42 years since the flight of the first Bulgarian cosmonaut Georgi Ivanov

Bulgaria ranks 6 th country worldwide to have an astronaut (cosmonaut) flown in in space (above 100 km), after (former Soviet) Russian's first Yuri Gagarin, US' first (suborbital) Alan Shepard, (former Czechoslovakia) Czech's first Vladimir Remek, Poland's first Miroslaw Hermaszewski and (former East) Germany's first Sigmund Jähn. Following with the statistics (as of January 2018), Bulgaria holds the 9th place by the total number of astronauts in space, after USA, Russia (with former Soviet flights), Japan, Germany, China, France, Canada and Italy. Four countries have two astronauts, though when organized by date, the order is as follows: Bulgaria (1979, 1988), Netherlands (1985, 2011), UK (1991, 2015) and Belgium (1992, 2009).

The possibility of non-space industry nations to have astronauts was realized after the launch of the Interkosmos program. Each flight included not only astronaut exchange program but also execution of numerous scientific experiments with equipment designed and manufactured by scientists and engineers from the partner country. One such joint mission was between (former Soviet Union) Russia and Bulgaria in 1979. The Soyuz 33 flight was scheduled as a 7-day mission to Salyut 6 orbital station with Soviet Nikolai Rukavishnikov as the commander (and fist civilian in space) and the Bulgarian cosmonaut Georgi Ivanov as a cosmonaut-researcher. The docking was scheduled for 12th April. The backup astronaut for Ivanov was Alexander Alexandrov, who became in 1988 the second Bulgarian cosmonaut. Several written sources report a huge storm on 10th April 1979 at the Baikonur space launch site. According to the meteo-forecast only at around 8 pm local time a short-term decline of the storm wind speed is to be expected and it is decided for a launch in this time window. The two-member team was selected and the launch took place at 20:34 local time (17:34 UT). This was about one day short to the ninth anniversary of the Apollo's 13 launch (11th April 1970, 19:13 UT). During the first day, the cosmonauts follow prescribed routines for maneuvering by also switching on the main engine for 10–12 second burn. The maneuvering continued on the following day in order to further approach the Salyut 6 orbital station. At a distance of 3 – 3.5 km from the station, the main engine was switched on. However, the main engine went off after only 3 seconds. Upon decision from the mission control, 5–6 additional attempts to start the main engine were done, all were

unsuccessful. The cosmonauts, Vladimir Lyahov and Valeriy Riumin, who were inside the station, witnessed flames emanating from the opposite direction as expected and in direction of the auxiliary engine. Despite performing well over 8000 tests, the main engine had failed, marking this accident as the first orbital failure of the main engine in the manned space flight history. Soon it was realized by the flight engineer Rukavishnikov that an explosion is possible and the crew is in danger. One of the suspected reason was that the side wall of the combustion chamber of the main propulsion system engine has burned. From flight control is was ordered to shut down the main engine in attempt to save fuel, to abort the docking attempt and to return back after spending 12 hour-time for rest. In mission control were 2 preparing for the worst outcome. The options of a return path involved the use of the secondary engine, which turned out to be partially damaged. Two options were possible – gliding trajectory and landing on many 100s of km away for the landing zone or a very steep ballistic trajectory enduring high G-strain. The main constructor of the Soyuz ships, Yrii Semionov, decided to cancel the planned test of the secondary engine and to proceed by switching it on only for the return maneuvers. On 12th April the commander Rukavishnikov took manual control for the landing – for the very first time in aeronautic history, thanks to his experience as with Soyuz flight systems. A manual set for 188 secondburn of the secondary engine was programmed. This was needed to slow down the spaceship to 8 m/s in order to enter in the corridor for re-entry. Additional 25 second run of the engine could be allowed, and on the 213th second, Ruhavishnikov manually switched it off. In addition, the spacecraft had to be orientated with the engine forwards. Using the information for the 188-sec burn, mission control estimated a landing site into the Caspian Sea. The actual landing, however, occurred not too far off the original scheduled place, due to the lower trust of the secondary engine, namely 120 km southeast of Dzhezkazgan (Kazahstan city) on 12th April at 19:35 local time. The crew endured 8–10Gs (times 10 the weight of the cosmonaut). In many sources this is quoted as the only manual landing via ballistic trajectory and is part of every astronautic textbook. The total duration of the flight was 1 day 23 hours and 1 minute and had completed 31 orbits. For safety reasons, no equipment was taken in the return capsule, only the two cosmonauts. The carried components for the optical system Spectrum-15 were all abandoned in Soyus-33 spacecraft and the lost components needed to be re-build in Bulgaria for a very short time for the next scheduled flight of Progres6. The science

program prepared for the flight of the first Bulgaria cosmonaut was later completed by the Salut-6 crew, Liahov and Ruimin and other crews during the Interkosmos program. The capabilities and high quality performance of the Spectrum-15 system is evident by the fact that the system was accepted as a permanent one on board allowing many crews to work with it.

Georgi Ivanov Ivanov Born on 2 July 1940 in Lovech, Bulgaria, has been requested to change his original family name to Ivanov due to a misnomer in Russian language. Bulgaria's air force pilot, admitted in 1959 and graduated from the military academy in 1964. In the period 1964–1967 he continued as instructor and in 1968–1978 as a group commander and finally as a squadron commander. In 1978 was selected for the space program with more than 1900 hours of air flight training. After the space flight he was rewarded with many Soviet and Bulgarian medals. In 1984 he earned a PhD in Physics. Promoted to general-lieutenant.