
**Space systems — Best practices
for orbit elements at payload — LV
separation**

*Systèmes spatiaux — Meilleures pratiques pour les éléments en orbite
à charge utile — Séparation LV*

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#).

The committee responsible for this document is ISO/TC 20, *Aircraft and space vehicles*, Subcommittee SC 14, *Space systems and operations*.

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Introduction

This Technical Report will provide a recommendatory method for post-launch assessment of the orbit elements precision at separation, which is conducive to improving international communication effect and reducing the risks from errors resulting from miscommunication. It can estimate the orbit elements precision at separation, provide the reference for fuel capacity design of launch vehicle and spacecraft, and then help to reduce the manufactory costs of rocket and payload.

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Space systems — Best practices for orbit elements at payload — LV separation

1 Scope

This Technical Report provides the best practices for orbit elements at payload-LV separation. It includes orbit elements and calculation conditions, calculation method of orbit elements and their errors at elliptical orbit insertion of various payloads. The fit between the actual and expected values of orbit elements can be used as a criterion of commercial launch.

There are many different sets of orbit elements. Each is best suited for a particular application. The traditionally used set of orbital elements is called the set of Keplerian elements. This Technical Report gives the calculation method of Keplerian elements and the transformation method of all the other orbit elements, in order to satisfy different user's need.

Affected by terrestrial gravitational perturbation, lunisolar gravitation perturbation and other factors, orbit elements change slowly after orbit injection. Orbit elements calculation methods after separation are not included in this Technical Report.

The technical communication and specific progress for orbit elements is relatively easy to be agreed on by applying this Technical Report, which can contribute to avoiding possible disputes.

2 Symbols and abbreviated terms

2.1 Abbreviated terms

BIPM	Bureau International des Poids et Mesures
CTP	Conventional Terrestrial Pole
GAST	Greenwich Apparent Sidereal Time
GMST	Greenwich Mean Sidereal Time
GCRF	Geocentric Celestial Reference Frame
GPS	Global Positioning System
IERS	International Earth Rotation and Reference System Service
IRM	International Reference Meridian
ITRF	International Terrestrial Reference Frame
ITRS	International Terrestrial Reference System
LGEIF	Launch Geocentric Equatorial Inertial Frame
LV	Launch Vehicle
PZ90	Acronym of Russian Parametry Zemli 1990
SI	International System of Units