



News Review

Space Journey: Soft Landing on the Mars

The European Space Agency ESA and the Russian Roskosmos jointly want to place a robot in 2018 on the Mars. Already they are preparing for the biggest challenge that is the soft landing on the Mars.

On the 181st birth anniversary of the Italian astronomer Giovanni Schiaparelli (1835-1910) is to be bestowed a great honour. He flew to the planet Mars on which he once discovered supposed canals and that made him famous. On the 14th March 2016 the start window would be opened for the first European Expo Mars Mission which would bring one satellite on the orbit and the landing module should be placed on the surface of the Mars. The name of the module is Schiaparelli.

Originally Schiaparelli should have been in January on a Russian proton rocket lifted up along with the 'Trace Gas Orbiter' (TGO). Certainly then the hardware forced the shifting of the start in last summer in 2015. The Hollandish firm Moog Bradford had discovered that two of their pressure (converter) manufactured and used Lander transformers could be faulty. Due to damage in welding machine a series of transformers which were completed in the year 2013 indicated cracks. The duty of the two mgre 1 kg heavy part for the time being had been to trace the pressure development in helium and in fuel tank.

That it went for only later evaluation of rising of data, the ESA decided to keep it away. "We have assessed the risk of these transformers for the mission means and decided not to accept

it" – says Rolf de Groot, Manager of Robotic exploration coordination office of ESA. "Whether the cracks can be the leakage we would have first of all the experience of landing on the Mars. That is not the point of time to which one wants to find out something. It would then mean the loss of mission.

The soft landing represents the core of the first of the two missions which should have been executed under the title Exomars. With Schiaparelli the landing demonstrator modules (EDM), the technologies should be experimented in order to place certainly a rover on the Mars in 2018.

In order to improve the faulty components, a big part of the finished landing module must be dissembled again. The engineers with Thales Alenia Spazio in Turin placed special layers in order to interchange the nonfunctional capsules. The operation is closed says Thierry Blancquaert who is answerable for landing module with ESA so that propulsion system is not affected.

The trouble with the pressure transformer was only the last in a series of turbulences with which the Exo-Mars Manager had to get on in the previous years. Therefore before four years the rise of the project partner USA took care for headache. Thanks for the agreement attained with the Russian Space Agency Roskosmos which manufactures the carrier rockets and other components but the Exo-Mars in spite of this remain on course. In addition to that the assignments were distributed newly among the already existing partners. Therefore the

University of Bern now not only built up the telescope for the camera Cassis (colour and stereo surface imaging system), as originally in existence but also simultaneously the complete system. "It was a big challenge to finish the camera on time" – says project manager, Mr. Ruth Ziethe of Physics Institute of the University of Bern. We had only 27 months time which normally estimated as 38 months for such a complex instrument of this type. Cassis flies on the trace Gas Orbiter (TGO) a type of mother ship of Schiaparelli, which should swing on the orbit round the Mars after its separation from the landing unit. TGO serves as communication relay for Schiaparelli and should survey the atmosphere through several years. The summit of the first ExoMars Mission is the landing. The duration of the critical phase is only eight minutes. When Schiaparelli enters in the atmosphere with a speed of 21000 Km/hr, first of all a heat shield out of cork powder and phenol turns off the heat and seduces the speed to somewhat mach 5. A temperature sensor built by a German Centre for Atmosphere and Space Journey (DLR) records how hot it becomes on the flight phase. It is one of the contributions to this mission few originating from Germany from which the researchers expect for the closer to the solution on the difficulty for stimulating the temperature development.

With approximately twice the speed of sound the 12m diameter parachute unfolds which retards the landing equipment further. The heatshield is cast off and a Doppler-Radar-Altitude is activated which dispenses with the distance to the Mars-surface. "With the design of the parachute and the calculation of aerodynamics we could be benefited much from the experience of Huygens mission" – says Blancquaert. The Esa-Sonde Huygens was in 2005 with a parachute floated through the atmosphere of the Saturn moon titan floated and had reached the surface.

The last retardation phase begins at 1.4 km height. Here nine fast assembled hydrazin

propellant with 400 N thrust are ignited and decelerate the sudden drop to 15 Km/hr till these are switched off at a height of 1m to 2m. For this maneuver the 600 kg landing module has in total 39 kg fuel on board. The last jerk is finally asserted by a deformable crumbling zone. At the beginning of the planning a landing is also planned with the help of airbag but very soon again is rejected. For lander of such big dimension the scientists held retarding rockets as necessary.

Blancquaert is confident that the experiences gathered with Schiaparelli get used in future missions. These may be besides still earlier bigger and massive. Because Exo-mars is finally the first big step in 2001 for the reconnaissance of the solar system with Aurora programme developed by ESA. To the subsequent series of objectives calculates the transport of Marsian soil samples to the earth as also to a certain degree as crowning; a manned mission to our cosmic neighbour.

German policy-maker did not hold at that time not to send human-being in cosmos and therefore declined the participation in Aurora although the programme chiefly consists of unmanned mission as Exomars. This decision does not pay off. Because with the ESA the principle of 'geographical rerun' is valid. The volumes of order for a country are oriented previously controlled financial means. German firms and research institutes had therefore from the front into bad cards with the placement of order for this flagship mission. As Germany in 2005 finally participated with 3 million € in 2005 the principal orders were already placed.

After the start under German management lastly with phillae landing on a comet half way became successful now, it is to be seen whether, the Italians with Schiaparelli could make a better show on the Mars.

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