Taurus II Medium-Class Launch Vehicle

INNOVATION YOU CAN COUNT ON®

Introduction & System Features

MEDIUM-CLASS LAUNCH SERVICES FOR THE 21ST CENTURY

Taurus II is a two-stage launch vehicle designed to provide responsive, cost-effective, and reliable access to orbit and Earth escape for medium-class payloads weighing up to 7,200 kg. Taurus II is designed to be a highly reliable launcher to meet NASA Category 3 and similar DoD mission success standards, and incorporates flight-proven subsystems to reduce development cost, schedule and risk.

Low Risk Design

Taurus II incorporates flight-proven components from leading global suppliers and subsystems already successfully deployed on other Orbital launch vehicles.

Affordable

Projected launch services rates represent significant savings over existing medium- and heavy-class launchers, reducing total mission cost.

Leverages Flight-Proven Technologies

The Taurus II first stage is powered by dual AJ26-62 engines, with second stage propulsion provided by a Castor 30 solid motor (Castor 120 heritage). An optional N_2H_4/NTO-fueled orbit raising/trim kit is available and a higher performance 2nd Stage for more mass to orbit is also available.

Fills Medium-Class Launch Services Gap

Taurus II fills the service gap between medium-light Minotaur IV-class launch vehicles and heavy-lift Delta IV and Atlas 5 offerings.

Taurus II development is internally funded by Orbital. Its initial mission is a demonstration of commercial re-supply of the International Space Station (ISS) under a NASA Commercial Orbital Transportation Services (COTS) agreement. Future applications include the launch of medium-class science, defense and commercial launch missions.

Performance

VEHICLE CONFIGURATION	*KILOGRAMS*	*KILOMETERS*	*INCLINATIONS*
Low-Earth Orbit (Circular)			
2 Stage	1,000 - 5,400	1,000 - 200	SSO - 28.7
2 Stage Enhanced Second Stage	4,800 - 7,200	1,000 - 200	SSO - 28.7
3 Stage	3,500 - 5,500	1,000 - 200	SSO - 28.7
Earth Escape Energy			
3 Stage	350 - 1,800 (50 to - 5 km^2/sec^2)	185 (Perigee)	28.7

KEY FEATURES

- Incorporates both solid and liquid stages and flight-proven technologies to meet medium-class mission requirements
- Provides substantial payload performance to a variety of low inclination low-Earth (LEO) orbits, as well as sun-synchronous, geo-transfer and interplanetary orbits
- 3.9 meter fairing accommodates large payloads
- Streamlined vehicle/payload integration and testing via simplified avionics interfaces reduce time from encapsulation to lift-off
- Initial launch capability in 2011 from the Wallops Flight Facility (WFF)
- Capable of launching single and multiple payloads
- Compatible with the Western Range at Vandenberg Air Force Base (VAFB), Wallops Flight Facility, Eastern Range at Cape Canaveral Air Force Station (CCAFS) and Kodiak Launch Complex (KLC)

System Description & Parameters

VEHICLE DESCRIPTION / STAGES

Stage 1

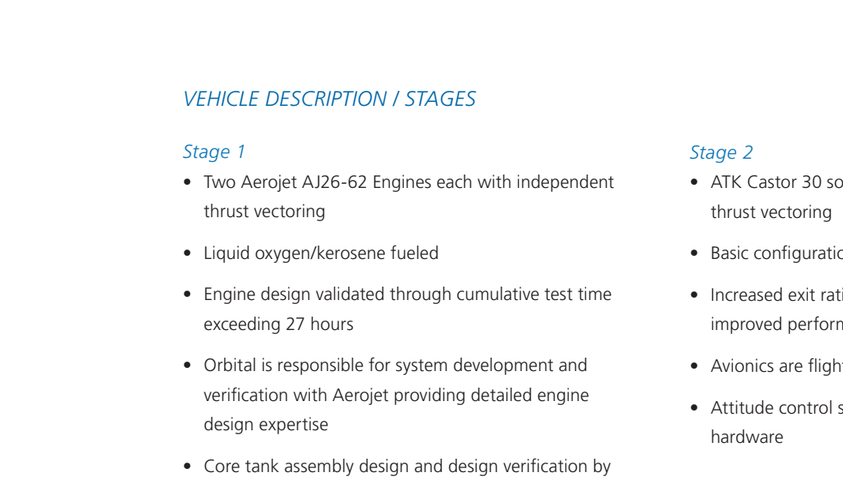
- Two Aerojet AJ26-62 Engines each with independent thrust vectoring
- Liquid oxygen/kerosene fueled
- Engine design validated through cumulative test time exceeding 27 hours
- Orbital is responsible for system development and verification with Aerojet providing detailed engine design expertise
- Core tank assembly design and design verification by KB Yuzhnoye with active involvement from Orbital (Zenit-derived heritage)
- Core tank assembly production by Yuzhmash
- Avionics Stage Controller uses flight-proven Orbital Modular Avionics Control Hardware (MACH) components

Stage 2

- ATK Castor 30 solid motor (Castor 120 Heritage) with thrust vectoring
- Basic configuration utilizes single 50:1 nozzle
- Increased exit ratio nozzle (75:1) in development for improved performance
- Avionics are flight-proven mach components
- Attitude control system incorporates SLV-heritage hardware

Optional Stage 3 - Orbit Raising Kit

- Helium pressure regulated bi-propellant propulsion system using nitrogen tetroxide and hydrazine (Orbital STAR Bus Heritage)



PARAMETERS

Stage 1:

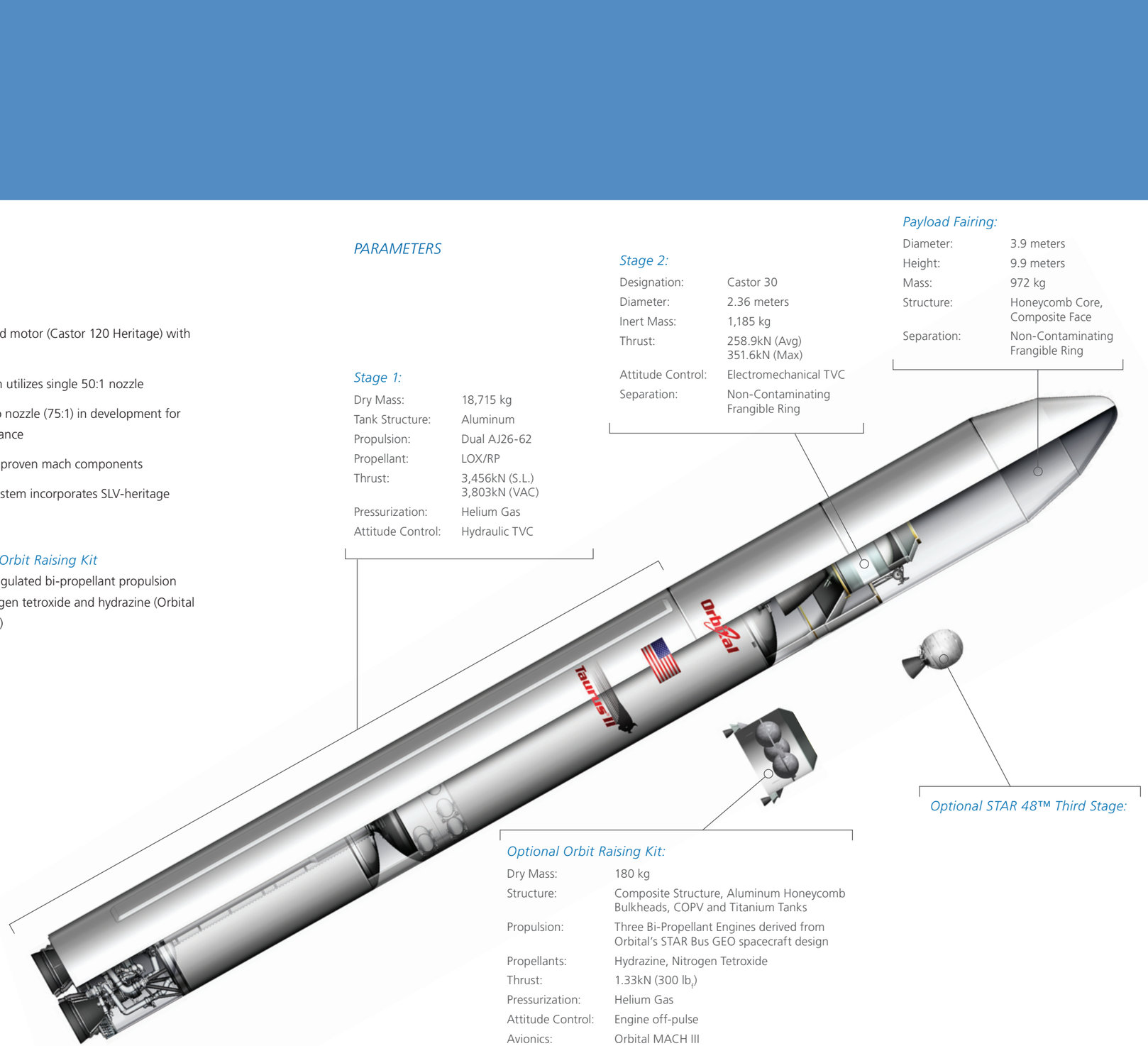
Dry Mass:	18,715 kg
Tank Structure:	Aluminum
Propulsion:	Dual AJ26-62
Propellant:	LOX/RP
Thrust:	3,456kN (S.L.) 3,803kN (VAC)
Pressurization:	Helium Gas
Attitude Control:	Hydraulic TVC

Stage 2:

Designation:	Castor 30
Diameter:	2.36 meters
Inert Mass:	1,185 kg
Thrust:	258.9kN (Avg) 351.6kN (Max)
Attitude Control:	Electromechanical TVC
Separation:	Non-Contaminating Frangible Ring

Payload Fairing:

Diameter:	3.9 meters
Height:	9.9 meters
Mass:	972 kg
Structure:	Honeycomb Core, Composite Face
Separation:	Non-Contaminating Frangible Ring



Optional STAR 48™ Third Stage:

Optional Orbit Raising Kit:

Dry Mass:	180 kg
Structure:	Composite Structure, Aluminum Honeycomb Bulkheads, COPV and Titanium Tanks
Propulsion:	Three Bi-Propellant Engines derived from Orbital's STAR Bus GEO spacecraft design
Propellants:	Hydrazine, Nitrogen Tetroxide
Thrust:	1.33kN (300 lb_f)
Pressurization:	Helium Gas
Attitude Control:	Engine off-pulse
Avionics:	Orbital MACH III

Launch Sites & Payload Accommodations

LAUNCH SITES

Taurus II is compatible with the Wallops Flight Facility in Virginia, Western Range at Vandenberg Air Force Base in California, Eastern Range at Cape Canaveral Air Force Station in Florida, and Kodiak Launch Complex in Alaska, providing customers with a variety of launch locations and trajectories.

Wallops Flight Facility (WFF)

NASA's WFF in Virginia is home to the Taurus II COTS/CRS launch program and supports mid-inclination and high energy missions.

Cape Canaveral Air Force Station (CCAFS)

CCAFS, with its core competence in expendable launch vehicle operations and manned spaceflight, is the Taurus II launch location for low-inclination missions.

Vandenberg Air Force Base (VAFB)

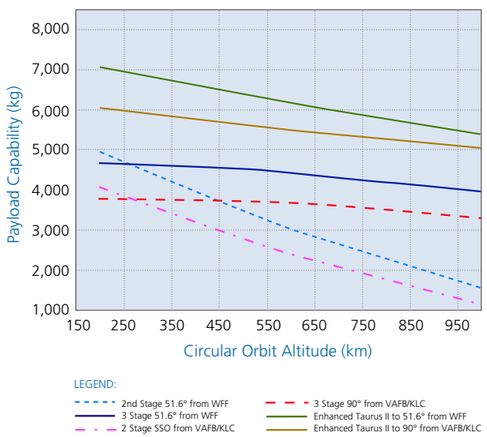
Taurus II leverages Orbital's experienced launch operations team and extensive VAFB facilities to achieve unparalleled responsiveness. VAFB is a prime location for high inclination, sun-synchronous launches.

Kodiak Launch Complex (KLC)

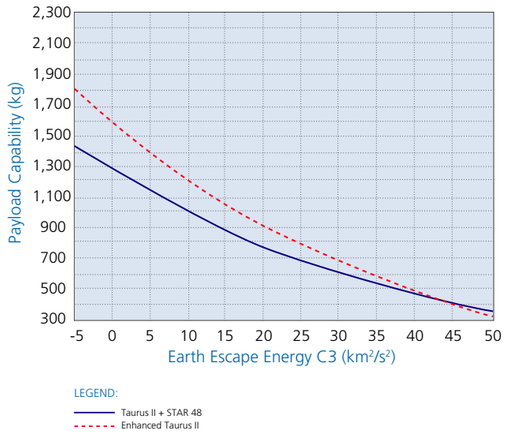
KLC is a mature launch complex with facilities to support spacecraft checkout and fueling operations. KLC in Alaska provides Taurus II with another prime location for launching high inclination, sun-synchronous missions.

PERFORMANCE

Low-Earth Orbit (Circular)



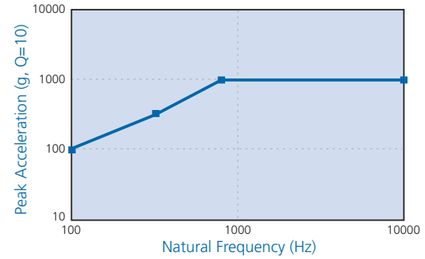
High Energy



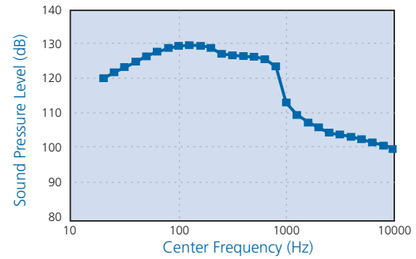
PAYLOAD ACCOMMODATIONS:

- Standard 3.9m (157 in.) diameter spacecraft fairing
- Standard fairing access doors for spacecraft support - two Standard 0.6m (24 in.) diameter mission/spacecraft specific access zones
- Launch vehicle environments are developed using well-defined processes, and analytical models validate through correlation with flight data from hundreds of launches and dozens of launch vehicle configurations
- RUAG SS1666VS flight-proven spacecraft separation system, including low-shock design
- Optional Payload Instrument Nitrogen Purge
- Thermally controlled fairing volume with standard Class M6.5 (100k) cleanliness, optional Class M5.5 (10k) cleanliness available

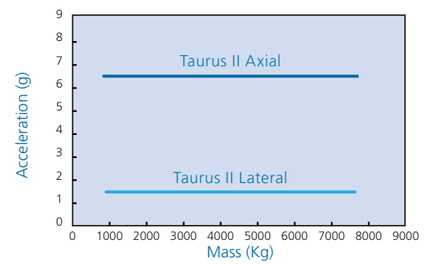
Shock Environment



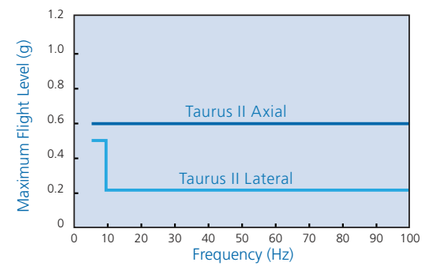
Acoustic Environment

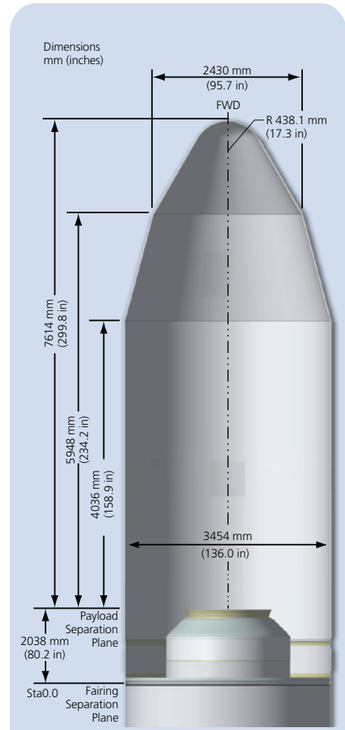


Acceleration Environment



Interface Random Vibration Environment





Payload Attach Fitting,
RUAG SS1666VS

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BUILDING ON A HERITAGE OF SUCCESS

Orbital has successfully developed more launch vehicles during the last 20 years than any other organization. The Taurus II launch system leverages Orbital's heritage of our highly successful Pegasus®, Taurus® and Minotaur space launch vehicles, as well as launch vehicles developed for the nation's missile defense system. Taurus II is being developed, manufactured and launched using management approaches, engineering standards, and production and test processes common to Orbital's other major launch vehicles.

Since the company's founding in 1982, Orbital has delivered and launched over 500 launch vehicles with one of the industry's best mission success records. Orbital's excellent reliability record reflects conservative engineering, aggressive supplier management, and disciplined manufacturing and test processes. The company has nearly 200 additional launch vehicles under contract for delivery to customers through 2014.

STATE-OF-THE-ART ENGINEERING, MANUFACTURING AND TEST FACILITIES

Orbital's launch vehicle engineering and test facilities are situated on Orbital's 44-acre Chandler, Arizona campus. Featuring 500,000 square feet of engineering, program offices, manufacturing bays and test labs in one location, the facility is fully ISO-9001 and AS-9100 Certified.

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