Human Spaceflight – Where to Go?

Oberpfaffenhofen, 3rd November 2010: The European Columbus module, docked to the International Space Station (ISS) has completed its 1000th day in orbit as of 3rd November 2010. Coincidentally the 25th anniversary of the successful completion of the German D-1 Spacelab mission was celebrated the same day. During those 25 years some spectacular milestones in human spaceflight exploration have been achieved -on the other hand the Space Shuttle flights are winding down in the same month ending the era of this human spaceflight "workhorse".

President Barack Obama signed the three-year NASA appropriation bill on October 11th, 2010 however the grand picture of a human space exploration plan remains unclear.

This article tries to summarize the current state of affairs in Russia and America, the two leading human spacefaring nations.

In order to assess Russia's plans SpaceOps News (**SoN**) had the opportunity to talk with Mr Gerhard Kowalski (http://www.gerhardkowalski.com), author of the book "The Gagarin Story" (published in 2000, Germany) revealing a lot of unknown details he could investigate thanks to his intimate knowledge of the Russian space activities since 1975 and his contacts with Russian authorities established as special correspondent for the news agency ADN (State News Agency of the former German Democratic Republic). He co-authored several books and has published over 100 in-depths articles about international space activities, with special emphasis on human spaceflight activities in Russia.

RUS-M Variant-1
approx. 23 metric tons to LEO
Variant-3: One non-separable and 4 strap-on boosters

Russian Situation

SoN: Mr. Kowalski, do the Russians have a long-term master plan with respect to future human spaceflight exploration?

Kowalski: As far as I can assess the Russian human spaceflight plans for the 21st century they don't follow a particular strategy although Prime Minister Putin is supporting the spaceflight activities and it looks like the current budget is secured up to 2016. However neither Moon nor Mars is on the agenda for human exploration.

An unofficial "vision" for 2020-2040 foresees a landing of a crew on the Moon (this would be the first time for the Russians) and later a crewed flight to Mars, however neither the spacecraft for crew transport nor the launch vehicle nor an appropriate launch site for performing those two tasks is visible as of today.

An upgraded Soyuz spacecraft, the "digital" Soyuz TMA-M series is available since the recent flight of the Soyuz TMA-01M on Oct. 7th 2010 allowing just one cosmonaut to "fly" the vehicle, i.e., making two passenger seats available on each flight. In addition the in-orbit stay time was expanded from 7 to 11 months.

The Soyuz spacecrafts (Progress and TMA-series) are committed to be available and maintained until 2018, in particular for servicing the ISS according to the recent ISS Partner's Tokyo-agreement (United States, Russia, Europe, Japan and Canada , 11th March, 2010). From 2018 onwards the Soyuz is planned to be replaced by a spacecraft called "RUS-M" accommodating a crew of six.
The launch vehicle for RUS-M is named "RUS" and has to be launched from a new launch site at Vostochny Cosmodrome (eastern spaceport) in the Amur-region since the leasing contract for Baikonur with the Republic of Kazakhstan is running out in 2050 forcing Russia to construct another (home-territory based) launch site.
The development for the RUS launch vehicle is planned to start in 2016 but has yet to be confirmed and funded.

Location of Vostochny Cosmodrome
at Amur Oblast Region in Southeast Russia

SoN: Does Russia have its own future plans for exploiting the low earth orbit (LEO)?

Kowalski: Derived from the MIR and ISS experience Russia would prefer a man-tented station in LEO to achieve a better micro-g environment for scientific experimentation but also from an operational cost point of view, i.e., reducing the manpower in the control centers with reduced staffing.

SoN: Could the newly constructed Soyuz launch pad at Kourou (French Guyana) not be expanded and utilized for future international co-operations?

Kowalski: The new Soyuz launch site at Kourou was built in co-operation with ESA and will only be used for unmanned Soyuz launch vehicles satisfying satellite weight/orbit requirements which could not be satisfied by the Ariane-family launch vehicles.

SoN: NASA is encouraging commercial crew transport (CCDev) and at least half a dozen US companies are developing vehicles for cargo and crew transport to the ISS but also for commercial suborbital flights. Are similar activities being initiated in Russia?

Kowalski: Russian companies are not interested in this kind of developments – it is considered a step backwards – at least concerning the suborbital tourist flights – because Russia offers full-fledged orbital flights already, and will expand this capacity with the digital Soyuz-TMA-M capsules. In fact RKK Energia (the former legendary OKB-1 "Design Bureau" Nr.1) in cooperation with Space Adventures will offer a lunar circumflight for approx. $100 mio for two passengers each per flight.

SoN: Why is Russia leading the recent long term Mars-flight simulation campaigns, e.g., the ongoing 520 day isolation study test at IBMP (Institute of Biomedical Problems) if they are not immediately interested in the human exploration of Mars?

Kowalski: Russia has this professional training facility with appropriate infrastructure available at the IBMP and is providing it to other interested nations like ESA, China and Canada. By participating in the simulations Russia can gain scientific insights while sharing the cost.

SoN: How intensive is the Russian co-operation with China with respect to human spaceflight.

Kowalski: Although the Chinese Taikonauts spent some time at Star City China likes to refer to Russia in a consulting function only. Fact is that Russia would like to co-operate with China in future human spaceflight LEO activities and they would have welcomed China for co-operation on the ISS already.

Orion Capsule, docked to the Moon Lander with Earth Departure Stage

American Situation

Comparable uncertainties exist on the American side: The three-year $58 billion NASA authorization bill, $19 billion for 2011, includes the operation of the ISS until 2020 and the fostering of commercial space transportation.

The Constellation program ("Moon, Mars and beyond") is replaced by the start of work for a heavy lift architecture to take astronauts beyond lower earth orbit and it is not clear to what extent the original Constellation's Orion Crew Exploration Vehicle will be implemented: The original Orion crew capsule was planned as crew service for the ISS and for missions to deep space, however might be scaled back for use as a crew lifeboat at the ISS only. On the other hand the authorization bill includes $1.1 billion to be spent in 2011 to develop a multipurpose crew vehicle capable of carrying astronauts on deep space missions within 5 years. (source: Space News, Oct 18th 10, http://www.spacenews.com).

No specific targets for the to be developed heavy lift vehicle and the multipurpose crew vehicle have been identified, candidates are: returning to the Moon and establish a moon base, Asteroid targets or a Mars exploration flight.

International co-operation is vaguely addressed and has yet to take a lot of hurdles as it became clear during the second International Conference on Space Exploration at Brussels (21st Oct., 2010): possible partners are hesitantly standing by or having divergent bi-lateral discussions with no tangible results yet.

Orion Crew Exploration Vehicle

ISS as of 23rd May 2010

Summary

It can be stated that the ISS remains the only operational usable asset for human spaceflight at least up to 2020 with an unpredictable future.

Prognosis

The ISS is most likely be operated beyond 2020, the commercial cargo and crew transport capabilities will grow into service within the next 5 years.
Commercial business will be established in LEO for scientific (possibly taking advantage of the “man tented” approach) and touristic customers (including suborbital flights).

At least one of the important spacefaring nations will try to establish a presence on the Moon within the next 40 to 50 years – Mars might probably has to wait until then.

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