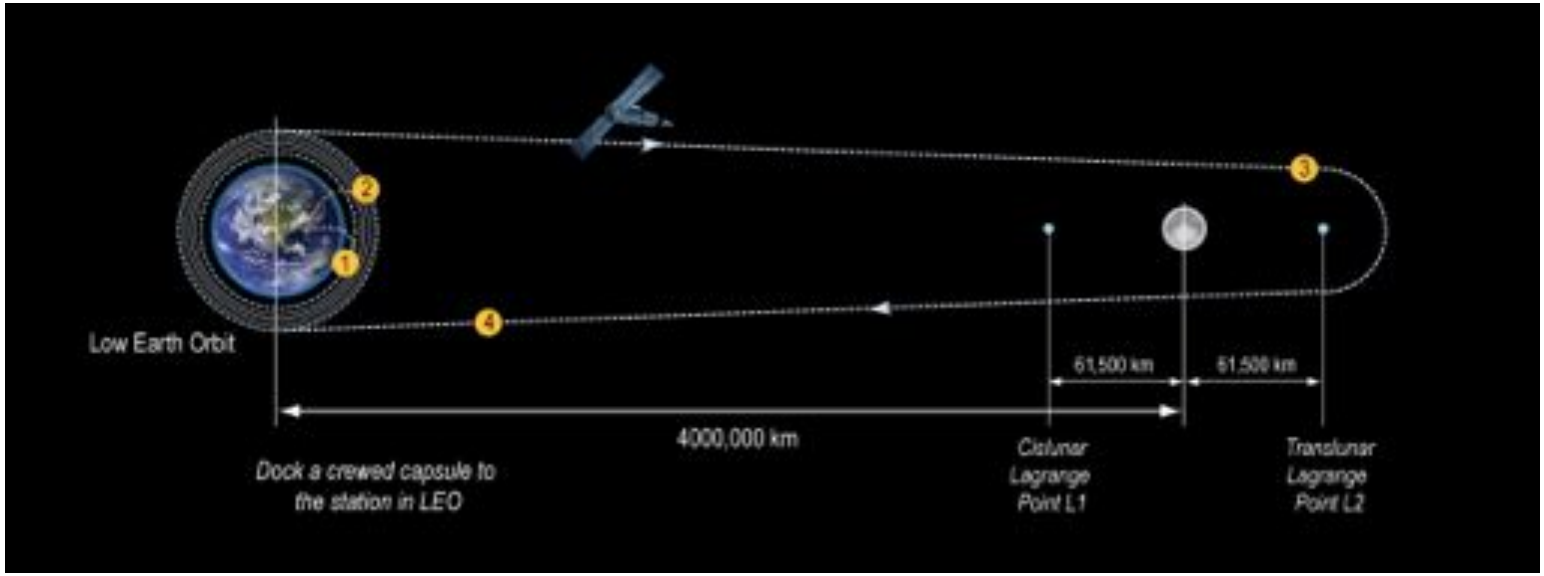
Mission Examples



- **Once the mission configuration is complete, the spacecraft is ready to leave Earth's orbit and begin its Lunar and/or Lagrange Point 2 orbit.**
- **Excalibur Almaz lunar missions will make use of gravity-stable destinations beyond Low Earth Orbit called Lagrange Points as possible staging areas for construction, fueling and extended exploration of the moon, asteroids and other destinations.**
- **Lunar missions will provide never-before-seen views of the moon and allow extremely close observations, lunar surface experiment delivery and even tether-enabled sample gathering on the moon's surface.**
- **Excalibur Almaz missions will also allow for near-Earth asteroid observation and exploration. During missions these asteroids can be analyzed, claimed and eventually mined to help supply the planet's ever-growing resource and energy needs.**

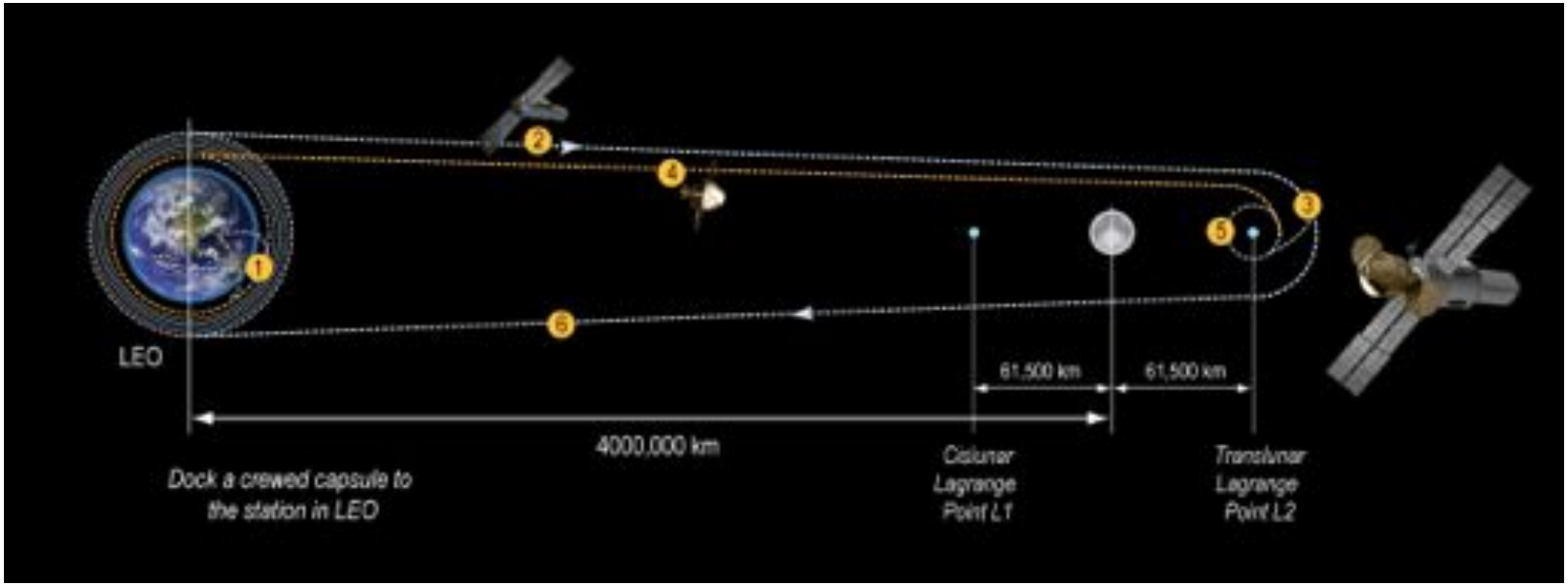
Earth – L2 Moon with Crew All the Way

1. Launch space station spacecraft outfitted for Earth – L2 cycle into LEO
2. Launch, rendezvous and dock a crewed capsule to the station in LEO
3. Utilize low energy spiral transfer orbit for transfer to L2 of combined docked spacecraft
4. Return to Earth using slow trajectory. Upon Earth arrival, capsule separates and returns crew, other payloads returned to Earth and Station is placed in a temporary circular orbit, then begins return trip to L2



Earth-L2 Crew Arrives at Lunar Orbit

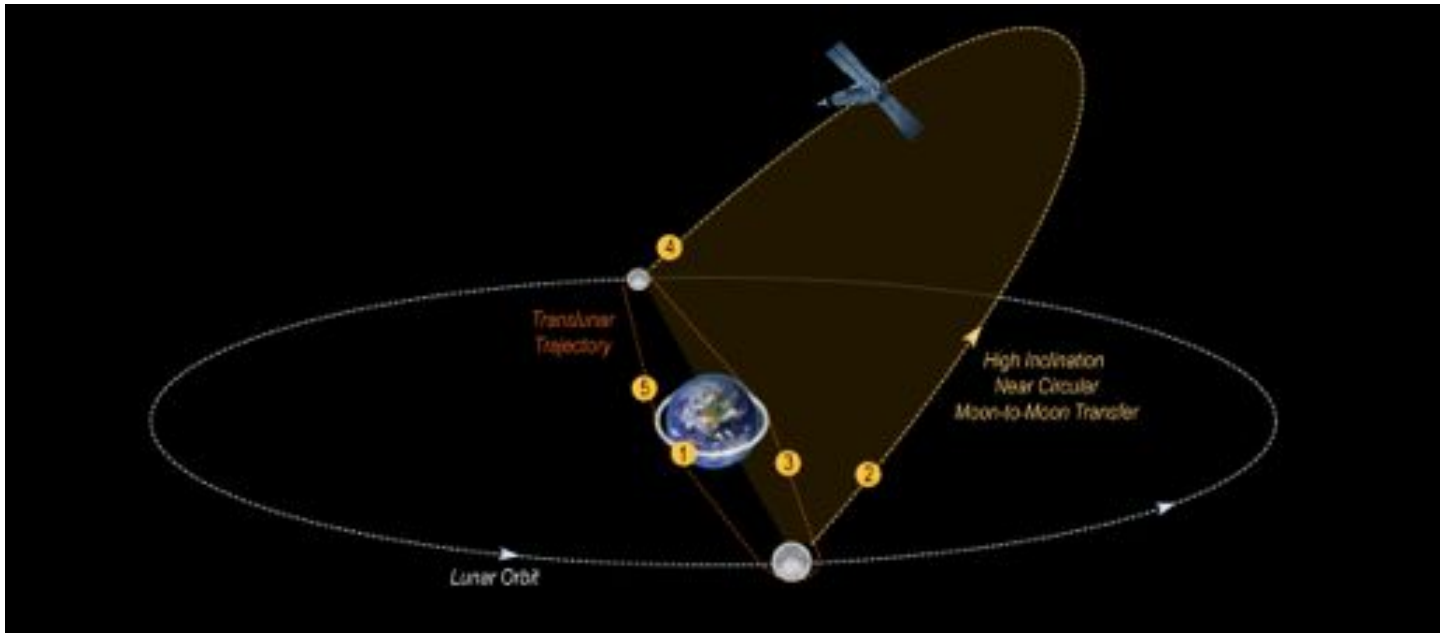
1. Launch space station spacecraft outfitted for Earth – L2 cycle into LEO
2. Utilize low energy spiral transfer orbit for transfer to L2 of space station/spacecraft (~2 years)
3. Once space station/spacecraft arrives at L2 and is placed in a parking orbit, launch a crewed capsule to LEO
4. Verify operational status of crewed capsule and use a traditional chemical injection stage and Hohmann transfer technique for a rapid trip to L2 (~4 days)
5. Rendezvous and dock with spacecraft at L2 and perform crew portion of mission
6. Return from L2 in a similar manner – Spacecraft takes spiral trajectory, capsule follows direct path to earth (~4 days)



Earth-L2 Moon to Moon Transfer Orbit

Cycle the Moon Twice a Month

1. Launch space station spacecraft outfitted for Earth – L2 cycler orbit into LEO
2. Utilize low energy spiral transfer orbit for transfer to Earth-Moon cycler orbit to fly by the Moon every two weeks.
3. When the spacecraft in cycler orbit flies past the Earth (once per Lunar month), launch a crew capsule to the Space Station
4. Rendezvous and dock the crew capsule with the station spacecraft in cycler orbit and perform crew portion of mission (includes two passes near the moon.)
5. When the combined spacecraft fly by the Earth in cycler orbit in one Lunar month; undock and de-orbit the crew capsule; launch the next mission's crew capsule, rendezvous and dock
6. Perform next mission.



EA will purchase the most cost effective launch service

- Current analysis shows our crew/ cargo spacecraft appears compatible with several operational vehicles including:
  - Atlas V, Falcon 9 and Zenit
- Immediate candidate launch vehicles for EA's space station class spacecraft are:
  - Proton, Delta IV, Atlas V Heavy, Ariane V
- EA continues to monitor the development of other emerging launch vehicles for our applications

Excalibur Almaz Approach (Cont'd.)

- To achieve our vision EA continues work on its commercial interests while supporting NASA's Commercial Crew Development program through an unfunded Space Act Agreement focused to establish the capability to deliver crew on a commercial basis to the International Space Station.

Mission Critical Elements are at Technology Readiness Level 9:

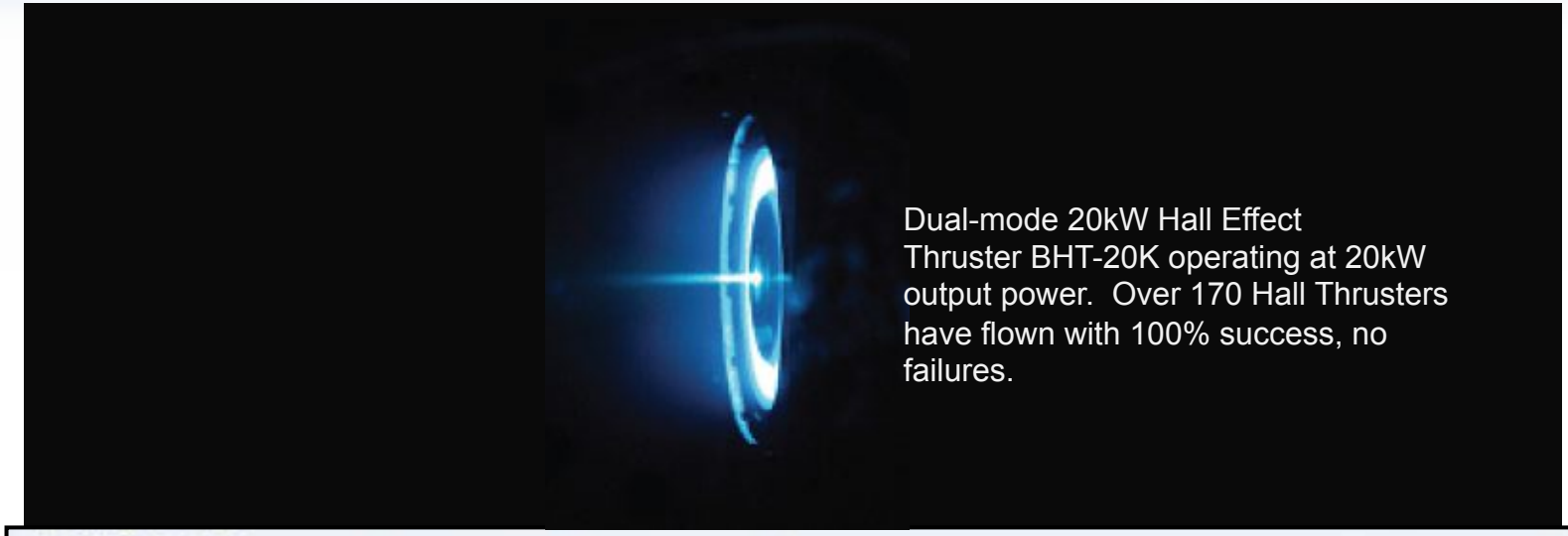
Spacecraft Aerodynamics, Thermal Shield, Deorbit and Landing Rocket Motors, Emergency Escape System, Landing System, Parachutes and Pyrotechnic Devices

Human Space Vehicle	TRL Status	Human Space Vehicle	TRL Status
HSV		**Reusable Reentry Vehicle (continued)**	
Emergency Escape Motor	9	Pilot control panels	5
Retro Rocket Retainer	9	Manual controls	5
Retro Rocket	9	Radio complex	6
Nose Compartment		Pyro/separation devices	9
Structure and thermal protection	9	Electrical power generation system	6
Attitude Control Subsystem	9	Crew Equipment	5
Nose Compartment Separation motor	9	Stability augmentation system	9
Avionics	6	Balance weights	n/a
Thermal shield	9	**RRV Equipment Fairings Jettisoned**	
Pyro/separation devices	9	Front fairing	9
Search and communications radio equipment	9	Wire tunnel fairing	9
Telemetry equipment	6	**Intermediate Stage (IS)**	
Depressurization and drain system	9	Structure and ground/pad umbilicals	5
Parachute and Landing System		Propulsion system	6
Parachute system	8	ECLSS components	5
Soft Landing Engine (SLE)	9	Tunnel	5
JPLS frame with parachute release unit	9	Docking Mechanism	5
Reusable Reentry Vehicle		Docking Electronics	5
Structure and thermal protection	8	Batteries	7
Equipment and cargo mounts	8	Fairing	5
Crew	n/a	Adapter	6
Shock-absorbing seats	8	**Ground and Flight SW**	
LSS and temperature-control system, thermal shield	5	Ground SW	5
Spacesuit ventilation and temperature control system	5	Flight SW (Post LV sep.)	5
Onboard Control Complex (OCC)	6		

Key: 9 | 8 | 7,6 | 5 | 4,3,2,1

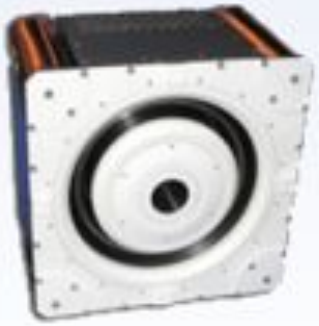
EA01C842v3

Busek 20kw Hall Thruster Manufactured in USA



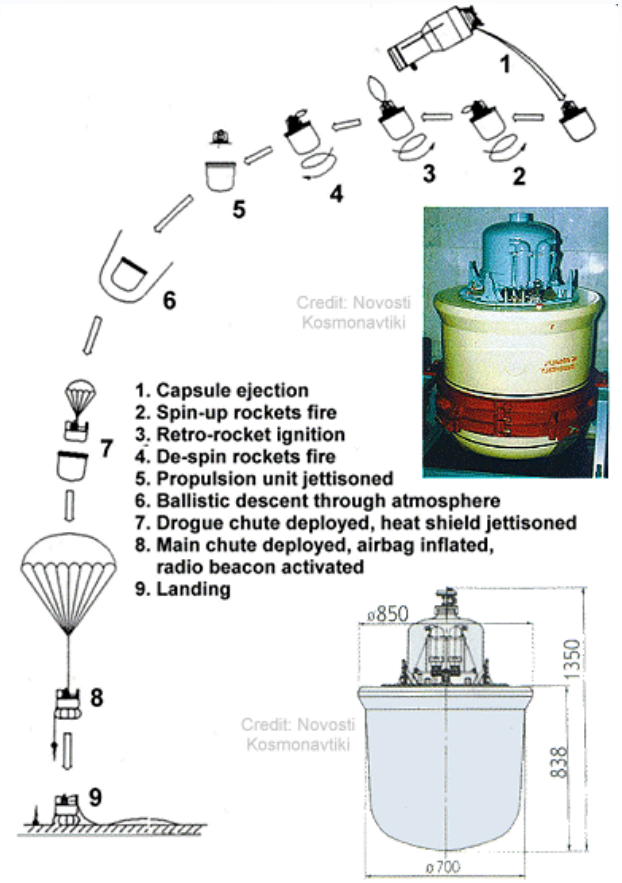
Dual-mode 20kW Hall Effect Thruster BHT-20K operating at 20kW output power. Over 170 Hall Thrusters have flown with 100% success, no failures.

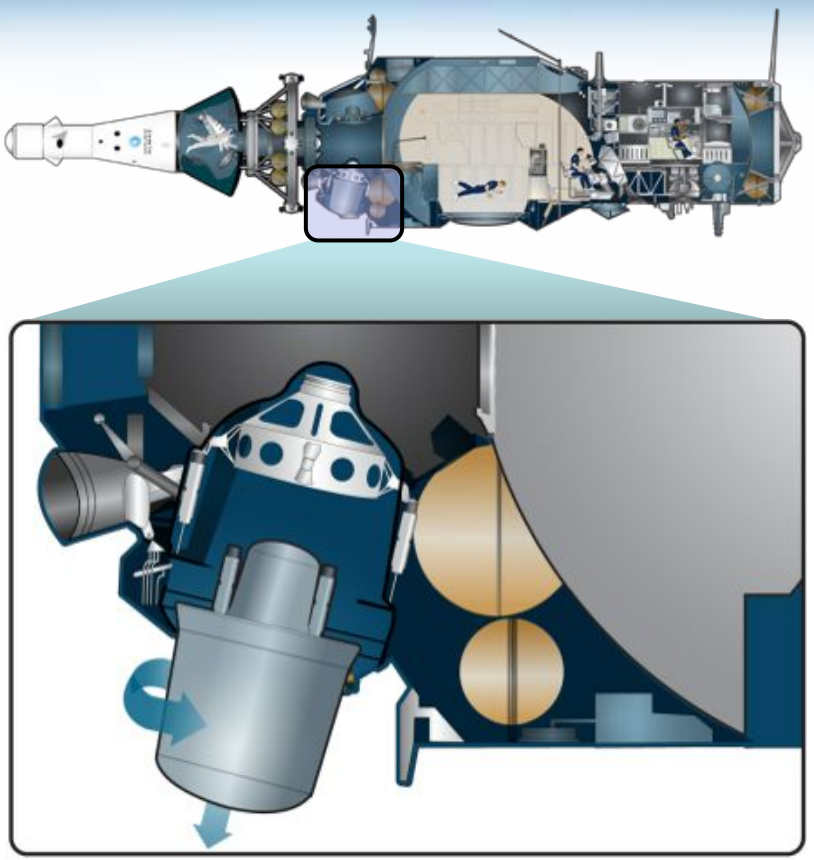
BHT-20k



Discharge Input Power	20 kW
Discharge Voltage	500 V
Discharge Current	40.5 A
Propellant Mass Flowrate	40.0 mg/sec
Thrust	1.08 N
Specific Impulse	2750 sec
Propulsive Efficiency	70.0%

128kg Cargo Descent Capsule





Descent Capsule Detail

Experimental results and other cargo could be returned to Earth for analysis using this space proven ejection and recovery system.