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THE MAIN COMPONENTS OF AVIATION GRAVIMETRIC SYSTEM

The indication of gravity anomalies from aircraft requires a combination of several instrumentation components, each of which is designed for the role of measurement or signal processing. The aggregate assemblage of these components constitutes an AGS. Subsets of this assemblage of components that relate system outputs to inputs will be termed the subsystems of the airborne gravimetric system. The present task is therefore to determine the number, function, and accuracy of the subsystems that make up an airborne gravimetric system [1].

Let us analyze the known systems of navigation parameter determination and offer the recommendations how reasonable it is to apply them to AGS depending on the peculiarities of the terrain the aircraft is flying over. The aircraft location coordinates (latitude ϕ, longitude λ, vector k) can be determined by different methods. These methods are classified according to the definite features. The most important of them are: the way of location coordinate determination, the nature of measured physical parameters. Taking into consideration the first feature, the navigation methods are divided into following groups: path calculation; position methods; overview and comparative methods.

The methods of the first group are based on the measuring of the components of acceleration or the speed of the object movement and time integration of these components in order to determine the location coordinates.

The position methods of navigation are based on the physical values measurements, if it is possible to obtain the line or surface of the object location. It is necessary to have two or three intersecting location surfaces to determine two or three object location coordinates correspondingly.

The overview and comparative methods of navigation are based on the location overview and the comparison of its image with the map or landmark system, which have been input into computer memory.

The selection of any method or the group of navigation methods to be applied to the definite airplane type is determined by the following conditions: the range of navigation parameter measurement (distance, speed, acceleration); the necessary precision of navigation parameter

measurement; the level of autonomy, interference ability and reliability of navigation measurements, the degree of navigation method physical implementation.

Having analyzed the advantages, drawbacks and technical characteristics of the presented methods of navigation parameter determination [2], having compared them to the requirements of plane movement parameter precision determination, it is possible to conclude that such navigation systems as Doppler navigation systems, geodesic electronic telemeters and azimuth radiofrequency systems are appropriate to use for aviation gravimetric measurements.

Modern Doppler systems include AN ACN-105 and DISS- 013, DISS-013-134, NAS-1A, NAS-1B developed in the CIS [2]. It is important to notice that all domestic navigation systems have drift angle error 15 ' at impulse output and 20' at analogue output. The range of accounting path for all the systems does not exceed 10 thousand km at the lateral deviation ± 1000 km.

It is known that radio technical angle measuring navigation system RSNB-2 is frequently used. It is developed in CIS and allows determining the plane location with precision ± 200 m at range and ± 0,250 at azimuth.

Aviation gravimetric measurements are conducted only in favorable flight conditions. So, it is grounded that the precision parameters of navigation systems are much higher.

Electronic telemeters or angle measuring navigation systems which function within medium wave, short wave and ultra-short wave range provide necessary precision of current coordinates of plane. However, the application of these systems should start at the initial point prior to surveying work. Besides, such systems are impossible to use in mountainous area where the stable phase field is hard to create. And in case of measuring over sea it is not always possible to supply the needed number of known radio stations. Doppler navigation systems can also have some drawbacks. These systems are not easy to apply either at the sea side or in mountains because of the lack of navigation parameters precision. That is why; INS is the basic source of navigation information.

References:

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