IAF SPACE TRANSPORTATION SOLUTIONS AND INNOVATIONS SYMPOSIUM (D2)
Future Space Transportation Systems (4)

Author: Prof.Dr. Vitaly Yemets
Oles Honchar Dnipropetrovsk National University, Ukraine, Vitaly.Yemets@yahoo.com

Prof.Dr. Mykola Dron'
Oles Honchar Dnipropetrovsk National University, Ukraine, nord@dnu.dp.ua
Mr. Anatoliy Pashkov
Oles Honchar Dnipropetrovsk National University, Ukraine, pashav@ua.fm
Mr. Mykhailo Yemets
Oles Honchar Dnipropetrovsk National University, Ukraine, Mykhailo.Yemets@outlook.com
Dr. Andrii Dreus
O. Honchar Dnipropetrovsk National University, Ukraine, dreus.andrii@gmail.com
Ms. Ludmila Dubovik
Oles Honchar Dnipropetrovsk National University, Ukraine, dubovik066@gmail.com
Mr. Oleg Kostritsyn
Ukraine, Oleg.Kostritsyn@ukr.net
Mr. Petro Zhuravel
Oles Honchar Dnipropetrovsk National University, Ukraine, petro.ilarionovych.zhuravel@gmail.com
Dr. Olena Kositsyna
Oles Honchar Dnipropetrovsk National University, Ukraine, ekositsina@gmail.com

METHOD TO PRESET G-LOAD PROFILE OF LAUNCH VEHICLES

Abstract

The paper is considers an effect of the decrease of the feed pressure and thrust of an autophage rocket, called as retardation effect. An autophage rocket we are developing has a sliding engine and polymeric consumable case as a solid propellant. For such a rocket the retardation effect is caused by inertial forces acting on the rocket sliding engine and thrust has an exponential decay pattern.

The influence of the effect on the rocket thrust is a prospective method of throttling and presetting g-load behaviour. The method consists in providing the rocket with the engine of proper mass and proper retardation capability determined by the friction of the sliding engine against the rocket case called as a retardation coefficient. To describe the rocket characteristics taking into account the retardation effect, several kinds of sets of equations are developed. According to them the preset g-load pattern includes decay, increase or constancy as particular cases.

The nature and domains of the retardation coefficient are explained and illustrated with plots. The rocket engineering feasibility and validation with experimental results are presented. Finally the mass breakdown and economical efficiency of the autophage launch vehicle with preset g-load are discussed.