

# Mission Analysis for Navigation Satellite with Constraints

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## Abstract

To meet the navigation mission requirements on the satellite position accuracy and the stability as well as the constellation configuration, this article carried out navigation mission analysis and discussed the adaptability to navigation mission for the navigation satellite using the flight-verified communication satellite platform. Based on the analysis results, the article proposed the design modification for the satellite platform, and described the characteristics of navigation mission.

## 1 Introduction

Under the general object and constraints which include political constraints, economic constraints, mission function constraints, schedule constraints, launch window constraints, TTC and launch constraints etc, satellite mission is analyzed and simulated to yield the overall design constraints, and finally input to system design.

The first generation Chinese navigation satellites, inherited the functions of the current communication satellites, are capable of poisoning and communicating between stations by the aid of the main control station. Based on principles of the user transceiver with the given height, the first generation Chinese navigation satellites are two-dimensional, active navigation positioning system. According to the satellite development requirements, the second generation Chinese navigation satellites are passive navigation positioning system which is the mixed constellation consisting of GEO satellites (Earth geostationary satellite) IGSO satellites and MEO satellites. There are strict constraints among the satellites. Specially, the accurate position determination demands the high stability of satellite station keeping. For navigation satellites using the

current communication satellite platform, there are lots of challenges. This article carried out mission analyses on the second generation Chinese navigation satellites, and the main focus is on the design constraints which are different with communication satellites and brought out by different flight missions between the navigation satellite and the communication satellite.

## 2 Analyses on satellite design constraint by navigation

### mission

Navigation missions impose constraints on the satellite design, and two important constraints are a) accurate and stable satellite station, b) strict configuration of mixed constellation.

## 3 Summary

This article discusses the differences about satellite design constraints which resulted from changes of the navigation mission over the communication mission. These differences prompted us to use the new strategies on the designs of high orbit satellites.

In conclusion, the mission analysis is the input for satellite design. The mission analysis includes many aspects. This article carried out the particular analyses on differences between navigation missions and communication mission on the basis of the current satellite platform, and proposed the design modifications.

## References

- [1] Understanding GPS Principles and Application, Second Edition, Writed by Elliott D.Kaplan, Christopher J.Hegart
- [2] Affects of thruster operation on satellite orbit, Yanghui, Chiese space science and technology,2008