

SYMPOSIUM ON SAFETY, QUALITY AND KNOWLEDGE MANAGEMENT IN SPACE
ACTIVITIES (D5)

Safety of Vehicules and Ground Segment for Aerospace Missions (1)

Author: Dr. Vadim Kadzhaev

Federal State Unitary Enterprize CENTER FOR GROUND SPPACE INFRASTRUCTURE
OPERATION (FGUP TsENKI), Russian Federation, kava.tsenki@mail.ru

Prof. Igor V. Barmin

Center for Ground-Based Space Infrastructure Facilities Operation, Russian Federation,
barminkbom@mail.ru

Mr. Alexander Fadeev

TsENKI, Russian Federation, tsenki@roscosmos.ru

THE RISKS ANALYSES AND SAFETY BARRIERS ELABORATION FOR STAGE OF LAUNCH
PREPARATION THE FACTORS OF STABLE ROCKET SPACE COMPLEX OPERATION.

Abstract

Rocket vehicle on-land prelaunch operation include, as a rule, measures for ensuaring its reliability and safety. They involve possible risk analyses and threat evaluations in the complex situation of rocket's and on-land technological equipment interaction. Additional lends pre-launch tests and adjustments, which determine the quality of a planned space program by means of preliminary removal of critical risk or reduction of their probability. While the quantitative reliability evaluation assume operations on sets of random values, the risk analysis deals with separate critical events, including characteristic system risks, and determines their specific properties. This allows to classify risks, taking into account their influence on system reliability "a posteriori", and engage the adequate "safety barriers". The reviewed risks comprise several groups: physical, operational and situational. The first two groups can be considered as project risks, accessible to system analysis. At the same time, physical risks are divided into two types: the ones associated with (i) process parameters, and (ii) with material characteristics (durability). The third group consists of a number of random factors, including possible human errors, neutralized by general technical rules and guidelines based on the experience in operation of similar facilities. The derivative risks, which can arise during primary risks neutralization, should be also taken into account. The "failure tree" and "threat tree" analysis has great value for critical risk disclosure, followed by their subsequent elimination by means of technological procedures and "safety barriers". As a result, the mathematical expectation of risks and threat degree decrease significantly. The current study develops the subject of article IAC-09.D.1.3. "Ensuring an acceptable reliability and safety level for a launch complex" presented earlier at the 60th anniversary IAF congress.