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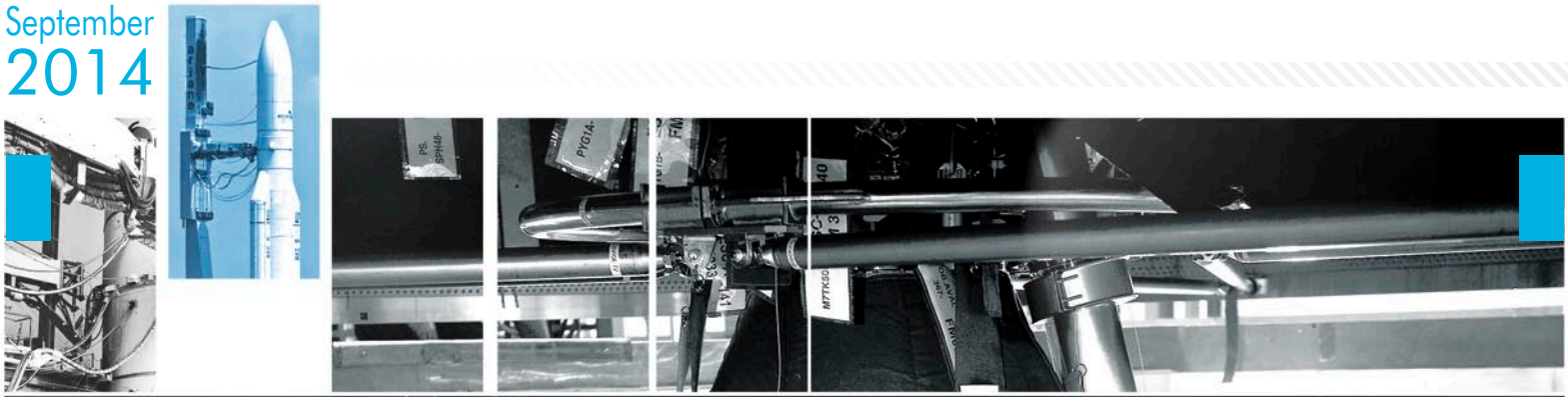
September
2014



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MEASAT-3b
OPTUS 10

esa

measat

OPTUS yes

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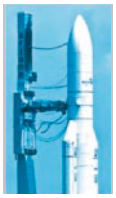

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MEASAT-3b - OPTUS 10

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ARIANESPACE TO LAUNCH SATELLITES FOR TWO LEADING OPERATORS IN THE ASIA-PACIFIC

On its fourth Ariane 5 launch of the year, Arianespace will orbit two telecommunications satellites: MEASAT-3b for the Malaysian-based Asian operator MEASAT and OPTUS 10 for the Australian operator OPTUS.

Arianespace's selection by the world's leading satellite operators and manufacturers is clear international recognition of the company's excellence in launch services. With 64% of the commercial satellite launch market in the region, Arianespace clearly sets the standard for launch services in the Asia-Pacific, working for both manufacturers and operators. Since being founded in 1980, Arianespace has launched two-thirds of the Asia-Pacific region's commercial geostationary telecommunications satellites.

MEASAT-3b

MEASAT-3b will be the third satellite launched by Arianespace for the operator MEASAT Global Berhad ("MEASAT"), following MEASAT-1 and MEASAT-2 in January and November 1996.

Built by Airbus Defence and Space on a Eurostar 3000 L platform, MEASAT-3b will weigh 5,897 kg at launch. It will be fitted with 48 Ku-band transponders and one experimental S-band payload. From its orbital position at 91.5° East, MEASAT-3b will provide telecommunications and direct-to-home (DTH) broadcast services to Malaysia, India, Indonesia and Australia. Alongside the MEASAT-3 and MEASAT-3a satellites, the latest member of this family will considerably increase the operator's DTH (Direct To Home) capacity in the Asian market. MEASAT-3b offers a contractual life of about 15 years.

MEASAT-3b is the 110th payload built by Airbus Defence and Space, or its predecessors, to be launched by Arianespace.

OPTUS 10

OPTUS 10 will be the sixth satellite launched by Arianespace for this Australian operator. Aussat A3 was launched in 1987, followed by OPTUS & DEFENCE C1 in 2003 and OPTUS D1, D2 and D3 in 2006, 2007 and 2009, respectively. SingTel, the parent company of OPTUS, also chose Arianespace to launch its two satellites, ST-1 and ST-2, in 1998 and 2011.

OPTUS 10 was built by Space Systems/Loral in Palo Alto, California, using an SS/L 1300 platform. It will weigh approximately 3,270 kg at launch, and is fitted with 24 Ku-band transponders. Offering a design life of 15 years, OPTUS 10 will be positioned at 164° East, and offer direct TV broadcast, Internet, telephone and data transmission services to Australia, New Zealand and the Antarctic region.

OPTUS 10 is the 44th satellite built by Space Systems/Loral to be launched by Arianespace.

CONTENTS

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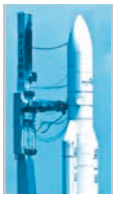

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MEASAT-3b - OPTUS 10

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MISSION DESCRIPTION

The 219th Arianespace launch will orbit two telecommunications satellites: MEASAT-3b for the Malaysian operator MEASAT and OPTUS 10 for the Australian operator OPTUS.

This will be the 75th launch of an Ariane 5.

The launcher will be carrying a total payload of 10,088 kg, including 9,157 kg for the MEASAT-3b and OPTUS 10 satellites, which will be released into their targeted orbits.

The launch will be from Ariane Launch Complex No. 3 (ELA 3) in Kourou, French Guiana.

Targeted orbit
Perigee altitude : 250 km
Apogee altitude : 35,746 km
Inclination : 6 degrees

Liftoff is planned on **Thursday, September 11, 2014** as soon as possible within the following launch window:

- between 06:21 pm and 07:23 pm, Kourou time,
- between 05:21 pm and 06:23 pm, Washington DC time,
- between 09:21 pm and 10:23 pm, Universal time (GMT),
- between 11:21 pm and 00:23 am, Paris time on September 11-12
- between 05:21 am and 06:23 am, Kuala Lumpur time on Friday, September 12
- between 07:21 am and 08:23 am, Sydney time on Friday, September 12

The launch at a glance

The launcher's attitude and trajectory are totally controlled by the two onboard computers, located in the Ariane 5 vehicle equipment bay (VEB).

7.05 seconds after start of the ignition of the main stage cryogenic engine at T-0, the two solid-propellant boosters are ignited, enabling liftoff. The launcher first climbs vertically for 6 seconds, then rotates towards the East. It maintains an attitude that ensures the axis of the launcher remains parallel to its velocity vector, in order to minimize aerodynamic loads throughout the entire atmospheric phase, until the solid boosters are jettisoned.

Once this first part of the flight is completed, the onboard computers optimize the trajectory in real time, minimizing propellant consumption to bring the launcher first to the intermediate orbit targeted at the end of the main stage propulsion phase, and then the final orbit at the end of the flight of the cryogenic upper stage. The main stage falls back off the coast of Africa in the Atlantic Ocean (in the Gulf of Guinea).

On orbital injection, the launcher will have attained a velocity of approximately 9,355 meters/second, and will be at an altitude of about 654.7 kilometers. The fairing protecting the MEASAT-3b and OPTUS 10 spacecraft is jettisoned shortly after the boosters are jettisoned at about T+203 seconds.

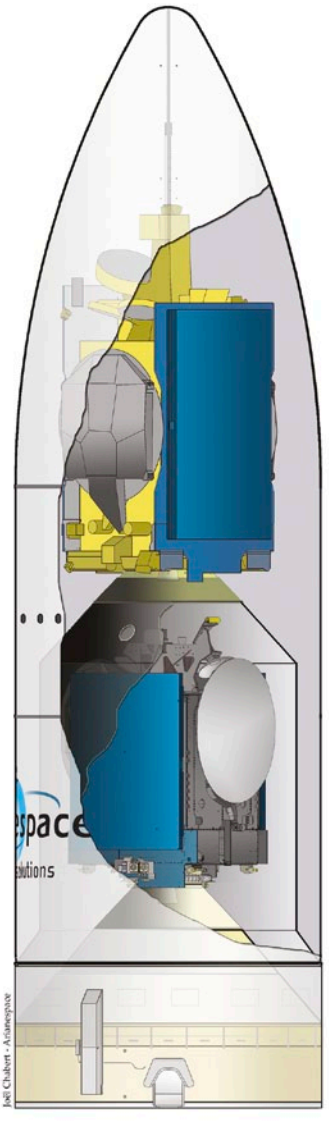
Payload configuration

The MEASAT-3b satellite was built by Airbus Defence and Space in Toulouse, France for the Malaysian-based Asian operator MEASAT.

Orbital position: 91.5° East

The OPTUS 10 satellite was built by Space Systems/Loral in Palo Alto, California (United States) for the Australian operator OPTUS.

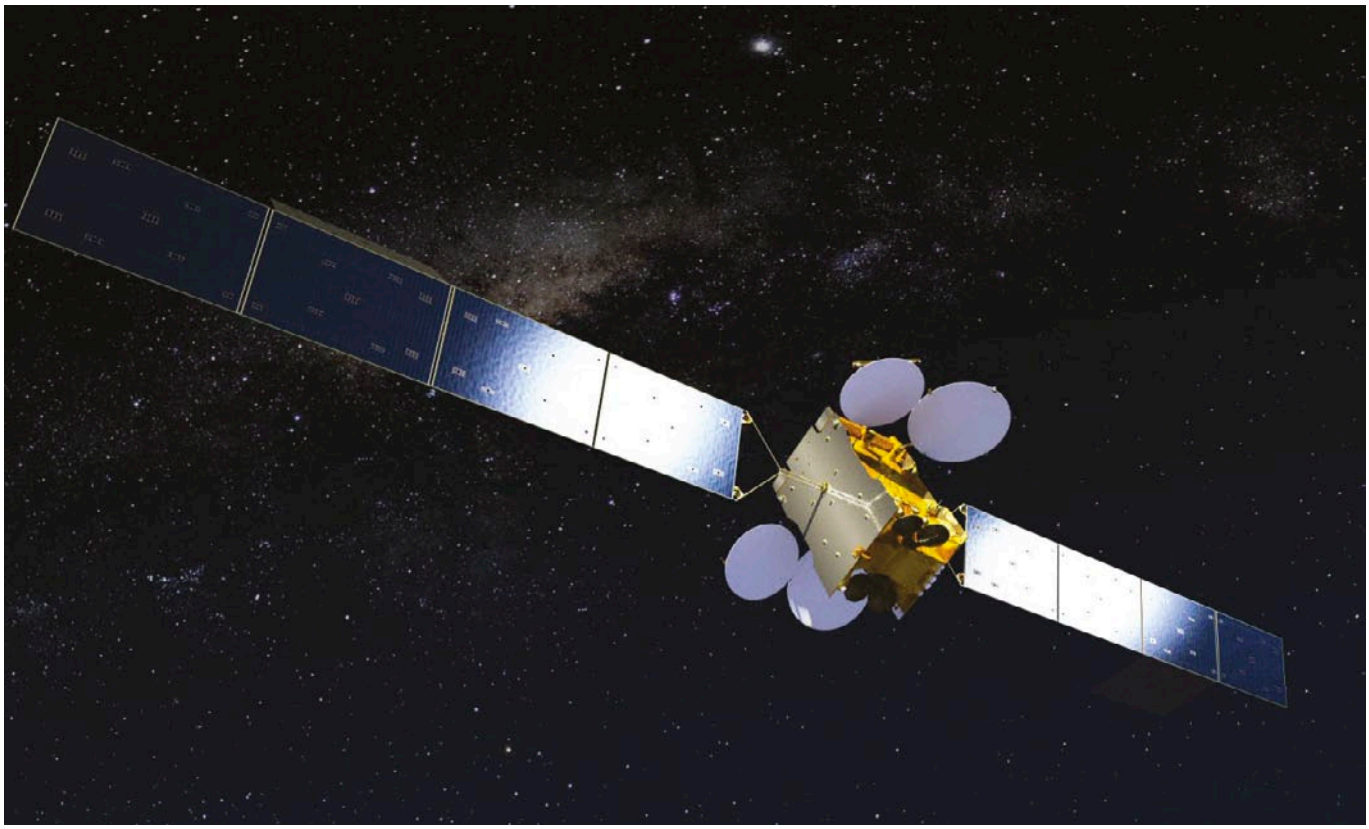
Orbital position: 164° East



Mission length

The nominal length of the mission (from liftoff to separation of the satellites) is **47 minutes and 8 secondes.**

THE MEASAT-3b SATELLITE



Customer	**MEASAT**
Prime contractor	**Airbus Defence and Space**
Mission	**Telecommunications services and DTH services**
Mass	**Total mass at lift-off approx. 5,897 kg**
Stabilization	**3 axis**
Dimensions **Span in orbit**	**6.6 x 2.8 x 2.3 m** **39.4 m**
Platform	**Eurostar 3000 L**
Payload	**48 Ku and 1 S band**
On-board power	**16.2 kW (end of life)**
Life time	**15 years**
Orbital position	**91.5° East**
Coverage area	**Malaysia, Indonesia, India and Australia**

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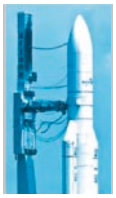

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MEASAT-3b - OPTUS 10

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THE OPTUS 10 SATELLITE

Customer	**OPTUS NETWORKS PTY. LTD.**
Prime contractor	**SPACE SYSTEMS/LORAL**
Mission	**Telecommunications**
Mass	**Total mass at lift-off 3,270 kg**
Stabilization	**3 axis**
Dimensions **Span in orbit**	**5.1 m x 3.1 m x 3.1 m** **24.7 m**
Platform	**1300 LL Bus**
Payload	**24 Ku band transponders**
On-board power	**7.3 kW (end of life)**
Life time	**15 years**
Orbital position	**164° East**
Coverage area	**Australia, New Zealand and Antarctica**

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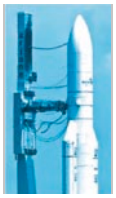

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MEASAT-3b - OPTUS 10

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ARIANE 5-ECA LAUNCH VEHICLE

54.8 m

780 tons
(total mass at liftoff)

Fairing
(RUAG Space)
- 17 m
- Mass: 2.4 t

MEASAT-3b
(Airbus Defence and Space)
- Mass: 5.9 t

OPTUS 10
(Space Systems Loral)
- Mass: 3.27 t

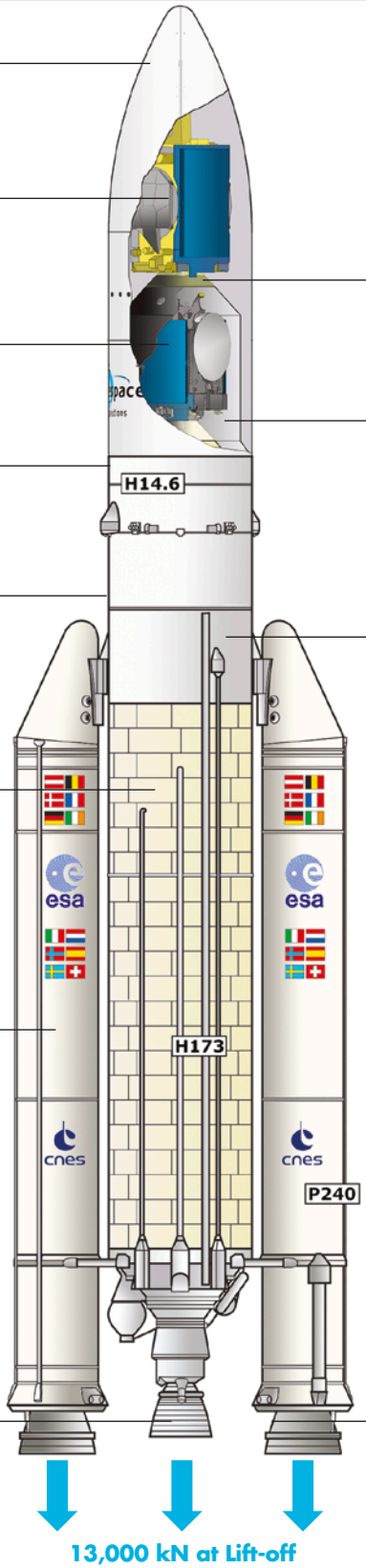
Vehicle Equipment Bay
(Airbus Defence and Space)
- Height: 1.13 m
- Mass: 970 kg

ESC-A - Cryogenic upper stage
(Airbus Defence and Space)
- Height: 4.71 m
- Mass: 19 t

EPC - Main Cryogenic stage
(Airbus Defence and Space)
- Height: 31 m
- Mass: 188 t

EAP - Solid Rocket Boosters
(Airbus Defence and Space)
- Height: 31.6 m
- Mass: 277 t approx.

Moteur Vulcain 2
(Snecma)
- Thrust: 1,390 kN (in the vacuum)
- 540 sec of propulsion



13,000 kN at Lift-off
(at T-O + 7 to 8 sec)

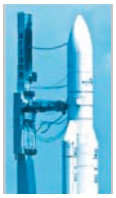
ACU - Payload adaptateur (2)
(RUAG Space ou Airbus Defence and Space)
- Mass: 140 kg each approx.

SYLDA - Internal structure
(Airbus Defence and Space)
- 7 versions (Height:4.9 to 6.4 m)
- Mass: 400 to 530 kg

Moteur HM-7B
(Snecma)
- Thrust: 67 kN (in the vacuum)
- 945 sec of propulsion

Propellants (in ton) at T-O
H : Cryogenic
P : Solid

MPS - Moteur à Propergol Solide
(Europropulsion)
- Average thrust: 5,060 kN
- Maximum thrust: 7,080 kN (in the vacuum)
- 130 sec of propulsion



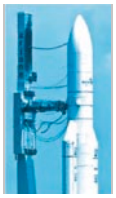
RANGE OPERATIONS CAMPAIGN: ARIANE 5 - MEASAT-3b - OPTUS 10

MEASAT-3b - OPTUS 10 and launch vehicle campaign calendar

Dates	Satellites activities	Launch vehicle activities
February 27, 2014		Campaign start review
February 28, 2014		EPC erection
March 1st, 2014		EAP transfer and positioning
March 6, 2014		EPC/EAP integration
March 12, 2014		ESC-A Erection and equipment bay integration
April 14, 2014	Arrival in Kourou of MEASAT-3b and beginning of preparation campaign in building S1B	
April 15, 2014		Transfer BIL-BAF
April 24, 2014	MEASAT-3b transfer to S3B	
April 25 - May 6, 2014	MEASAT-3b filling operations	
August 13, 2014	Arrival of OPTUS 10 and beginning of preparation campaign in building S5A	
August 22, 2014	OPTUS 10 transfer to S5B	
August 26-28, 2014	OPTUS 10 filling operations	
Monday May 12, 2014	MEASAT-3b integration on adaptor (PAS) and functional test	
Wednesday, May 14, 2014	MEASAT-3b transfer to Final Assembly Building (BAF)	
Thursday, May 15, 2014	MEASAT-3b integration on SYLDA	
Monday, May 19, 2014	Fairing integration on SYLDA	
Saturday, August 30, 2014	OPTUS 10 integration on ACU	

MEASAT-3b - OPTUS 10 launch vehicle campaign final calendar

Dates	Satellites activities	Launch vehicle activities
Monday September 1st, 2014	OPTUS 10 transfer to Final Assembly Building (BAF)	
Tuesday, September 2, 2014	OPTUS 10 integration on launcherr	
Wednesday, September 3, 2014	Composite integration with MEASAT-3b on launcher	
Thursday, September 4, 2014		Completion of composite integration on launcher
Friday, September 5, 2014		ESC-A final preparations and Launch rehearsal
Monday, September 8, 2014		Arming of launch vehicle
Tuesday, September 9, 2014		Launch readiness review (RAL) and final preparation of launcher
Wednesday, September 10, 2014		Rollout from BAF to Launch Zone, launch vehicle connections and filling of the EPC liquid helium tank
Thursday, September 11, 2014		Start of final countdown and launch countdown, including EPC filling with liquid oxygen and liquid hydrogen



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MEASAT-3b - OPTUS 10

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COUNTDOWN AND FLIGHT

The countdown comprises all final preparation steps for the launcher, the satellites/spacecraft and the launch site. If it proceeds as planned, the countdown leads to the ignition of the main stage engine, then the two boosters, for a liftoff at the targeted time.

The countdown culminates in a synchronized sequence (see appendix 3), which is managed by the control station and onboard computers starting at T-7 minutes.

If an interruption in the countdown means that T-0 falls outside the nominal liftoff window, then the launch will be delayed by one, two or more days, depending on the problem involved, and the solution developed.

TIME			EVENT
- 11 h	30 mn		Start of final countdown
- 07 h	30 mn		Check of electrical systems
- 04 h	50 mn		Start of filling of main cryogenic stage with liquid oxygen and hydrogen
- 03 h	20 mn		Chilldown of Vulcain main stage engine
- 01 h	10 mn		Check of connections between launcher and telemetry, tracking and command systems
	- 07 mn	00.0 s	"All systems go" report, allowing start of synchronized sequence
	- 04 mn	00.0 s	Tanks pressurized for flight
	- 01 mn	00.0 s	Switch to onboard power mode
		- 05.5 s	Cryogenic arm opening command
		- 04.0 s	Onboard systems take over
		- 03.0 s	Two inertial reference systems switch to flight mode

T-O			Ignition of the cryogenic main stage engine (EPC)
		+ 07.0 s	Ignition of solid boosters (EAP)
		+ 07.3 s	Liftoff
		+ 12.5 s	End of vertical rise, beginning of pitch motion (10 seconds duration)
		+ 17.0 s	Beginning of roll maneuver
	+ 02 mn	21.0 s	EAP separation
	+ 03 mn	23.0 s	Fairing jettisoned
	+ 08 mn	00.0 s	Acquisition by Natal tracking station
	+ 08 mn	56.0 s	End of EPC thrust phase
	+ 09 mn	02.0 s	EPC separation
	+ 09 mn	06.0 s	Beginning of first EPS thrust phase
	+ 13 mn	42.0 s	Acquisition by Ascension tracking station
	+18 mn	25.0 s	Acquisition by Libreville tracking station
	+ 23 mn	09.0 s	Acquisition by Malindi tracking station
	+ 25 mn	13.0 s	End of first EPS thrust phase / Injection
	+ 26 mn	54.0 s	**MEASAT-3b satellite separation**
	+ 28 mn	41.0 s	Sylda 5 separation
	+ 34 mn	26.0 s	**OPTUS 10 satellite separation**
	+ 47 mn	08.0 s	End of Arianespace mission

MEASAT-3b - OPTUS 10 MISSION PROFILE

The launcher's attitude and trajectory are entirely controlled by the two onboard computers in the Ariane 5 vehicle equipment bay (VEB).

The synchronized sequence starts 7 minutes before ignition (T-0). It is primarily designed to perform the final operations on the launcher prior to launch, along with the ultimate checks needed following switchover to flight configuration. As its name indicates, it is fully automatic, and is performed concurrently by the onboard computer and by two redundant computers at the ELA 3 launch complex until T-4 seconds. The computers command the final electrical operations (startup of the flight program, servocontrols, switching from ground power supply to onboard batteries, etc.) and associated checks. They also place the propellant and fluid systems in flight configuration and perform associated checks. In addition, they handle the final ground system configurations, namely:

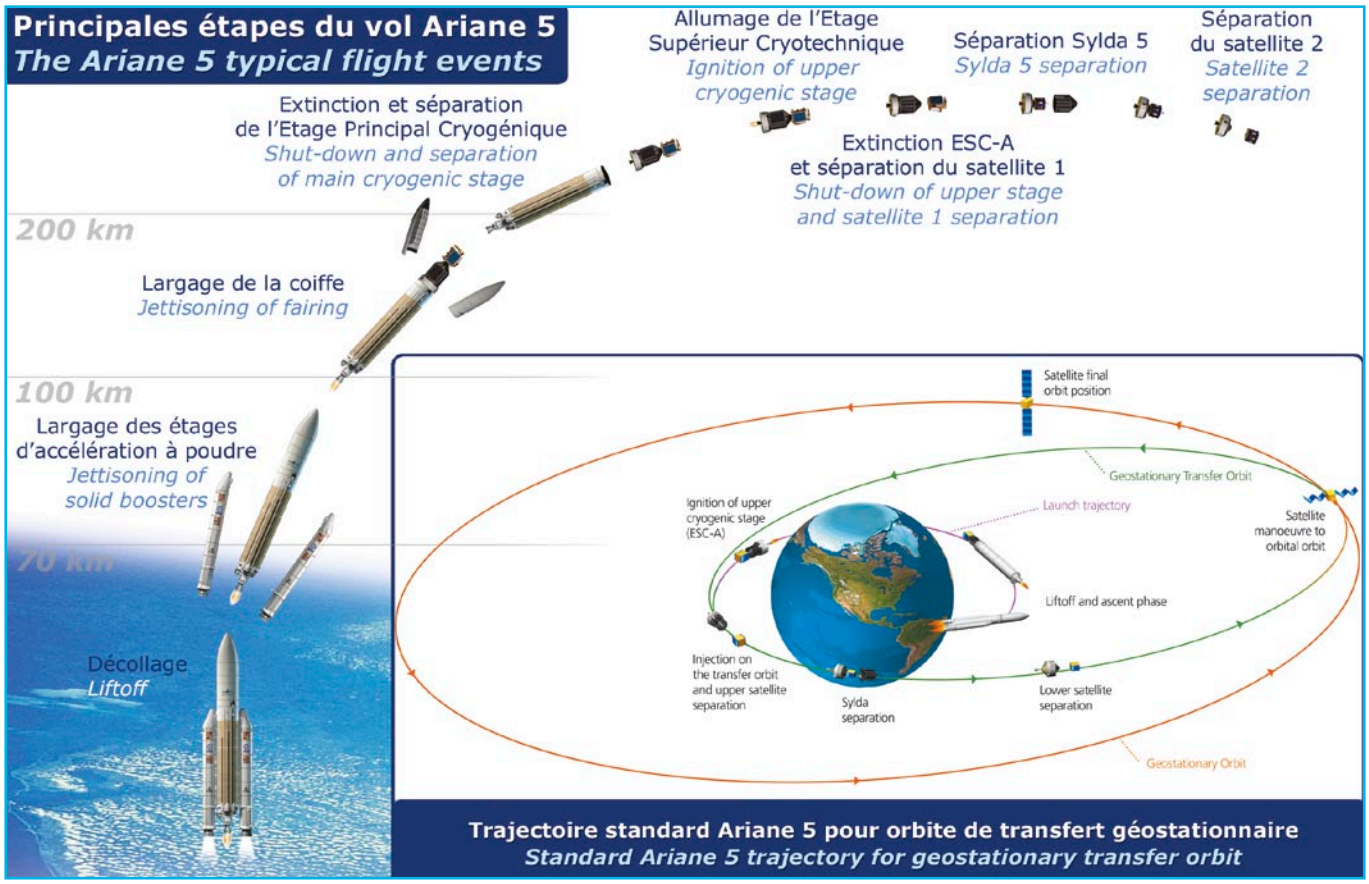
- Startup of water injection in the flame trenches and jet guide (T-30 sec).
- Hydrogen aspiration for chilldown of the Vulcain engine in the jet guide (T-18 sec).
- Burnoff of hydrogen used for chilldown (T-5.5 sec).

At T-4 seconds, the onboard computer takes over control of final engine startup and liftoff operations. It:

- Starts the ignition sequence for the Vulcain main stage engine (T-0).
- Checks engine operation (from T+4.5 to T+7.3 sec).
- Commands ignition of the solid boosters for immediate liftoff at T+7.3 seconds.

Any shutdown of the synchronized sequence after T-7 mn automatically places the launcher back in its T-7 min configuration.

Ariane 5-ECA - MEASAT-3b - OPTUS 10 trajectory



ARIANESPACE AND THE GUIANA SPACE CENTER

Arianespace, the first launch service company in the world

Arianespace was founded in 1980 as the world's first launch Service & Solutions company. Arianespace now has 21 shareholders from ten European countries (including French space agency CNES with 34%, Airbus Defence and Space with 30%, and all European companies participating in the construction of Ariane launchers). Since the outset, Arianespace has signed more than 390 launch contracts and launched 490 satellites. More than two-thirds of the commercial satellites now in service worldwide were launched by Arianespace. The company posted sales of about 989 million euros in 2013.

At January 1, 2014, Arianespace had 330 employees, working at the company's headquarters in Evry (near Paris), the Guiana Space Center in French Guiana, where the Ariane, Soyuz and Vega launch pads are located, and offices in Washington, D.C., Tokyo and Singapore. Arianespace offers launch Service to satellite operators from around the world, including private companies and government agencies. These services call on three launch vehicles:

- The Ariane 5 heavy launcher, operated from the Guiana Space Center in Kourou, French Guiana.
- The Soyuz medium launcher, currently in operation at the Baikonur Cosmodrome in Kazakhstan and the Guiana Space Center.
- The Vega light launcher, also operated from the Guiana Space Center.

Building on its complete family of launchers, Arianespace has won over half of the commercial launch contracts up for bid worldwide in the last two years. Arianespace now has a backlog of more than 40 satellites to be launched.

The Guiana Space Center: Europe's Spaceport

For 40 years, the Guiana Space Center (CSG), Europe's Spaceport in French Guiana, has offered a complete array of facilities for rocket launches. It mainly comprises the following:

- CNES/CSG technical center, including various resources and facilities that are critical to launch base operations, such as radars, telecom network, weather station, receiving sites for launcher telemetry, etc.
- Payload processing facilities (ECPU), in particular the S5 facility.
- Ariane, Soyuz and Vega launch complexes, comprising the launch zones and launcher integration buildings.
- Various industrial facilities, including those operated by Regulus, Europropulsion, Air Liquide Spatial Guyane and Airbus Defence and Space, all involved in the production of Ariane 5 components. A total of 40 European manufacturers and local companies are involved in operations.

Europe's commitment to independent access to space is based on actions by three key players: the European Space Agency (ESA), French space agency CNES and Arianespace. ESA is responsible for the Ariane, Soyuz and Vega development programs. Once these launch systems are qualified, ESA transfers responsibility to the operator Arianespace. ESA has helped change the role of the Guiana Space Center, in particular by funding the construction of the launch Complexes, payload processing buildings and associated facilities. Initially used for the French space program, the Guiana Space Center has gradually become Europe's own Spaceport, according to the terms of an agreement between ESA and the French government. To ensure that the Spaceport is available for its programs, ESA takes charge of the lion's share of CNES/CSG fixed expenses, and also helps finance the fixed costs for the ELA launch Complexes.

French space agency CNES has several main responsibilities at the Guiana Space Center : It designs all infrastructures and, on behalf of the French government, is responsible for safety and security. It provides the resources needed to prepare the satellites and launcher for missions. Whether during tests or actual launches, CNES is also responsible for overall coordination of operations, collects and processes all data transmitted from the launcher via a network of receiving stations, to track Ariane, Soyuz and Vega rockets throughout their trajectories.

Arianespace in Guiana

In French Guiana, Arianespace is the contracting authority in charge of operating the family of three launchers, Ariane, Soyuz and Vega.

Arianespace supervises the integration and functional checks of the Ariane launcher, built by Astrium as production prime contractor, in the Launcher Integration Building (BIL). It then carries out acceptance tests of the launcher at the same time as satellite preparations in the Payload Preparation Complex (EPCU), operated by the Guiana Space Center (CSG). Arianespace next oversees final assembly of the launcher and integration of satellites in the Final Assembly Building (BAF), followed by transfer of the launcher to Launch Zone No. 3 (ZL3), and then final countdown and liftoff from Launch Complex No. 3 (CDL3).

Arianespace deploys a top-flight team and technical facilities to get launchers and satellites ready for their missions. Building on this unrivalled expertise and outstanding local facilities, Arianespace is now the undisputed benchmark in the global launch services market.