

USE OF THE AERODYNAMIC PRINCIPLE OF INSTALLMENT SEPARATION OF THE THROWN DESIGN FOR THE ADJUSTABLE THROWING OF GROUP OF ELEMENTS ON THE BALLISTIC STAND

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Keywords: Aerodynamic principle, visualisation of flow, group of debris

Expansion of scale of human activity in space for last thirty years is accompanied all by building up continuous accumulation of various fragments in a near space. All these skew fields, collecting on earth orbits, organise the so-called space refuse which excessive abundance already represents now real danger to operation of various space vehicles and to a life of cosmonauts.

Debris of technogenic refuse have wide enough spectrum on masses, forms and velocities of their collision with launched space installations. Mutual collision of large debris leads to formation of streams of debris with their various distribution on front and on depth. Physical and mathematical modelling of interacting with elements of protection of space installations of group of corpuscles of the different spectrum imitating a flow of technogenic debris in an adjacent space, is a perspective method of obtaining of a trustworthy information about dynamics of all process of group blow and its aftereffects [1]. The complex experimentally-theoretical analysis of this challenge should switch on at the first stage working out of methods and devices of an adjustable throwing in laboratory conditions of group of corpuscles in air medium and in vacuo. Further experimental study of blow of corpuscles on various obstructions and its aftereffects on the saved samples. Then numerical modelling with working out adequate to experiment of a design procedure of blow of group of debris on the obstructions imitating protection of space engineering.

Among a large variety of possible systems of an adjustable throwing of group of debris in laboratory conditions in air essential interest the assemblages using an aerodynamic principle of instalment separation of a thrown design (represent the drain pan with debris). They do not demand additional energy sources for security of the set orientation of debris in group. Thus, in the course of branch of various drain pans and leading devices, it is required to organise this process for was possibly a short period [2].

In the given activity the technique of a throwing of group of corpuscles (from 2 to 12) in air medium on the basis of separation of composite systems which were packed from identical skew fields is used. It was done sequentially so, that their longitudinal axis coincided, or was parallel one another and a longitudinal axis of all system. Process of the directed let of debris of the container under the influence of air forces was thus supplied. For a throwing of group of corpuscles the special container which supplied preservation of layout of group of debris at driving on the bore and their operated dispersion in the set trajectory peak was made.

Base experiments were conducted on a ballistic route with use powder ballistic ranges of the various pass. In the capacity of modelling technogenic debris balls and compact cylinders

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from various structural materials have been taken. On a ballistic route in some cases conducted visualisation of flow of divided assemblages by a method of "a shone point".

The range of initial running speeds of assemblage in air varied within 500-3500 m/s. Parametric researches have shown, that, choosing matching values of aerodynamic and in large quantities-geometrical performances of packing skew fields of assemblage, it is possible to operate purposefully driving and dispersion of composite system as a whole. It was thus supplied as simultaneous blow on a target of group of debris - so-called "face-to-face blow" and the dispersed blow (with distribution of debris on depth of a flow).

For a throwing of group of skew fields the assemblages supplying branch of the leading container from debris at the expense of sliding blow on an edge of the drain pan by the shield with a central orifice in vacuo were used.

Thus, the developed techniques and devices supply modelling in laboratory conditions a throwing and the subsequent act of a cloud of debris (with the set distribution of corpuscles in a flow on front and depth) on installations of space engineering.

Activity is executed at Russian Fund for Fundamental Investigations support (a code of the design 06-0-96920)

REFERENCES

1. Radchenko A.V., Fortov V.E., Khorev I.E. Physical of a singularity of high-speed interacting of the oblong technogenic debris with designs. Reports of academy of sciences, 2003, т.389, №1, s.49-54.
2. Khorev I.E., Yakushev V. K., Zelepugin S.A., Sidorov V. N, V.E. Throwing and a collision of group of high-speed bodies. Reports of academy of sciences, 2003, т.389, № 2, s.197-202.