

IAF SPACE EXPLORATION SYMPOSIUM (A3)
Interactive Presentations - IAF SPACE EXPLORATION SYMPOSIUM (IP)

Author: Ms. Tatiana V. Matveeva
Korolev RSC Energia, Russian Federation, tvmatv@mail.ru

OPERATING EXPERIENCE SUMMARY AND DEVELOPMENT STRATEGY FOR SPACE
TRANSPORT VEHICLES

Abstract

Human exploration of outer space started from manned vehicles testing missions. When the space stations appeared in orbit, space vehicles became irreplaceable transportation facilities. In addition to manned vehicles, automated cargo vehicles provided new abilities of fuel and cargo delivery, new system workout and special research performance. Only two states possessed space transport vehicles in 20th century: the Soviet Union/Russia and the United States. Nowadays, there are Chinese, Japanese, European space vehicles. The greatest space project of the ISS became possible due to reliable transport vehicles. American Space Shuttle orbiter could transfer massive cargoes and objects. Russian long-life Soyuz vehicle supported continuous crew work aboard the station being ready any moment to provide emergent descent and landing. The difference between these spacecraft clearly demonstrates that transport vehicle characteristics must correspond with the purposes and tasks of the certain space program. The paper presents retrospective of the space vehicles from different countries with comparison of their characteristics and mission programs. Not only new modifications of well-tried spacecraft are currently developed. Future-oriented vehicles are also designed that will be possible to solve wide range of prospective tasks. Analysis of various projects made in different countries shows that creation of manned and automated space vehicles requires years of work in spite of significant funding. For instance, upon Space Shuttle flight termination in 2011, NASA returned to the manned missions of American SpaceX Crew Dragon vehicles only in 2020. It should be remembered that Crew Dragon was developed on the basis of unmanned SpaceX Dragon that had been flying to the ISS since 2012. That is why the purposes and tasks of the transport vehicles must be defined well before their real missions. There is a great variety of purposes of future manned missions – from rapidly developing space tourism to flights to the other planets. In order to provide high level of reliability of advanced new spacecraft, it is necessary to take into account existing experience of space flights, to process and generalize results of various space operations performance, overcoming of off-nominal situations, to study a way of possible vehicle modernization. Continuous work with Russian Soyuz and Progress transport vehicles during several decades provides a unique base for such study. The paper presents conclusions and recommendations made on the base of analysis of Russian vehicles missions in the programs of different orbital stations, which can be used for the future transport vehicle development.