

13th Ariane 5 to boost communications and weather satellites

Arianespace's mission will orbit two satellites: the ATLANTIC BIRDTM 1 communications satellite built by Alenia Spazio for Eutelsat, and the MSG-1 weather satellite for Eumetsat, the European Meteorological Satellite organization.

Flight 155 will be the ninth launch of the year.

Ariane's track record for reliability and availability have established Arianespace as the benchmark launch services company for major European operators.

ATLANTIC BIRD™ 1, built by Alenia Spazio, part of the Finmeccanica group, is designed for telecommunications, image transmission and Internet services. Weighing about 2,700 kg. at liftoff, it will be fitted with 24 Ku-band transponders, and provide coverage of Europe and the east coast of the Americas. Its design life is 15 years. Atlantic Bird 1 will join the Eutelsat fleet.

This marks the first launch service contract between Alenia Spazio and Arianespace, although Ariane has already launched four satellites built by the Italian company. Atlantic Bird 1 will be the 18th satellite launched by Arianespace for Eutelsat.

Meteosat Second Generation **MSG-1** is part of a european meteorological geostationary satellite programme designed to primarily serve the needs of operational meteorological and climate monitoring user communities. A series of three MSG satellites, built by Alcatel Space (France), will provide more comprehensive and frequent data for at least the next 12 years from the orbital position at 0° Longitude above the Gulf of Guinea. MSG is the seventh satellite for which EUMETSAT has selected the European launcher.

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Follow the launch live on the internet broadband at www.arianespace.com (starting 20 minutes before lift-off)



1. Arianespace Flight 155 mission

The 154th Ariane launch (Flight 155/Ariane 513) will use an Ariane 5 to place 2 satellites into geostationary transfer orbit: the ATLANTIC BIRDTM 1 telecommunications satellite and MSG-1, a meteorological satellite.

For Arianespace, this marks the tenth commercial mission of the new Ariane 5 launcher. Arianespace has performed 8 other launches this year (6 ARIANE 4 and 2 ARIANE 5). The Ariane 513 launcher will carry a dual payload of 6,561 kg (14,443 lb), including 4,717 kg (10,377 lb) for the satellites.

The launch will be carried out from the ELA 3 launch complex in Kourou, French Guiana.

Injection orbit

Perigee altitude	580 km
Apogee altitude	35,994 km at injection
Inclination	5.5° degrees

The lift-off is scheduled on the night of August 27 to 28, 2002 as soon as possible within the following launch window :

Launch opportunity

	Universal time (GMT)	Paris time	Washington time	Kourou time
Between	10:30 рт	00:30 am	06:30 pm	07:30 pm
and	11:15 рт	01:15 am	07:15 pm	08:15 рт
on	August 27, 2002	August 28, 2002	August 27, 2002	August 27, 2002

Ariane 513 payload configuration

The ATLANTIC BIRDTM 1 satellite was built by Alenia Spazio for EUTELSAT. *Orbital position: 12.5° West, over the Atlantic Ocean.*

The MSG-1 satellite was built by Alcatel Space for the European organization, EUMETSAT. *Orbital position: 0° longitude, above the Gulf of Guinea.*





2. Range operations campaign : ARIANE 5 – ATLANTIC BIRDTM 1-MSG-1

The actual work for satellite range operations lasts 28 working days for ATLANTIC BIRDTM 1 from its arrival in Kourou (before beginning combined operations). The actual work for satellite range operations lasts 48 working days for MSG-1 from its arrival in Kourou (before beginning combined operations). The ARIANE 5 preparation campaign lasts 30 working days.

Satellites and launch vehicle campaign calendar

Ariane activities	Dates	Satellites activities
	May 15, 2002	Arrival in Kourou and beginning of MSG-1 preparation campaign in S1A building
	June 19, 2002	Arrival in Kourou and beginning of ATLANTIC BIRD TM 1 preparation campaign in SSC building
	July 1-29, 2002	Stand-by for MSG-1 operations
Flight 153	July 5, 2002	Launch of STELLAT 5/N-STAR c
	July 9-29, 2002	Stand-by for ATLANTIC BIRD TM 1 operations
Campaign start review	July 18, 2002	
EPC Erection	July 18, 2002	
EAP transfer and positionning	July 19, 2002	
Integration EPC/EAP	July 20, 2002	
EPS Erection	July 23, 2002	
Integration equipement bay	July 23, 2002	
	July 30, 2002	Transfert of MSG-1 into the S5A building
	July 31, 2002	Transfert of ATLANTIC BIRD TM 1 into the S5B building
	August 2, 2002	Beginning of ATLANTIC BIRD TM 1 filling operations in S5B building
	August 5, 2002	Beginning of MSG-1 filling operations in S5B building
	August 10, 2002	Roll-out from BIL to BAF

Satellite and launch vehicle campaign final calendar

J-9	Tuesday, August 13	ATLANTIC BIRD TM 1 integration on ACU
J-8	Wednesday, August 14	ATLANTIC BIRD TM 1 integration on Sylda
J-7	Friday, August 16	MSG-1 integration on ACU
J-6	Monday, August 19	MSG-1 integration on launcher.
J-5	Tuesday, August 20	ATLANTIC BIRD TM 1 integration on launcher
J-4	Wednesday, August 21	Filling of SCA with N2H4
J-3	Thursday, August 22	Launch rehearsal and filling of EPS stage with MMH and N2O4
J-2	Friday, August 23	Launch readiness review (RAL) and final mechanical preparation of launcher and arming
J-1	Monday, August 26	Roll-out from BAF to Launch area (ZL) and filling of the EPC Helium sphere
J-0	Tuesday, August 27	Launch countdown including EPC filling with liquid oxygen and liquid hydrogen



3 - Launch countdown and flight events

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

The countdown culminates in a synchronized sequence (see appendix 3), which is managed by the control station and onboard computers starting at T-6 minutes 30 s.

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

Time		Events		
— 11h	30 mn	Start of final countdown		
— 7 h	30 mn	Check of electrical systems		
— 5 h	20 mn	Start of filling of main cryogenic stage with liquid oxygen and heliu	ım	
— 3 h	20 mn	Chilldown of Vulcain main stage engine		
— 1 h	15 mn	Check of connections between launcher and telemetry, tracking an	d command sys	stems
	— 6 mn	30 s "All systems go" report, allowing start of synchronized sequence		
		- 35 s Start of automated ignition sequence		
		– 22 s Authorization for control handover to onboard computer		
		– 03 s Onboard systems take over		
		– 02 s Unlocking of inertial guidance systems to flight mode		
но	Ignitio	n of the cryogenic main stage engine (EPC)	ALT (km)	V. rel. (m/s)
	+ 7.0 s	Ignition of solid boosters	0	0
	+ 7.3 s	Liftoff	0	0
	+ 13 s	End of vertical climb and beginning of pitch rotation (10 seconds duration)	0.088	34.7
	+ 17 s	Beginning of roll maneuver	0.295	5 65.9
+ 2 mn	23 s	Jettisoning of solid boosters	67.6	2069.6
+ 3 mn	17 s	Jettisoning of fairing	105.9	2320.0
+ 8 mn	06 s	Acquisition by Natal tracking station	134.5	5700.1
+ 9 mn	36 s	Extinction of main cryogenic stage	145.2	7778.2
+ 9 mn	42 s	Separation of main cryogenic stage	148.0	7797.1
+ 9 mn	49 s	Ignition of storable propellant stage	151.3	7793.7
+ 12 mn	13 s	Acquisition by Ascension tracking station	231.8	7930.5
+ 21 mn	26 s	Acquisition by Malindi tracking station	908.4	8351.0
+ 26 mn	30 s	Extinction of storable propellant stage	1651.5	8567.8
+ 28 mn	04 s	Separation of ATLANTIC BIRD TM 1 satellite	1952.5	8359.2
+ 31 mn	45 s	Separation of Sylda 5	2735.9	7855.9
+ 36 mn	12 s	Separation of MSG-1 satellite	3773.9	7269.6
+ 53 mn	41 s	End of ARIANESPACE Flight 155 mission	8349.5	5383.2



4 - Flight 155 trajectory

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 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 computer optimizes 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 upper (storable propellant) stage.

The main stage falls back off the coast of the Galapagos Islands in the Pacific Ocean. On orbital injection, the launcher will have attained a velocity of approximately 8,565 meters/second, and will be at an altitude of about 1,658 kilometers.

The fairing protecting the ATLANTIC BIRDTM 1/MSG-1 spacecrafts is jettisoned shortly after the boosters are jettisoned at about T+197 seconds.



Standard Ariane 5 trajectory for geostationary transfer orbit



5 - Ariane 5 launcher





6 - The ATLANTIC BIRDTM 1 satellite



Customer	ALENIA SPAZIO for EUTELSAT		
Prime contractor	Alenia Spazio		
Mission	Internet, broadcasting and telephony		
Mass	Total mass at lift-off	2 700 kg	
	Dry mass	1 550 kg	
Stabilization	3 axis stabilized		
Dimensions		2,1 x 2 x 2,8 m	
	Span in orbit	19 m	
Plate-form	Geo Bus		
Payload	24 Ku band transponders (11 - 14 GHz)		
On-board power	5,000 W (beginning of life)		
Life time	> 15 years		
Orbital position	12,5° West		
Coverage area	Europe, North and South Ame	rica	

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7 - The MSG-1 satelitte



Customer	EUMETSAT (Darmstadt), Germany		
Prime contractor	Alcatel Space (Cannes), France		
Mission	Continious visible and infrared images of the Earth's surface and atmosphere every 15 minutes in 12 spectral channe		
Mass	Total mass at lift-off Drv mass	2 000 kg 1 000 kg	
Stabilization	100 rpm spin-stabilized		
Dimensions	Cylindar solar drum	Ø 3.2 m x 2.4 m	
Payload	12 channels enhanced imaging radiometer (SEVIRI) Geostationary Earth Radiation Budget (GERB) instrument		
On-board power	700 W (at end of life)		
Life time	7 years		
Orbital position	0° longitude, above the Gulf of Guinea		
Coverage area	Europe, Africa, part of Indian Ocean and the Atlantic Ocean		

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Annex 1 - Arianespace Flight 155 key personnel

In charge of the launch compaign					
Mission Director	(CM)	Bernard PUYGRENIER	ARIANESPACE		
In charge of the launch service contracts					
ARIANE Payload Manager	(RCUA)	Christophe BARDOU	ARIANESPACE		
ARIANE Deputy Mission Manager	(RCUA/A)	Alexandre MADEMBA-SY	ARIANESPACE		
In charge of ATLANTIC BIRD ™ 1 satellite					
Satellite Mission Director	(DMS)	Filippo GRIMALDI	ALENIA SPAZIO		
Satellite Project Director	(CPS)	Vincenzo COSTABILE	ALENIA SPAZIO		
Satellite Preparation Manager	(RPS)	Alessandro BONFIGLIETTI	ALENIA SPAZIO		
In charge of MSG-1 satellite					
Satellite Mission Director	(DMS)	Sergio ROTA	EUMETSAT		
Satellite Project Director	(CPS)	Wolfgang SCHUMANN	ESA/ESTEC		
Satellite Project Director	(RPS)	Alain GUEDJ	ALCATEL SPACE		
In charge of the launch vehicle					
Launch Site Operations Manager	(COEL)	Pierre-François BENAITEAU	ARIANESPACE		
ARIANE Production Project Manager	(CPAP)	Jean-Jacques AUFFRET	ARIANESPACE		
In charge of the Guiana Space Center (CSG)					
Range Operations Manager	(DDO)	Jean-Yves TREBAOL	CNES/CSG		
Flight Safety Officer	(RSV)	Dominique POULAIN	CNES/CSG		

Annex 2 - Launch environment conditions

Acceptable wind speed limits at liftoff range from between 9 m/s. to 14 m/s. according to the wind direction. The most critical is a northerly wind. For safety reasons, the wind's speed on the ground (Kourou) and at a high altitude (between 10.000 and 2.000 m) is also into account.

Annex 3 - The synchronized sequence

The synchronized sequence starts 6 mn 30 sec. 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 a redundant computer at the ELA 3 launch complex until T-5 seconds.

The computer commands the final electrical operations (startup of the flight program, servocontrols, switching from ground power supply to onboard batteries, etc.) and associated checks. It also places the propellant and fluid systems in flight configuration ans performs associated checks. In additionn, it handles 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 Vulcain engine in the jet guite (T-18 sec) ;
- $\cdot\,$ burnoff of hydrogen used for chilldown (T-7 sec).

At T-3 seconds, the onboard computer takes over control of final engine startup ans liftoff operations :

- \cdot It starts the ignition sequence for the Vulcain main stage engine (T-0) ;
- It checks engine operation (from T+4 to T+7 sec);
- $\cdot\,$ It commands ignition of the solid boosters for immediate liftoff at T+7.5 seconds.

Any shutdown of the synchronized sequence after T - 6 mn 30 seconds automatically places the launcher back in its T-6 min 30 sec configuration.



Annex 5 - ARIANESPACE, its relations with ESA and CNES

FROM A PRODUTION BASE IN EUROPE, ARIANESPACE, A PRIVATE COMPANY, SERVES CUSTOMERS ALL OVER THE WORLD. Arianespace is the world's first commercial space transportation company, created in 1980 by 36 leading European aerospace and electronics corporations, 13 major banks and the French space agency CNES (Centre National d'Etudes Spatiales).

The shareholder partners in Arianespace represent the scientific, technical, financial and political capabilities of 12 countries : Belgium, Denmark, Germany, France, Great Britain, Ireland, Italy, Netherlands, Norway, Spain, Switzerland and Sweden.

In order to meet the market needs, Arianespace is present throughout the world : in Europe, with its head office located near Paris, France at Evry, in North America with its subsidiary in Washington D.C. and in the Pacific Region, with its representative offices in Tokyo, Japan, and in Singapore.

Arianespace employs a staff of 380. Share capital totals FF 2,088 million.

Arianespace is in charge of these main areas :

O markets launch services to customers throughout the world ;

O finances and supervises the construction of Ariane expendable launch vehicles ;

- O conducts launches from Europe's Spaceport of Kourou in French Guiana ;
- O insures customers for launch risks.

Personalized reliable service forms an integral part of Arianespace launch package. It includes the assignment of a permanent team of experts to each mission for the full launch campaign.

The world's commercial satellite operators habe contracted to launch with Arianespace. This record is the result of our company's realistic cost-effective approach to getting satllites into orbit.

RELATIONS BETWEEN ESA, CNES AND ARIANESPACE

Development of the Ariane launcher was undertaken by the European Space Agency in 1973. ESA assumed overall direction of the ARIANE 1 development program, delegating the technical direction and financial management to CNES. The ARIANE 1 launcher was declared qualified and operational in January 1982. At the end of the development phase which included four launchers, ESA started the production of five further ARIANE 1 launchers. This program, known as the "promotion series", was carried out with a management arrangement similar to that for the ARIANE 1 development program.

In January 1980 ESA decided to entrust the commercialization, production and launching of operational launchers to a private-law industrial structure, in the form of ARIANESPACE company, placing at its disposal the facilities, equipment and tooling needed of producing and launching the ARIANE launchers.

Ariane follow-on development programs have been undertaken by ESA since 1980. They include a program for developing uprated versions of the launcher : Ariane 2 and Ariane 3 (qualified in August 1984) ; the program for building a second ARIANE launch site (ELA 2) (validated in August 1985) ; the Ariane 4 launcher development program (qualified on June 15th, 1988) ; and the preparatory and development program of the Ariane 5 launcher and its new launch facilities : ELA 3 (qualified on November, 1997). All these programs are run under the overall direction of ESA, which has appointed CNES as prime contractor.

In general, as soon as an uprated version of the launcher has been qualified 5 Oct, 1998, ESA makes the results of the development program together with the corresponding production and launch facilities available to ARIANESPACE.

ESA is responsible (as design authority) for development work on the Ariane launchers. The Agency owns all the assets produced under these development programs. It entrusts technical direction and financial management of the development work to CNES, which writes the program specifications and places the industrial contracts on its behalf. The Agency retains the role of monitoring the work and reporting to the participating States.

Since Flight 9 Arianespace has been responsible for building and launching the operational Ariane launchers (as production authority), and for industrial production management, for placing the launcher manufacturing contracts, initiating procurements, marketing and providing Ariane launch services, and directing launch operations.

USE OF THE GUIANA SPACE CENTER

The "Centre Spatial Guyanais" (CSG), CNES's launch base near Kourou, has all the equipment needed for launching spacecraft-radar tracking stations, telemetry receiving stations, a meteorology station, a telecommand station, safety facilities, etc... It became operational in 1968 for the purpose of the French National Space Program.

ESA has built its own launch facilities, the ELA 1 and ELA 2 and ELA 3 (for Ariane 5) complexes and the EPCU payload preparation complex inside the CSG compound, becoming the Europe Space Port. Using these launch pads requires, especially during launch operations, programs. In return, ESA shares in the costs of operating the CSG.

Arianespace directly covers the costs of use, maintenance and upgrading of the Ariane launch sites and the payload preparation complex.





Flight 155 Addendum

L'Agence Spatiale Européenne (ESA) co-finance et développe le premier satellite de la série MSG et approvisionne les satellites ultérieurs pour le compte d'EUMETSAT (organisation européenne pour l'exploitation de satellites météorologiques). Le satellite MSG-1 a été construit par Alcatel Space sous la direction de projet de l'ESA pour le compte d'EUMETSAT.

The European Space Agency (ESA) is the development and co-financing Agency for the first satellite of the MSG series and procures the recurrent satellites on behalf of EUMETSAT (European Organisation for the Exploitation of Meteorological Satellites). The MSG-1 satellite was built by Alcatel Space under the project management of ESA on behalf of EUMETSAT.

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