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INCONTROL®

Satellite command and control software for on-orbit, factory test and ground system monitor and control

L3Harris' InControl provides a cost-effective, flexible, advanced command and control solution that gives satellite owners and operators the power to more effectively test and control space assets on ground and on orbit.

InControl supports the full range of command and control system requirements, including telemetry processing, data display and analysis, constellation monitoring and control, onboard system management and ground equipment monitoring and control.

The system's user-centric design enables satellite owners and operators to easily adapt to changes in mission-unique requirements and provides a simplified, common interface that reduces training time and cost.

INDUSTRY-LEADING CONSTELLATION SUPPORT

InControl is a flexible system that easily scales from developing and testing demonstration satellites to supporting a full constellation on orbit with a small number of operators. The software's robust capabilities provide greater autonomy, enabling satellite operators to customize and expand operations with less hardware and system complexity than similar systems — all while significantly reducing operational cost.

InControl is designed to support a fleet of satellites, treating each satellite and ground station as its own mission. The dynamic system provides operators with a constellation view in addition to drill-down capabilities, which enable operators to assess individual satellite performance with one click of a button. InControl provides the ability to manage shared configurations, scripts and displays across a fleet, reducing the configuration management burden associated with large constellations.

AUTOMATION PROVIDES GREATER CONVENIENCE

InControl facilitates control system automation by carefully coordinating all major system functions — specifically, command procedure execution, telemetry processing and analysis, payload management, ground system management, mission planning and flight dynamics.

> The task scheduler executes scheduled command procedures at designated times and simplifies the management of nominal and daily scheduled activities, such as contact schedules for low Earth orbit (LEO) missions.

> Command procedures can automatically detect and respond to anomalous conditions on board the spacecraft, making it possible to reduce, or even eliminate, potential downtime caused by known system anomalies.

> Telemetry data is used to perform automatic command verification and to update overall system status.

The system's well-coordinated, closed-loop design allows owners and operators to choose the level of automation to maximize overall operational efficiency.
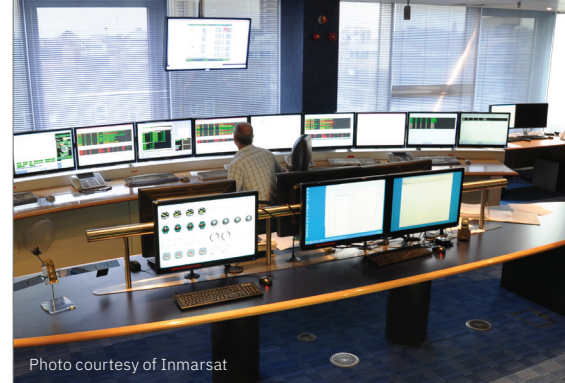
FEATURES

> Provides single-mission, multi-mission and large constellation support

> Scales easily to accommodate CubeSat, LEO, geostationary equatorial orbit, medium Earth orbit and interplanetary spacecraft

> Uses same software application in satellite test and on-orbit operations, resulting in cost savings

> Offers high degree of customization to integrate into any operational environment

> Supports automation of all command and control functions, providing support for lights-out operations

> Integrates with multiple flight dynamics and mission-planning solutions

> Manages complex data for LEO missions, including ability to merge back orbit data with real-time data

> Supports cloud with distributed client/server architecture, scalable storage and container deployments

> Facilitates ground system integrations with a comprehensive representational state transfer (REST) API

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EFFECTIVE ASSEMBLY, INTEGRATION AND TEST FOR GREATER INSIGHTS

InControl offers a flexible platform with the ability to customize and automate data collection and report generation as satellites move through the production line and into final system-level testing.

Systems and test engineers use hardware or software simulators to support test efforts as the spacecraft progresses through subsystem development and enters assembly, integration and test (AI&T). Engineers can also integrate test procedures from subsystem development into system-level tests, resulting in increased reuse.

InControl is highly customizable with a gateway interface capability that facilitates the use of simulators, ground terminals and third-party test equipment and tools with ease.

The procedure platform automates testing and archives data available for analysis using the system's existing JADE™ data display or through external tools.

Test engineers can create customized, formatted reports containing as-run procedures, data and test results and graphic displays that generate automatically during tests.

Once a satellite is on orbit, operators can view data collected by InControl during AI&T and easily compare operational data with integration data for a more complete view of the space asset.

CAPABILITY	DESCRIPTION
Automation	Integrated activity scheduler, combined with the JAS scripting language, provides automation of operational and test procedures and contact management.
Event logging	Records and maintains permanent record of activity log with means to filter, review and comment.
Data distribution	Supports an open architecture by providing multiple options for distributing data to users and ingesting data from other sources. This includes an application programming interface (API), custom user-written functions, web access and the ability to easily access archived data.
Procedure development	Powerful automation allows scripted access to system features, such as telemetry, commanding and report generation.
Archiving	Configurable archiving for all project data, including raw and processed archives, command histories and event logs. The system's open-source, NoSQL database provides users easy access to stored data using widely available APIs.
Data displays	JADE is a user-friendly, drag-and-drop application to display and monitor parameters and missions. Users have access to alphanumeric displays, time charts and custom-animated graphics to create individual views and complete workbooks.
Equipment monitor and control	Monitor and control of ground and test equipment provides insights critical to maintain the health of satellites.
Data retrieval	Data analysts can access archived data by time range and can request all samples or summary data from long-term archives.
Report generation	Operators can generate customizable reports to include graphics, tailored formats and as-run data.
Built-in simulation	InControl can simulate telemetry and command verification responses for operator training, mission rehearsal and procedure development. Full satellite simulation is available using the L3Harris Satellite Design Tool.
Fault tolerance, failover and redundancy	Built-in configurable capabilities can design and enact customized fault resolution processes.
Extensible Markup Language (XML) Telemetric and Command Exchange translator	Translates data from XML and XTCE to the internal XML data representation.
Machine learning (ML) platform	Open-architecture approach to data archiving allows the use of industry standard tools in support of ML and artificial intelligence approaches to data analysis, anomaly detection and automation.

L3Harris Technologies is an agile global aerospace and defense technology innovator, delivering end-to-end solutions that meet customers' mission-critical needs. The company provides advanced defense and commercial technologies across air, land, sea, space and cyber domains.

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