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Author: Mr. Ruslan Mochonov  
Yuzhnoye State Design Office, Ukraine, Mochonov@science.yuzhnoye.com

Mr. Aleksandr Sotnichenko  
Yuzhnoye State Design Office, Ukraine, info@dpukrconfaa.org  
Mr. Gennadii Ivanitskiy  
Yuzhnoye State Design Office, Ukraine, info@dpukrconfaa.org  
Mr. Maxim Salo  
Yuzhnoye State Design Office, Ukraine, info@dpukrconfaa.org

PROTECTION OF LAUNCHING FACILITIES FROM LAUNCH VEHICLE MOTOR JET IMPACT

**Abstract**

The Report falls into category D – Infrastructure, subcategory D 2.2 – Launch Services, Tasks, Programs and Equipment. Lately the firing tests of lower stages of launch vehicles (such as Antares, Falcon) at the launching facility, intended for regular launches, are performed more frequently. Severe in-process thermal loads produce harmful effect on stages and launching equipment. This necessitates use of dedicated heat protection. In the majority of the existing launching systems thermal protection is provided via supply of water to motor supersonic jet. At firing tests supersonic jets impact acts longer than at regular launch (tests duration being up to 30 s). This implies use of high-efficiency water supply system, able to reduce the loads up to the acceptable thermal range of the structural materials. Otherwise the surfaces of the launching facility would undergo melting, severe erosive wear and significant thermal deformations. This might result in structure limpness and destruction of its individual elements. Therefore, finding a way to increase efficiency of water supply system is a topical issue for development of launching facilities that foresee firing tests. During realization of its Cyclone-4M program, Yuzhnoye SDO has conducted thorough research. Thermal and power loads on the launching facility in operation of the water supply system were analyzed using the method of numerical simulation of two-phase medium dynamics in mixed definition by Euler-Lagrange. We obtained the data on efficiency of reducing of thermal and power impact of supersonic jets, and found physical processes that impact directly on intensity of thermal loads reducing. Also we outlined the directions of water supply systems optimization and their efficiency enhancing. Integration of highly-efficient water supply system into the multipurpose launching facilities was studied.