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APOGEE HYDROGEN PEROXIDE-ETHANOL ROCKET PROPULSION. ECOLOGICAL COMPATIBILITY, SAFETY AND NEW POWER OPPORTUNITIES

Abstract

Among the rocket engines the Liquid Rocket Motors (LRM) are used the most widely. Currently there is actual task to replace hydrazine fuel motors by more environment friendly and, by the authors opinion, the most appropriate and expedient we can assume the use of hydrogen peroxide and ethanol at the aqueous concentration close to 100%: the energy is sufficient (it is higher than a pair of "nitrogen oxidant plus hydrazine"), the components have stable chemical formulas, they are mass-produced in the world, the LRM using such the components is technologically simpler, it has the less cost than oxygen-kerosene, oxygen-hydrogen or nitrogen-hydrazine LRMs. The feature of application of 98% hydrogen peroxide, containing 93% of oxygen, it was experimentally proved the combustion temperature at the combustion chamber of the engine is around 1300K that is less than it is using cryogenic oxygen. It makes possible not to use forced cooling of the engine nozzle and to expect to re-use engines. It can be considered as positive absence of self-ignition of the propellant components, thus avoiding unplanned ignitions as into the combustion chamber during starting and as well after turning-off. In accidental flood and spread of the components the environmental disasters is not occurred. Both components are used and stored under normal climatic conditions. The patented circuit allows develop demanded types of LRM: apogee, march orbiter and steering LRM. The propellant components withstand deep supercooling in space without destroying of the component structures and can be defrosted without changing of the properties. The propellant components can be stored at a space vehicle for long time: ethanol is evaporated and not decomposed, the decomposition of hydrogen peroxide and evaporation is around 1% per year, the process stops with partial pressure increasing into tank. The same double-chamber design of forced ignition of fuel is used at the form of a universal hub for all types of current engines. The liquid components are injected into LRM combustion chamber (CC) through nozzles. The components are ignited by flame from the second combustion chamber. The ignition processes of propellant mixture at the LRM CC with the use of hydrogen peroxide is the most complex, currently is under the experimental testing and study of the processes start. The proposed LRM line is the basis of development for the given direction in the rocket-space area and has great potential, being the full-value and significantly environment friendly replacement of hydrazine motors.