Procurement and ARIEL presentation

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AIRBUS

Procurement activities and knowledge

- 2017: Airbus DS worked with 4 companies:
  - GMV
  - Astripolska
  - Mobica
  - Sener

- We are also working with Airbus PZL for flight and ground harness activities on various ESA program.

- Important Airbus DS knowledge on Poland industrial capabilities (not only for space and exhaustive list):

Actia
Adaptronic
ARRK
Astronika
Blue Do solutions
CBK
Creotech (*)
EC engineering
Gardner
GMV Poland
Hertz System
IB Remarketing
Institute Geodesy
Institute of aviation
IRES Technology Sp
ITTI
Iwamet
Jakusz
Magellan
Mikroma
MindMade
Mobica (*)
N7 Mobile
OCAM
Octagonet
PCO Poland
PIAP
PIT Poland
PZL Hydral Aviation
SATREVOLUTION
SCNTPL
Sener Poland
Silesian Sciences and Technology
SIMRA
Solaris Optics
Space Forest
SYDERAL /3city Electronics JV
Techmex
Thoni Alutec
Vac Aero Kalisz
Vigo
WB Group

(*) Toulouse Space Show participant

Toulouse Space Show : a very good opportunity

Toulouse Space Show 2018

The place to be in 2018!

"Join us for this unique event, which attracts space players from all over the world".

The Toulouse Space Show will showcase the latest trends in the space sector and their impact on society, covering topics such as innovation, climate change, Newspace and the latest challenges for the space industry, the increasing importance of satellite data, the emergence of startups and the mechanisms to empower them to reach new heights.

International TSS conferences and exhibitions will provide a forum for leading stakeholders & decision makers to exchange views on how Space technologies & innovative solutions can tackle societal issues & meet scientific challenges for the benefit of our planet and ultimately humanity itself. TSS 2018 will provide unique opportunities for high-level networking and gaining valuable insights into current and future industry trends, including for non-space companies that offer space-based solutions. Iconoclastic speakers will share their perspectives on digital disruption, the emergence of new technologies and the search for solutions to solve Global problems, such as Climate Change and the Digital Divide. For its 6th edition, the TSS is pleased to welcome China as its guest of honor. Several events will highlight Chinese space achievements and ambitions. Join fellow CEOs, VPs, institutional leaders and policy maker in expanding their knowledge of how the space sector, which has repeatedly led the way, contributes to the socio-economic welfare of the whole world.

Jean-Yves Le Gall
CNES President

" We look forward to seeing you in Toulouse in June at this exceptional and inspiring gathering of minds."

Key figures

3,000 visitors from around the world

Space agencies, leading contractors and SMEs in the sector, service companies (SMEs, intermediate-size companies, research and training institutions, etc.)

- **45 countries**
- **350 exhibitors**
- **2000 business meetings**

Networking events

The Toulouse Space Show will open officially in the afternoon of Tuesday 26 June.

*On Wednesday 27 June, the Toulouse Space Show evening event will be an opportunity for everyone to continue discussions in the exceptional setting of the **Cité de l'Espace** theme park.*

Access to the Toulouse Space Show is by registration only.

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Toulouse Space Show Team
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Registration: **www.toulousespaceshow.eu**

Toulouse Space Show : a very good opportunity

Meet us in Toulouse for three days of discovery, networking and innovation

Attended by participants from all over the world, including leading stakeholders & decision-makers, entrepreneurs, space agency directors, executives of key organizations and political leaders, the TOULOUSE SPACE SHOW is a major global forum dedicated to novel space-based systems, highlighting future trends and the new space economy.

Welcome to Europe's leading space region

With 12,000 jobs in the space sector (a quarter of all such jobs in Europe), more than 1,000 researchers, the presence of the two most important European prime contractors, and a dense network of OEMs, SMEs and startups, the Occitanie Region is the European leader for the design and creation of space systems and their applications.

The 2016 edition of the Toulouse Space Show attracted more than 3,000 people from 45 countries, confirming the role of Toulouse as a space capital and Occitanie as one of the world's great space regions.

From Tuesday 26 to Thursday 28 June 2018, CNES and its partners will be welcoming the global space industry to Toulouse

The international gathering for space stakeholders, from designers to users

5 good reasons to attend:

- World-class keynote speakers
- An international industrial exhibition
- Premier B-to-B opportunities
- Outstanding networking events
- Southern French *"art de vivre"*

For this 6th edition, China will be the official guest of honour.

TOULOUSE SPACE SHOW '18 June 26-28, 2018

Round tables and themed talks

On key subjects of topical importance to the space sector.

Themes for 2018:

- Factory of the future
- The digital revolution and space data
- Autonomous mobility
- The advent of 5G
- Satellites and climate issues
- The ecology of space
- Living/working in space (possibly with an associated event for the general public)

An international fair

Choose the most appropriate stand size, from 4 to 12 sq metres, to promote your company!

Major groups, SMEs, space agencies, regional authorities, local and international communities, associations of professional users of space technologies and manufacturers are expected to promote their know-how in the fields of infrastructures, subcontracting and space applications; a regional, national and international showcase for space technology and applications.

Premier B-to-B opportunities

Take advantage of pre-scheduled meetings with SMEs and major groups that develop space solutions and applications, companies that offer the technologies used to develop them, or users of these solutions and applications.

Make targeted contacts in the space industry's supply chain: major manufacturing contractors, space system operators or French and foreign subcontractors.

An international startup village

A village to provide visibility for a selection of the best startups: pitch your ideas or show demonstrations to potential contractors or customers, and meet with visitors to the village in a dedicated area available to each startup.

An international hackathon: ActInSpace

Find everyday uses for space-developed technologies or satellite-acquired data!

Entrepreneurs, students, job-seekers, developers, creative users – meet the challenge within 24 hours!

Side events or Toulouse Space Show-labelled events

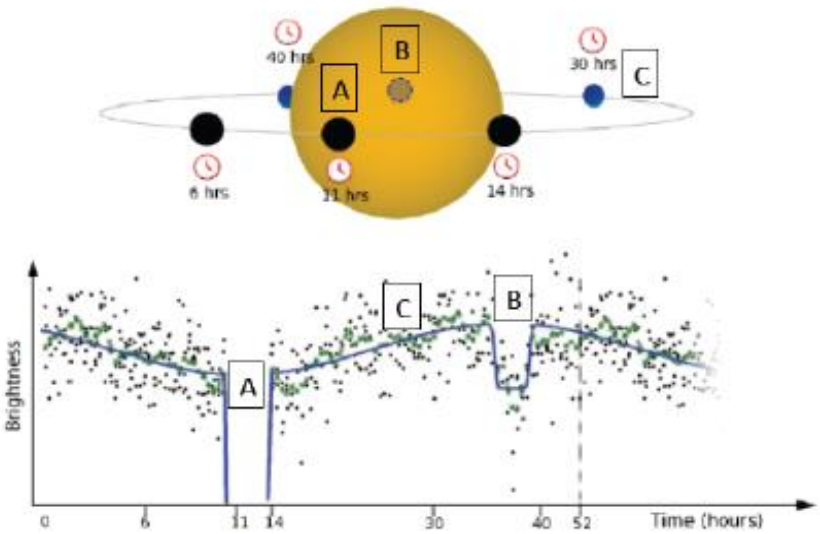
- The big Nano-Space»
- NetSat Day
- " Navigation Satellite System" event
- Women in Aerospace
- and much more...

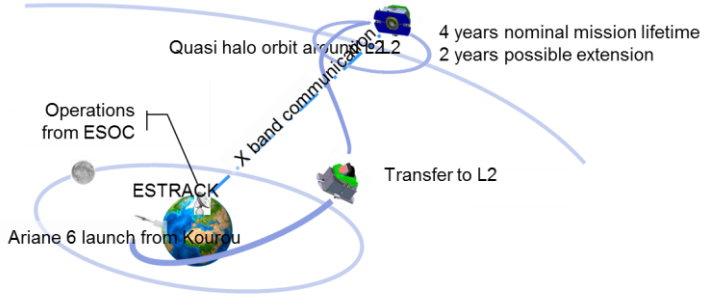
A half-day specially for young entrepreneurs, students and the general public

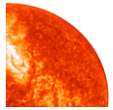
ARIEL mission

- A mission to determine the chemical composition and physical conditions of the exoplanet atmospheres by performing IR (2–8 μm) spectroscopic observations of some 500 hot transiting planets

Orbit	**L2** large amplitude Lissajous orbit
Mission duration	Nominal mission duration = **3.5 years** + 6 months for transfer to L2, commissioning and cool-down.
Launcher	**Ariane 6.2**
Spacecraft mass	Around 1200 kg
Member States provision	The entire payload module i.e. •The telescope, •The spectrometer, •The detection system, •The cryocooler •The thermal shields (V-groove)







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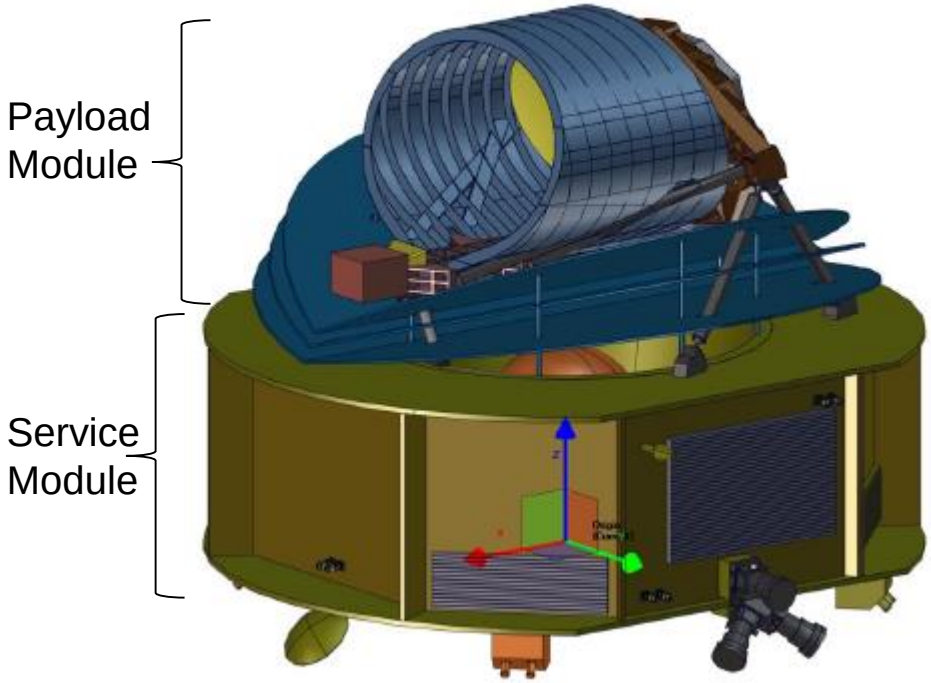
ARIEL spacecraft

- PLM (Payload Module)
  - 1.1 x 0.7m 3-mirror anastigmatic telescope
  - Three V-groove shields for passively cooling the telescope to 70 K
  - IR spectrometer [2-8µm] with 2 Teledyne detectors
  - VNIR 3 photometers and 1 spectrometer, used also as Fine Guidance Sensor
  - Cryocooler to cool the AIRS down to 35K
- SVM (Service Module)
  - Alu structure with central cylinder accommodating the chemical propulsion module
  - AOCS based on reaction wheels, thrusters, star trackers, sun sensors and use of FGS measurements
  - CDMU re-used for previous programs
  - Solar array body-mounted at rear of the SVM
  - X-band link (5 Mbits/s) with a steerable antenna



Spacecraft illustration based on ESA internal CDF study

ARIEL programmatics

Schedule

- Phase A completed in November 2017
- Two competitive industrial Phase B1 studies: Airbus and TAS
  - Start of Phase B1: April 2018
  - Intermediate Review: April 2019
  - MAR (Mission Adoption Review): April 2020
- Program adoption at Nov 2020 SPC
- ITT for Phase B2/C/D expected end of 2020
- Implementation Phase
  - Start expected mid-2021
  - Launch by 2028

Industrial set-up

- RFI campaign to be launched after Intermediate Review (IR) in April 2019. Potential suppliers to be contacted 1st quarter 2019
- Committing RFP : Beginning 2021

Financial and Georeturn constraint

- ARIEL is part of Cosmic Vision, which is a mandatory program
- ESA Cost-at Completion: 450 M€
  - Usually, industrial cost represents 40% to 50% of the ESA Cost-at-Completion (CaC)
- Georeturn scenario provided by ESA
  - DE+IT+UK+FR (Big 4) < 55%
  - PL: 3.8%

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