X PRIZE Team Summary Sheet
MICRO-SPACE, INC.

All the information given in this document has been cleared for official release by the X PRIZE Foundation and the Micro-Space team. Quotes provided by Micro-Space are shown in italics. For more information about or if you have questions about Micro-Space, please visit their web site at www.micro-space.com.

TEAM OVERVIEW

Micro-Space is located in Denver, Colorado, USA, and has 2800 square feet in the primary office/lab building. They have open space for radio tracking tests and a motor test area on an industrial site. Micro-Space includes the following facilities:

- A prototype fabrication shop suitable for bread-boarding instrument systems and rocket components.
- Several high vacuum systems suitable for testing components in the space environment.
- Hydrostatic pressure systems for production testing of our tanks, and various composite fabrication tools.
- Chemistry lab is equipped to assay hydrogen peroxide and Permanganate solutions.
- Electronics shop includes analog and digital oscilloscopes, RF generators, counters, RF voltmeters and spectrum analyzers.
- Equipped to fabricate and assemble prototype PCBs. A supply of components, DVMs, power supplies and tools supports this work.

TEAM LEADER BACKGROUND

Richard Speck, a licensed radio operator in 1957, was receiving the Sputnik 1 signals and has been involved in amateur rocketry since he was a charter member in the National Association of Rocketry in 1958. His background in physics and electronics led to work in pulmonary physiology research at the University of Colorado Medical Center. He is a member of the Experimental Aircraft Association and has his pilots license. Mr. Speck founded the corporate predecessor to Micro-Space to manufacture electro-optic instruments. In 1991, he began designing low-cost, modular rocketry which has evolved into his X PRIZE entry.

DATA AT-A-GLANCE

TEAM SPECIFICATIONS

- Name: Micro-Space, Inc.
- Leader: Richard Speck
- Place: Denver, Colorado, USA
- Registered with X PRIZE: 14 January 2003
- Web: www.micro-space.com

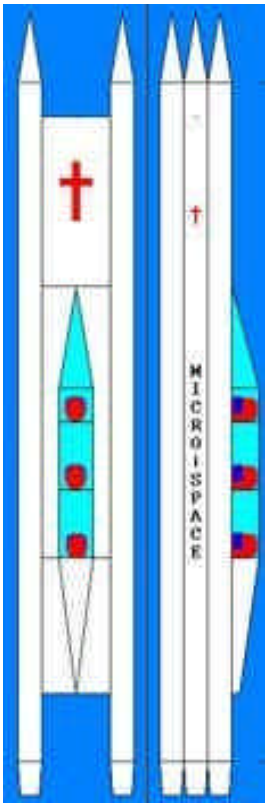
VEHICLE SPECIFICATIONS

- Name: Crusader X
- Diameter: Approximately 5 feet
- Height: Approximately 25 feet
- GTOW: Approximately 5,000 lb_m
- Dry Weight: Approximately 600 lb_m
- Crew Environment: To be determined.
- Payload Capacity: 270 kg
- No. of Engines: TBD
- Propulsion System: Pressure fed
- Fuel: Methyl Alcohol
- Oxidizer: Hydrogen Peroxide
- Total Thrust: Approximately 12,000 lb_f
- Reaction Control System: Thrust deflector vanes.

MISSION SPECIFICATIONS

- Ascent Method: Vertical take-off from ground
- Max. Accel. Force on Ascent: 4 G
- Alt. at Engine Cut-off: 40 km
- Time at Engine Cut-off: 60 seconds
- Max. Speed: Approximately 4,000 feet per second
- Max. Altitude: 120 km
- Time in Weightless Conditions: 4 minutes
- Reentry Method: Ballistic, ballute reentry
- Accel. Forces on Descent: Approximately 3-4 G
- Landing Method: Parafoil deployed at 10 km
- Total Duration: Approximately 15 minutes
- Landing Distance from Take-off Location: TBD
- Time Between Missions: 1-2 days

VEHICLE/LAUNCH SYSTEM DESCRIPTION



The Crusader X uses a lightweight core frame with seats and windshield resembling a bobsled or undersea sled. Propulsion modules are strapped onto the sides which are retained for the entire flight. Life support equipment is worn by the crew. The core holds the attitude control jets, tiny flight controller, and parachute packages. The equipped crew will make up half the empty weight of this craft.

PROPULSION SYSTEM

Each propulsion module includes bipropellant tanks, valves and rocket motor. They can be built with no moving parts, and all achieve stable thrust in the launch tower before a commitment to flight. High strength composite tanks allow use of a simple pressure fed system with good mass ratio. The nontoxic hydrogen peroxide/alcohol system is stable and well proven.

Twenty of the present X long fuel tanks will be sufficient for one man X PRIZE competition flights.

Clusters of 300 to 500 pound thrust engines will be sufficient to power the X PRIZE flights. Larger units are an option for the X prize effort. The craft will fly to a landing with para-plane, ultra-light parafoils.

MISSION DESCRIPTION

The CRUSADER X is not an airliner. Motivated individuals will find these flights comparable to extreme adventure travel or research diving. The most critical flight step will be donning, sealing and testing the Personal Life Support unit with backup parachute, communications, and GPS gear.

Following this checkout the individuals will be hoisted and eased into acceleration seats. The rocket assembly will be at an intermediate angle to facilitate fuel and passenger loading. Primary control will be automated. Backup control will be a ground team with radio links. The occupants will have abort options.

VEHICLE ASCENT

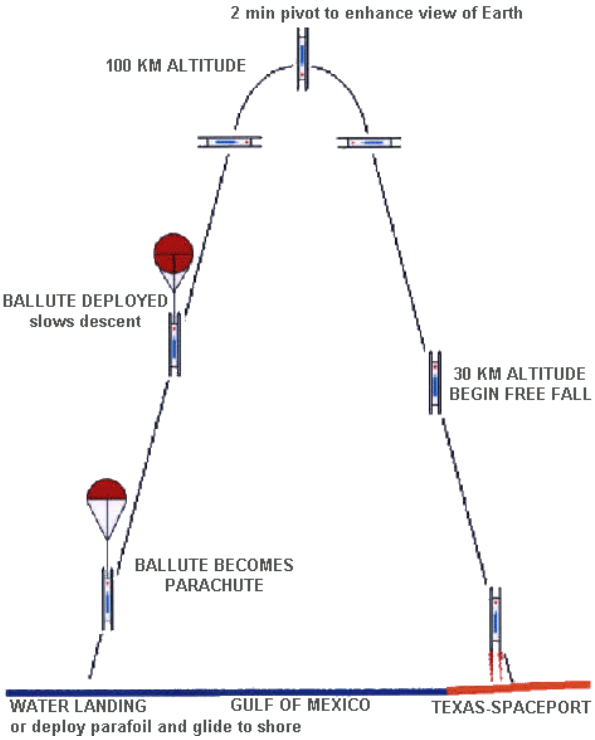
Once the windshield is latched into place over the occupants, the rocket is angled up to vertical. The ignition sequence includes warm-up and stabilization of all of the propulsion modules (including the attitude jets). After ten seconds of engine burn, the clamps are blown and the rocket lifts off with 4 Gs of total thrust. The X version will thrust for sixty seconds, ending 40 km up, and will coast to 120 km in another two minutes. The sky is dead black, the horizon lies over 700 miles distant, and mountains are insignificant.

WEIGHTLESSNESS

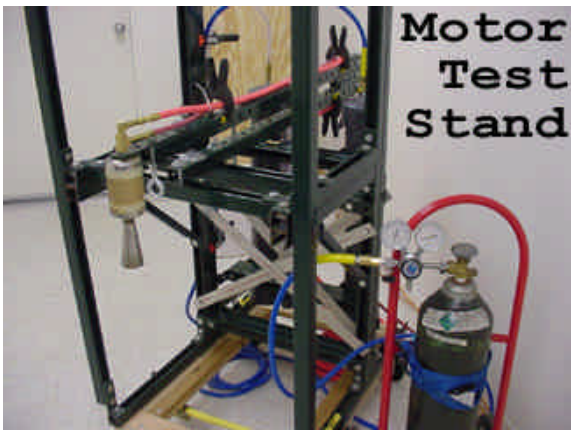
After 240 seconds, free fall will end as a ballute (an inflated 'balloon-parachute' to provide controlled drag) begins to slow the descent.

VEHICLE DESCENT AND LANDING

At 10 km the parafoil is deployed, inflates and is flown to a controlled landing near the launch site. Direct descent into water is possible using the ballute as a parachute.



HARDWARE & TESTS



The following hardware and testing has been built or completed to date:

- Crew cabin mock-up has been built for sizing and detail design.
- Half scale model of the crew cabin (center frame) is now becoming an operational hover test model.
- 25 pound thrust liquid fuel motors have been run with hydrogen peroxide and methyl alcohol propellants.
- Four launches in 2002 have validated the integration of the liquid fuel motors, fuel tanks and other flight systems components, including telemetry and ground support systems.
- Twenty flight qualified fuel tanks are in stock.
- Flight ready liquid fuel motors are in stock.
- Four rockets are flight ready for high altitude tests.
- An instrumented 500 pound thrust test stand is ready for use.
- Flight testing of the control system is planned for early 2003.
- A large cluster of small motors will allow manned test flights in 2003.
- Approximately 1000 lightweight fuel tanks have been made and hydrostatically tested.
- One hundred of the tanks would hold the fuel needed for the X PRIZE flights. This number can be produced in four months.

PUBLICITY

PERSONAL APPEARANCES

- None yet disclosed.

TELEVISION AND RADIO

- None yet disclosed.

PRINT MEDIA

- None yet disclosed.

TEAM BACKGROUND

TEAM MEMBERS

- Mladen Martinovic, Senior Composite Materials Technician
- Vladimer Gulyan, Electronic and Composite Materials Technician
- Nancy M. Speck, Administration
- Bruce Bahnmiller, Associate Electronic Engineer
- Dave Gianakos, Pilot Consultant

X PRIZE QUOTE

“The anomaly of governments dominating transportation technology and controlling access to the final frontier is ending. The Entrepreneurial Space Age has begun. The X Prize is a sunburst which reveals the myriad efforts in workshops around the world and will empower these to accelerate their work. Thank God that the X Prize Foundation has made it possible for humanity to see and believe that the shores of space are not an impossible barrier, and to know that they themselves could be among the many who travel beyond them. Adventure travel, beyond the atmosphere, is less than the tip of an iceberg. Participants, and spectators, will fund the next steps. The Orbital Highlands await, and the Lunar Continent. Prophecies about the exhaustion of Earth's resources will become a distant memory - studied by historians. Near Earth asteroids alone will provide mountains of resources for the benefit of all.”
– Richard Speck

PHILOSOPHY

“Space-flight pioneers won't insist on comfort: like mountaineers or divers, they will wear special gear

and learn necessary skills. The Manned Maneuvering Unit proved that compact life support systems were adequate for hours in space. A million SCUBA divers prove the same in more dangerous environments. Given that developmental and operational costs have the 'per pound' element, ultra-light, minimalist plans will radically reduce the costs, and increase reliability and safety."
– Richard Speck

Mission and Goals

"Micro-Space is not focused on suborbital flight. It is a necessary stepping stone, and has interesting potential, but we have not specialized in this aspect. Airbreathing hypersonic planes could be competitive for travel and shipping. Tourists? More people will pay to fly into space (even in a somewhat dangerous craft) than pay to climb Mt. Everest (now more than one hundred a year), so this is significant. The jump to orbital flight is technically daunting, but will happen a lot sooner than expected. Once orbital access is "affordable", the satellite repair business becomes possible. This alone promises to be a billion dollar a year industry, profiting tough midgets who don't quote OSHA rules. Anything useful (or restored to usefulness) in orbit is literally worth its weight in gold. In Synchronous orbit the value is much higher. Eventually near Earth Asteroid mining will be big business. There is no need to do mining and mineral processing in our living room (the Earth's surface). But entertainment is HUGE. Billion Dollar Olympic events, hundreds of millions for sports stadiums, hundred million dollar movies: the list goes on and on. NASA has made space seem boring, but most people know that this Final Frontier is anything but! Once competitors can fly into space for the cost of fielding an Indy car, this aspect of entrepreneurial space-flight will explode. And while the public is watching extreme efforts on pay per view satellite broadcasts, they will be learning that more mundane space-flights are becoming routine. Spacesuited newsmen will be at the finish line for the Circum-Lunar races, including the pedal powered "Tour de Lune" (at 200 miles an hour). Then tourism explodes!"
– Richard Speck

X PRIZE FOUNDATION

Below is contact information for the X PRIZE Foundation.

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