



X PRIZE Team Summary Sheet

STARCHASER INDUSTRIES



All the information given in this document has been cleared for official release by the X PRIZE Foundation and the Starchaser team. Quotes provided by Starchaser are shown in italics.

For more information about Starchaser Industries, please visit their web site at www.starchaser.co.uk.

TEAM OVERVIEW



Starchaser began as an experimental rocket test programme set up by engineer Steve Bennett back in 1992 to develop an inexpensive means of delivering small scientific payloads to high altitudes. In 1996 the team successfully launched a 6 metre (21

foot) rocket called Starchaser 2. Later the same year the programme was re-launched as the Starchaser Foundation before relocating to Salford University where Steve still serves as Director of the Space Technology Laboratory. Starchaser has become internationally recognised as a leader in its field. Starchaser Industries was incorporated as a private limited company on 16th December 1998, it's primary goal being to win the X-Prize by December 2004. The company transferred its manufacturing and rocket assembly arm to new premises in Hyde, Cheshire in January 2001 where a dedicated team of 35 people are currently employed.

TEAM LEADER BACKGROUND

Steve Bennett as a boy, would put together small rockets and launch them for friends and relatives. After leaving school in 1980 Steve was employed as a laboratory technician before joining the Army in 1983. He worked his way up to Lance Corporal and was trained as a petroleum operator; his postings included West Germany and the Falkland Islands. After a three year tour of duty he left the Army and went back to work as a lab technician. Soon after he was invited to relocate to the Physics Department of Salford University where he still lectures in space science, Steve incorporated Starchaser as a limited company in 1998.



DATA AT-A-GLANCE

TEAM SPECIFICATIONS

- Name: Starchaser Industries Ltd.
- Leader: Steve Bennett

- Place: Cheshire, England, UK
- Registered with X PRIZE: 18 December 1996
- Web: www.starchaser.co.uk

VEHICLE SPECIFICATIONS

- Name: Starchaser 4 (launch vehicle), Thunderbird (spacecraft/cabin)
- Length: 27.5 m (90 feet)
- Diameter: 1.6 m (5.3 feet)
- GTOW: 20,000 kg (44,000 lb_m)
- Dry Weight: 10,000 kg (22,000 lb_m)
- Crew Environment: Pressurized cabin with commercial IVA suits
- Payload Capacity: 400 kg
- No. of Engines: 4 strap-on boosters and 1 engine on 1st stage, 1 engine on 2nd stage
- Propulsion System: Pressure fed
- Fuel: Undefined hydrocarbon
- Oxidizer: Liquid Oxygen
- Total Thrust: 75 tons
- Reaction Control System: Cold gas

MISSION SPECIFICATIONS

- Alt. at Ignition: Earth surface
- Orientation at Ignition: Vertical
- Max. Accel. Force on Ascent: 5 G
- Time and Alt. at 1st Stage Engine Cut-off: 60 sec at 24 km
- Time and Alt. at 2nd Stage Engine Cut-off: 90 sec at 54 km
- Max. Speed: 1,500 m/s (3,360 mph)
- Max. Altitude: > 100 km (62 miles)
- Time in Weightless Conditions: 4.5 minutes
- Reentry Method: Ballistic reentry
- Accel. Forces on Descent: 5 G
- Landing Method: Steerable parachute
- Total Duration: 23 minutes
- Landing Distance from Take-off Location: 0-5 km
- Time Between Missions: 7 days





VEHICLE/LAUNCH SYSTEM DESCRIPTION

Thunderbird is a low cost multi stage rocket ship designed to carry ordinary people on short sub-orbital pleasure flights into space. For the purposes of the X Prize there are three seats aboard Thunderbird and the ship will be flown twice. Starchaser Industries first “manned” flight has been scheduled for October 2004. Extensive use of off the shelf components reduce costs and minimize risks whilst advanced composite materials with superior



strength to weight ratios are employed in the fabrication of the airframe. The Thunderbird stack is composed of two discreet units:

- A command module (including pressurized cabin, life support, reaction control and launch escape tower) which is situated at the forward end of the rocket.
- A Starchaser reusable launch vehicle (RLV) comprising of a first stage core unit with four strap on boosters and a second stage sustainer. This includes guidance, engines and fuel tanks.

Every part of Thunderbird is recovered using parachutes.

PROPULSION SYSTEM

Propulsion is achieved by means of six dependable Stardrive TM rocket engines generating a combined lift off thrust of 75 tons, whilst reaction control operations are carried out using a series of small cold gas powered thrusters.



MISSION DESCRIPTION

VEHICLE ASCENT

Thunderbird will begin her ascent in a vertical orientation under the power of six dependable Stardrive TM rocket engines. Aerodynamic surfaces and a cold gas reaction control system will fine tune the attitude and orientation of the craft. Initial acceleration will be 5 Gs but quickly falls back to around 3 Gs for the comfort of the occupants.

WEIGHTLESSNESS

Following main engine cut-off, the vehicle will continue to coast on up to an apogee exceeding 100 km where the passengers will experience several minutes of weightlessness. Breathtaking views of Earth will be afforded by individual porthole windows, as the curvature of the Earth will be clearly seen against the blackness of space.

VEHICLE DESCENT AND LANDING

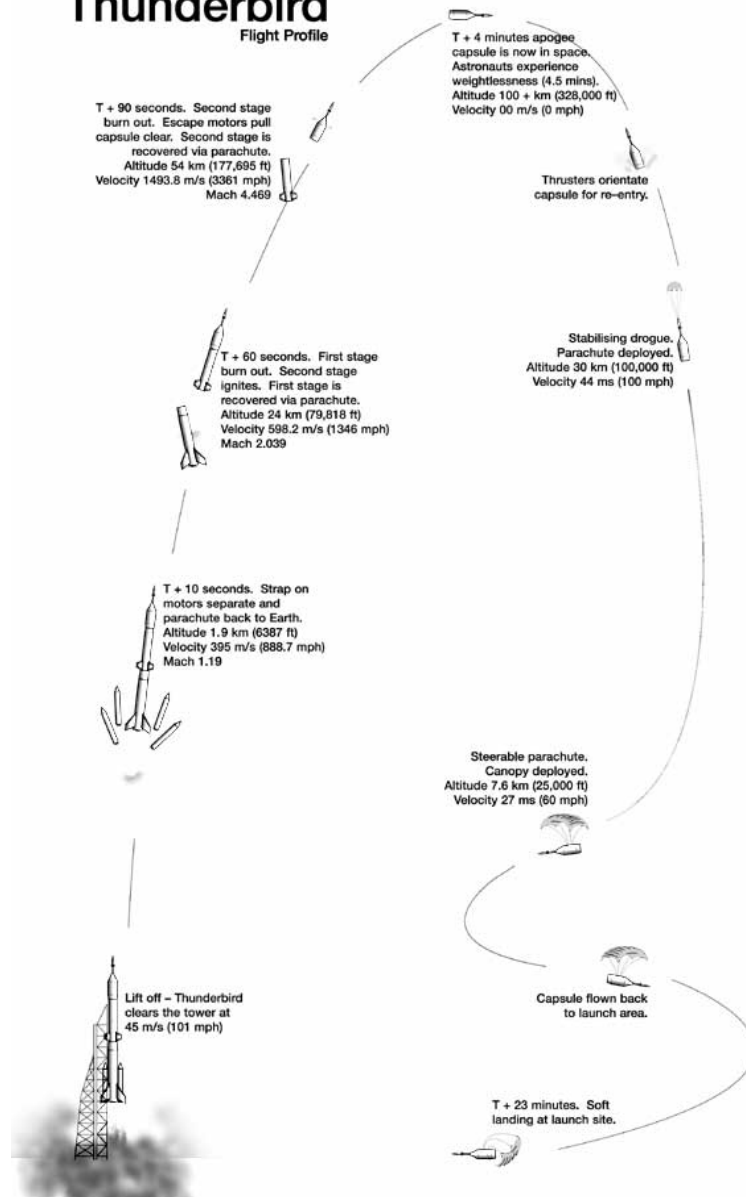
During the descent phase the Thunderbird capsule will re-enter the Earth's atmosphere tail first. Frictional heating will peak at 600 Celsius. A stabilizing drogue parachute will deploy at an altitude of around 100,000 feet. The main steerable canopy is deployed at 25,000 feet. Inflatable airbags are employed to assist the soft landing of the capsule, which will touch down on land in the vicinity of the launch complex.

The vehicle will be ready for relaunch within seven days of the first flight.



Thunderbird

Flight Profile



The company is also developing both liquid and hybrid rocket engines for eventual use in their high altitude rocket program.

Below is a list of successful rocket launches conducted by Starchaser:

- May 23, 1995: Starchaser 1a
- August 27, 1995: Starchaser 1a
- December 10, 1995: Starchaser 1a
- February 2, 1996: Starchaser 2
- May 19, 1996: Starchaser 1a
- February 7, 1997: LEXX
- March 5, 1999: TEMPEST
- August 20, 1999: Starchaser 3a
- May 2, 2000: SHARP1
- July 6, 2000: Starchaser Discovery
- December 16, 2000: SHARP 2
- November 22, 2001: Nova
- April 14, 2002: SHARP 4
- April 14, 2002: SHARP 5



PUBLICITY

As of October 21, 2002, Starchaser has been covered by the following media:

- Television - 213 appearances since 1992
- Radio - 258 interviews since 1992
- Newsprint - 610 articles since 1987

Please contact Starchaser for full listings.

PERSONAL APPEARANCES

Steve Bennett is happy to offer talks and personal appearances subject to availability. A nominal daily fee plus expenses is usually charged. The Nova rocket is also available at a daily rate plus shipping. Please contact Starchaser directly should you wish to arrange a booking.

HARDWARE & TESTS



Starchaser Industries is currently in the process of constructing the Starchaser 4 vehicle and the Thunderbird capsule.



TELEVISION

As of 21 November 2002, Starchaser has made 218 television appearances and been featured in 275 radio interviews since 1992. Some of the more recent Starchaser television appearances include:

- 20.02.01 Energy Changes - BBC
- 30.12.00 Discovery Today Christmas Special
- 29.12.00 Discovery Today Christmas Special
- 18.12.00 Space Detectives
- 11.08.00 Discovery Today
- 30.07.00 BBC Glasgow - recorded 'See You - See Me'
- 06.07.00 Sky News
- 06.07.00 BBC 'Short Circuit' - recorded
- 06.07.00 CBBC 'Space Detectives' - recorded
- 06.07.00 "A Spacemans Journey' -recorded
- 06.07.00 CBBC Newsround
- 06.07.00 'Discovery People' - recorded
- 06.07.00 Granada News
- 06.07.00 Granada Tonight
- 06.07.00 BBC North West Tonight
- 06.07.00 BBC News North West

PRINT MEDIA

As of 21 November 2002, Starchaser has appeared in 618 newspaper and magazine articles since 1987. Some of the more recent Starchaser print media appearances include:

- 06.03.01 Telegraph
- 05.03.01 Metro
- 05.03.01 Daily Express
- 05.03.01 Daily Star
- 03.03.01 Manchester Evening News
- 22.02.10 Tameside Advertiser
- 30.12.00 Express Magazine
- 28.12.00 Tameside Advertiser
- 30.09.00 The Weekly News
- 20.09.00 Professional Engineering
- .09.00 GQ Magazine

TEAM BACKGROUND

TEAM MEMBERS

List of team members not disclosed.

X PRIZE QUOTE

"The X PRIZE competition provides an incentive that will legitimize as well as galvanize the efforts of all of those working to turn an age old dream into

reality. We at Starchaser Industries believe that space is our destiny and space is our calling. As a tribute to the home of the X PRIZE perhaps one day our children will come to know St. Louis as the Gateway to the Stars!" – Steve Bennett

PHILOSOPHY

"We at Starchaser have responded to the challenge set by the American based X PRIZE Foundation by designing and entering our version of a reusable passenger carrying spaceship. Unlike our competitors however we are not trying to run before we can walk. Our project is aimed squarely at winning the X PRIZE and not in the first instance about ferrying truckloads of people into space. Project Thunderbird will cost a small fraction of what our competitors are quoting, we can realistically achieve our goals and we will be in profit long before our first flight. Those familiar with our work will know that we always keep our promises, we finish what we start and we always deliver!" – Steve Bennett

MISSION AND GOALS

"To inspire and enrich society and the economy of our planet by contributing positively towards a permanent human presence in space." – Steve Bennett

X PRIZE FOUNDATION

Below is contact information for the X PRIZE Foundation.

MAILING ADDRESS

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