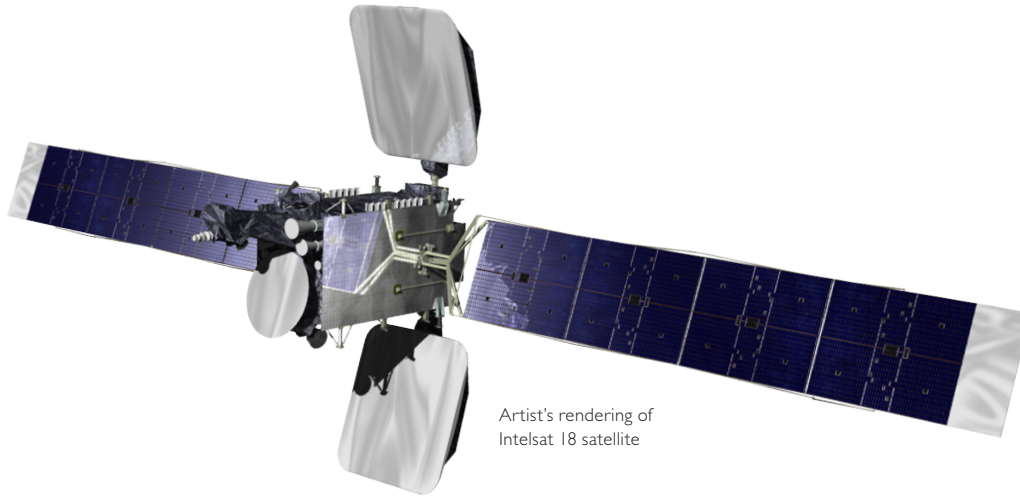




# STAR™ Bus

A fully redundant, flight-proven, spacecraft bus designed for geosynchronous missions



Artist's rendering of Intelsat 18 satellite

## Advantages of the STAR Bus

Orbital's STAR Bus design is unique within the satellite industry. While other satellite suppliers have focused on large powerful satellite platforms, Orbital's STAR Bus provides an affordable low-to-medium power satellite platform that is ideal for missions of this size. Rather than being a less efficient version of a larger, heavier product, Orbital's STAR Bus is designed specifically for the 1,000 to 7,500 W payload class. The STAR Bus is flight-proven with excellent operational performance among all 22 currently in-orbit. With 11 more STAR satellites now in production or awaiting launch, Orbital has established our class of GEO satellite products as the unquestioned market leader.

## Design

The STAR Bus satellite is a modular, mass efficient structure, designed for simplified integration to reduce manufacturing cycle times. The structure is supported by a composite thrust cylinder, to which the bus, payload, nadir and base panels are connected. Energy from two multi-panel solar wings and lithium ion batteries is electronically processed to provide 35 V regulated power to the satellite throughout the mission. All active units aboard the satellite are connected through a 1553 flight processor. Commands and telemetry are processed through the flight software resident on the flight processor, which provides robust autonomous control to all STAR satellites. The modularity of the structure and the standard 1553 interfaces allow parallel assembly and test of the bus and payload systems, reducing manufacturing schedule risk by minimizing the time spent in serial satellite integration and test flow.

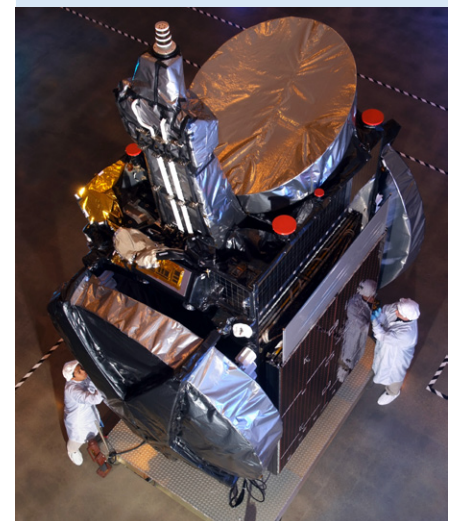
## Payload Support

While primary applications are Fixed Satellite Services (FSS) and Broadcast Satellite Services (BSS), STAR Bus can be adapted for MSS, Earth and space science applications, as well as for technology demonstration or risk reduction programs. Depending on mission duration requirements, STAR Bus can accommodate payloads in excess of 500 kg, and provide up to 7,500 W of power. Instrument data can be provided in standard format such as CCSDS or through secured encryption, as approved by the National Security Agency (NSA).

## QUICK FACTS:



- Orbital is the world's leading provider of small- to medium-class geosynchronous Earth orbit (GEO) communications satellites
- 22 GEO communications satellites delivered since 1997
- 11 GEO communications satellites on order or in production for delivery through 2013
- Average delivery of 24 months
- STAR-2 leads the industry with in-orbit reliability
- 18 STAR-2 satellites currently in orbit



Intelsat 15 in Orbital's Satellite Manufacturing Facility

# STAR™ Bus

## STAR BUS HERITAGE

### SES-8

Mission: Ku- and Ka-band  
Launch: 2013

### MEXSAT-3

Mission: C- and  
Ku-band FSS  
Launch: 2012

### Azerspace/Africasat-1a

Mission: C- and  
Ku-band FSS  
Launch: 2012

### Star One C3

Mission: C- and  
Ku-band FSS  
Launch: 2012

### OverHorizon OHO-1

Mission: Ka-band MSS  
Launch: 2012

### HYLAS 2

Mission: Two-way Ka-band  
Communications  
Launch: 2012

### Intelsat 23

Mission: Ku- and C-band  
Launch: 2011

### Intelsat 18

Mission: Ku- and C-band  
Launch: 2011

### Intelsat New Dawn

Mission: Ku- and  
C-band FSS  
Launch: 2011

### KOREASAT 6

Mission: Ku-band DBS  
and FSS  
Launch: 12/29/10

### SES-1, SES-2 and SES-3

Mission: Ku-band BSS,  
C-band FSS  
and Ka-band  
Launch: SES-1: 4/24/10;  
SES-2: 2011;  
SES-3: 2011

### NSS-9

Mission: C-band FSS  
Launch: 2/12/09

### MEASAT-3a

Mission: Ku-band DTH,  
C-band FSS  
Launch: 6/21/09

### AMC-21

Mission: Ku-band FSS  
Launch: 8/14/08

### THOR 5

Mission: Ku-band FSS  
and BSS  
Launch: 2/11/08

### Horizons-2

Mission: Ku-band FSS  
Launch: 12/21/2007

### Intelsat 16

Mission: Ku-band DTH  
Launch: 2/11/10

### Intelsat 15

Mission: Ku-band FSS  
and BSS  
Launch: 11/30/09

### Intelsat 11

Mission: Ku-band DTH,  
C-band FSS  
Launch: 10/5/07

### Optus D-Series

Mission: Ku-band DTH  
and FSS  
Launch: D1: 10/13/06;  
D2: 10/5/07;  
D3: 8/21/09

### TELKOM-2

Mission: C-band FSS  
Launch: 11/16/05

### Galaxy 12, 14 and 15

Mission: C-band FSS  
(G-15: C-band  
FSS & L-band  
Navigation)  
Launch: G-12: 4/9/03;  
G-14: 8/14/05;  
G-15: 10/13/05

### N-STAR c

Mission: S-band MSS  
Launch: 7/5/02

### BSAT-2a, -2b\* and -2c

Mission: Ku-band DTH  
Launch: -2a: 3/8/01;  
-2b: 7/12/01;  
-2c: 6/11/03

### IndoStar-1 (Carkwararta)

Mission: S-band DTH  
Launch: 11/12/97



\* Satellite lost due to LV failure



**INDOVISION**  
**BSAT**  
BSAT-2a, -2b and -2c  
IndoStar-1  
(Cakrawarta)

**NTT DoCoMo**  
N-STAR c

**INTELSAT**  
*Closer, by far*  
Galaxy 12, 14 and 15

**INTELSAT**  
*Closer, by far*  
Intelsat 11

**INTELSAT**  
*Closer, by far*  
Intelsat 15

**INTELSAT**  
*Closer, by far*  
Intelsat 16

**INTELSAT**  
*Closer, by far*  
Intelsat 18

**INTELSAT**  
*Closer, by far*  
Intelsat New Dawn

**INTELSAT**  
*Closer, by far*  
Intelsat 23

**horizons**  
INTELSAT-JSAT  
Horizons-2

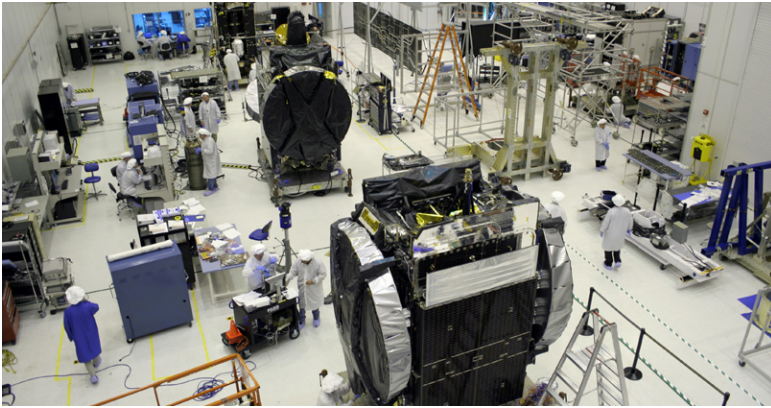
**telenor**  
THOR 5

**MEASAT**  
MEASAT-3a

**alleh kt**  
KOREASAT 6

**Telkom Indonesia**  
TELKOM-2

**'yes' OPTUS**  
Optus D1



Orbital's Dulles, VA Satellite Manufacturing Facility.

## Shared Launch Opportunities

Due to the size and mass envelope of the satellite, STAR Bus is compatible with almost all commercially available launch vehicles, increasing opportunities for launch and access to space. While dedicated or single launch services are more readily available, STAR Bus targets shared launch opportunities, where launch cost and launch-sharing opportunities are favorable.

## Mission Services

Customers can purchase the STAR Bus spacecraft bus alone, or as part of a turn-key service that includes an integrated payload, operations and launch vehicle. Orbital conducts spacecraft commissioning from its own ground station prior to transferring spacecraft control to the customer's operations center.

## Mission Life

The satellite is designed with conservative margin beyond 15 years, taking into account for the severe geosynchronous radiation environment. The typical limitation of mission duration is on-board fuel for orbit maintenance station-keep. However, fuel life can be optimized and extended to more than 15 years, based on launch vehicle selection.

## Heritage

Designed and developed as a standard bus for commercial telecommunications and direct broadcast missions, STAR Bus fills a market niche for small, high power geosynchronous communications spacecraft. Orbital's first application of the STAR Bus design, IndoStar-I, was successfully launched in November 1997 along with another satellite on an Ariane rocket.

Since then, Orbital has launched 22 STAR Bus spacecraft with 11 in production.

## Versatility

Several available options augment the basic bus to provide improved pointing, more payload power, secure communications, higher downlink data rates or enhanced payload computing power.

## Specifications

### Core Bus Features

Bus Dry Mass:	800-1,500 kg
Payload Mass Capability:	500 kg
Orbit:	Geosynchronous
Typical Mission Lifetime:	>15 years
Delivery:	24 months (typical) after receipt of order
Launch Vehicle Compatibility:	Ariane, Soyuz, Land Launch, Proton, H2A, Falcon-9, Sea Launch

### Structure

Bus Dimensions (HxWxL):	1.75 m x 1.7 m x 1.8 m
Construction:	Composite / Al

### Power Subsystem

Payload Power:	Up to 7,500 W orbit average @ 15 years
Bus Voltage:	24-36 VDC (nominal)
Solar Arrays:	Multi-junction GaAs cells
Batteries:	Li-Ion

### Attitude Control Subsystem

Stability Mode:	3-axis; zero momentum
Propulsion Subsystem Transfer Orbit System:	Liquid bi-propellant
On orbit:	Monopropellant (hydrazine)

### Command & Data Handling Subsystem

Flight Processor:	MIL-STD-1750A
Interface Architecture:	MIL-STD 1553B, CCSDS

## For more information, please contact:

### Mr. Amer Khouri

Vice President of Marketing, Global Communications  
703/948-4600, [geomarketing@orbital.com](mailto:geomarketing@orbital.com)