Gaia status, spectroscopic and photometric surveys

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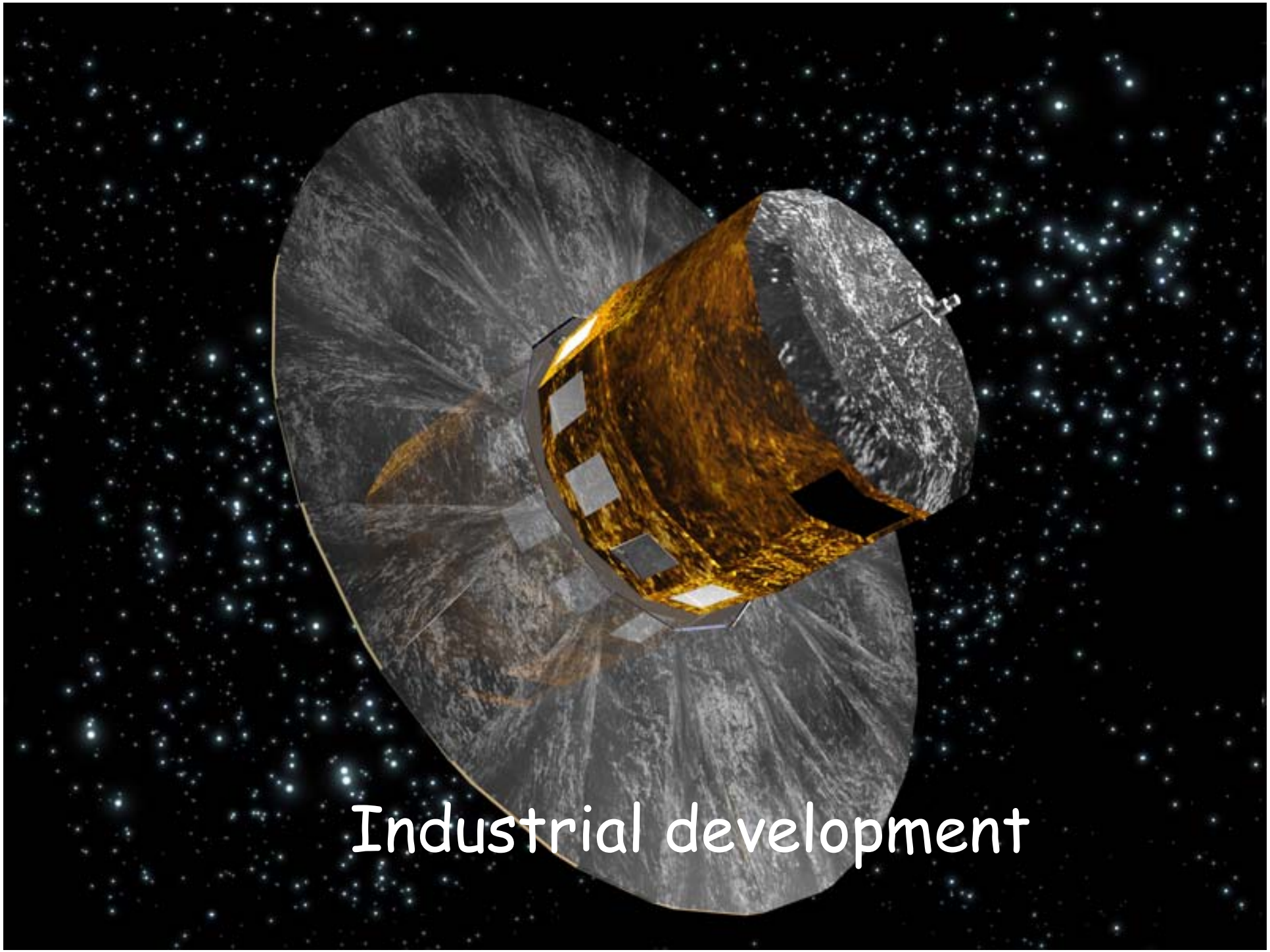

Industrial development

Launcher: Soyuz–Fregat from Kourou

20th Oct first launch:
Liftoff of Soyuz flight VS01

Confirmation that both launch site and launcher configuration for Gaia are ready

Gaia launch in 2013

Sunshield deployment test successfully completed

October-2011:

- delivery to Astrium
- integration in SVM and Thermal Tent
- the test demonstrated correctness of alignment, confirmed the deployment functionality and verified the flatness of the deployed DSA.

- duration: 20 min

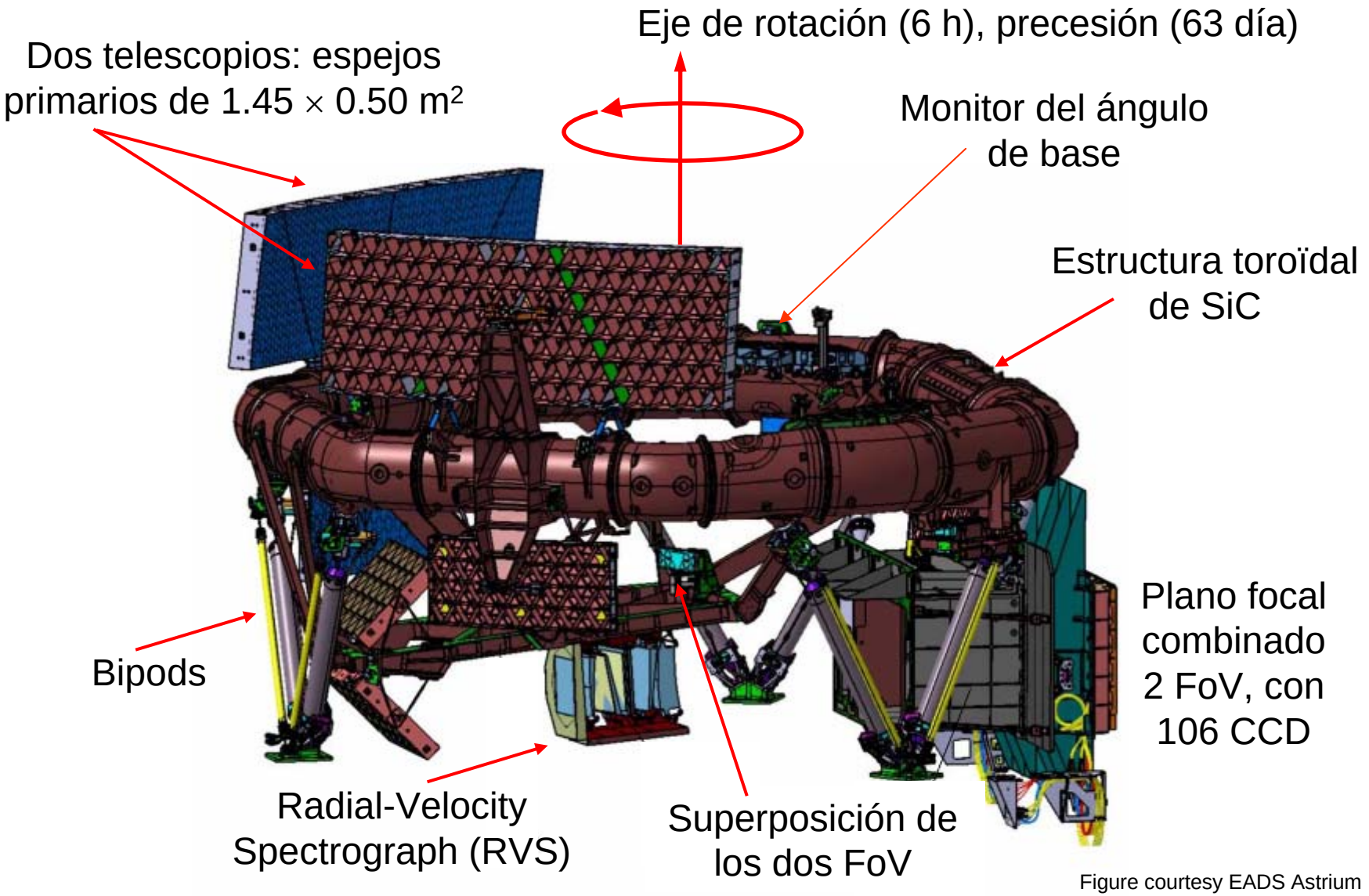


Figure courtesy EADS Astrium

Mirrors integration

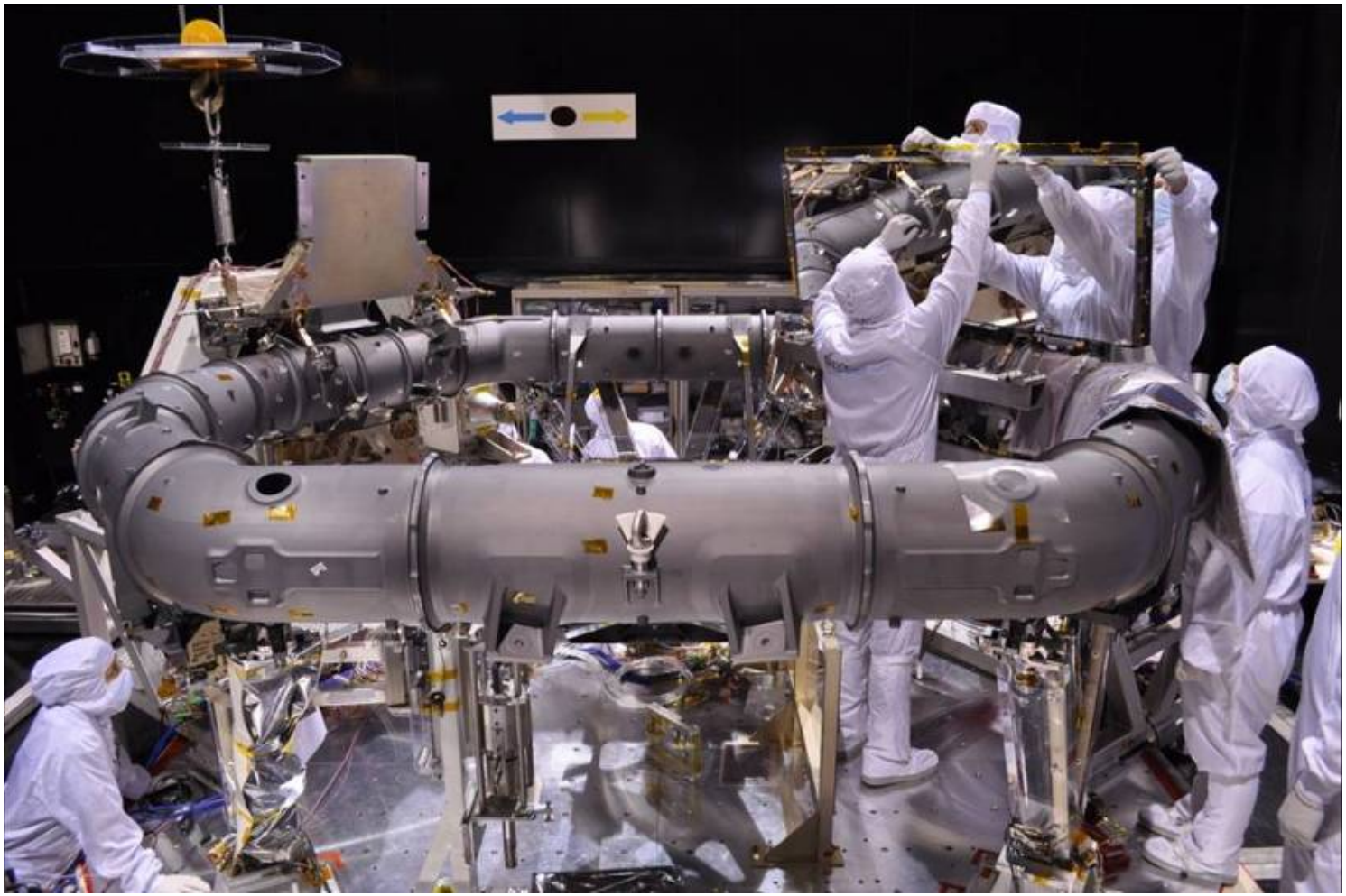


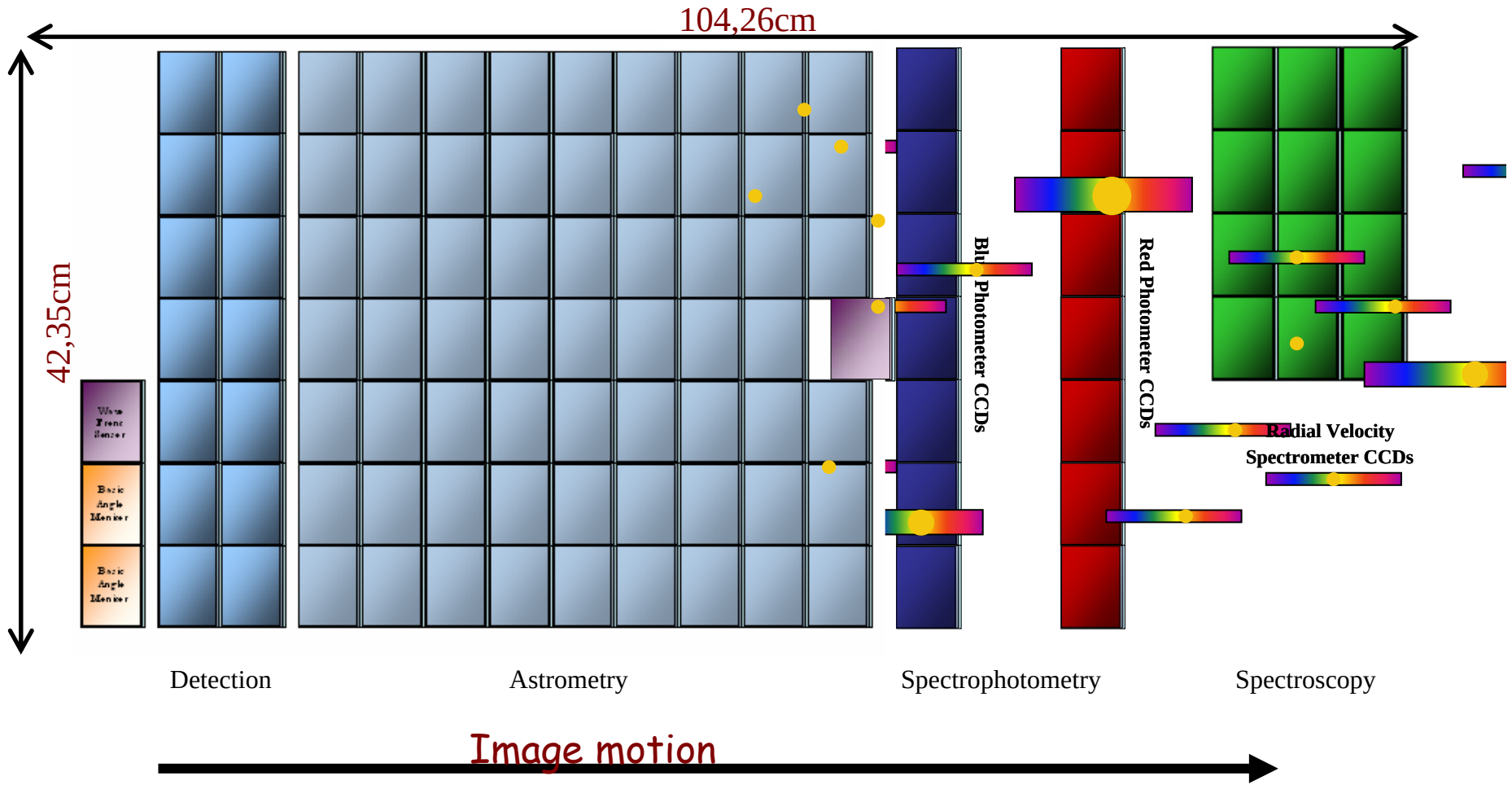
Figure courtesy EADS Astrium

All 10 mirrors integrated on the optical bench

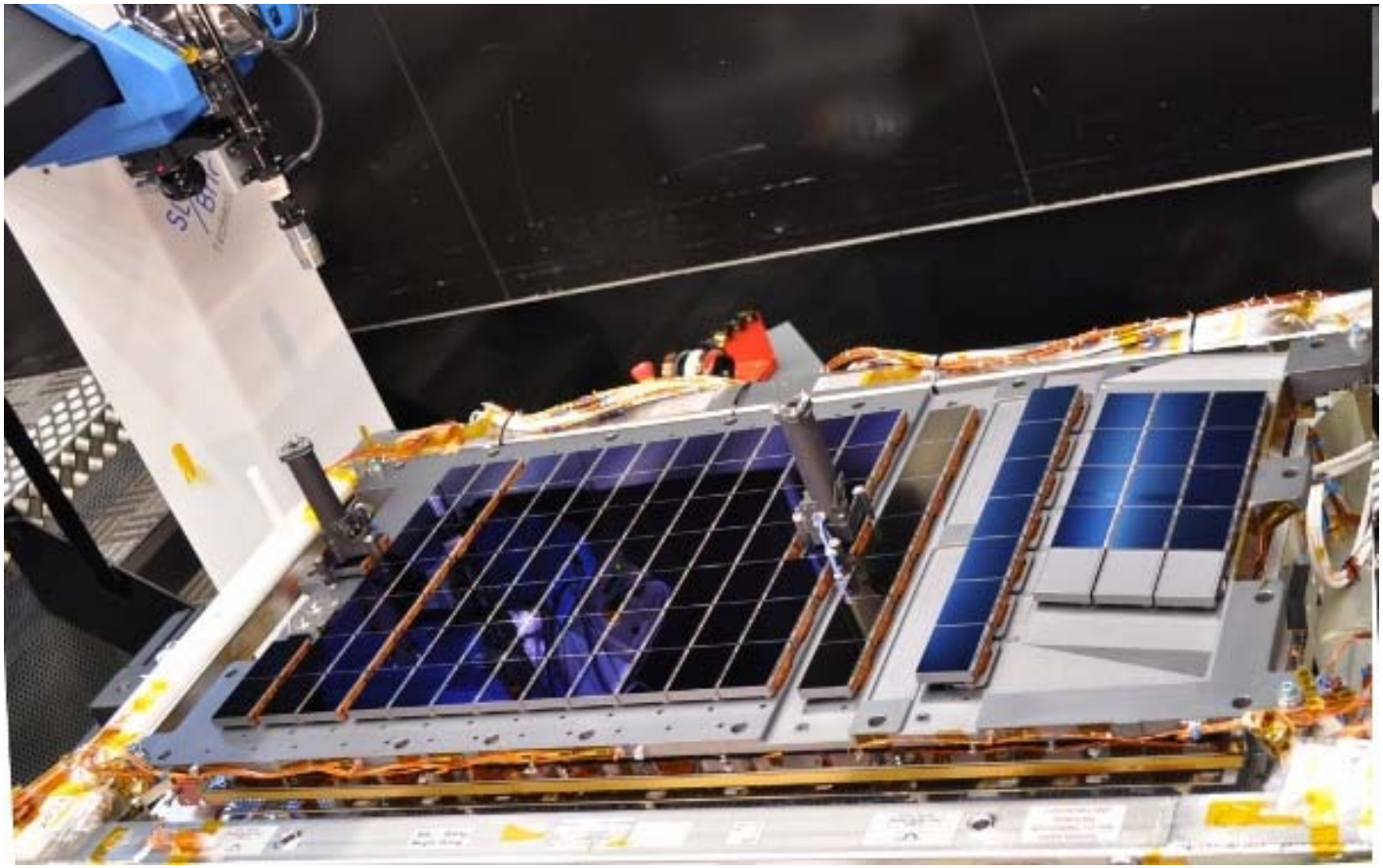
Alignment of the two telescopes in progress, tolerance 3 mm

Focal plane

106 CCD, 938 milions of pixels, 2800 cm^2



Focal Plane Assembly



Completion of mechanical and thermal tests; delivery for integration in the PLM

General status

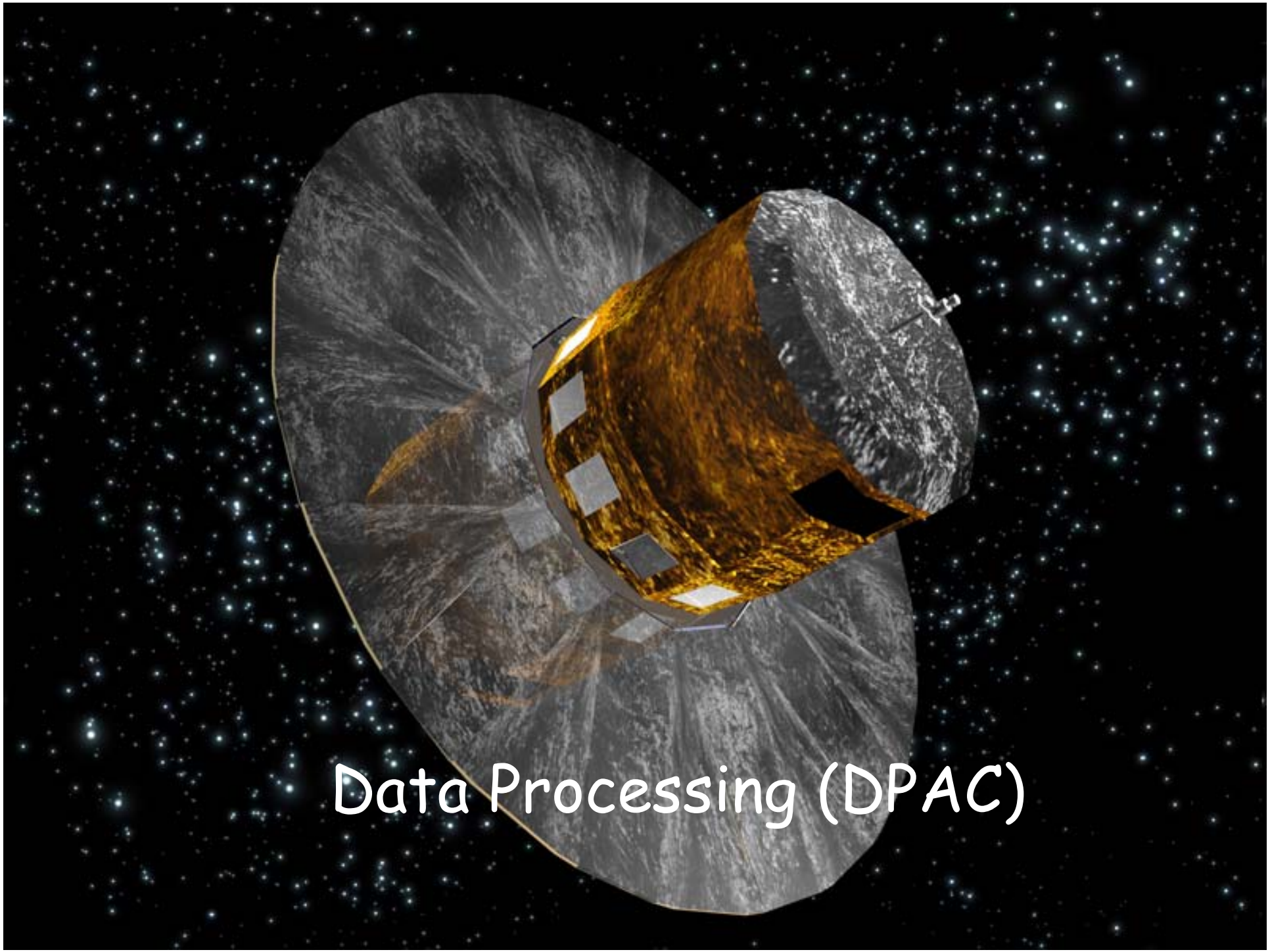
The progress is overall good. There are no major unresolved technical issues

Major milestones:

1. Completion of the FPA mechanical tests and thermal tests; delivery for integration on the PLM
2. Delivery of the other remaining systems:
   - Phased Array Antenna
   - Micro propulsion thrusters
   - Basic Angle Monitor
   - Radial Velocity Spectrometer (likely need to re-align one prism)
   - Focal Plane Assembly
3. Completion of the alignment of the two telescopes

The schedule is not stable yet. A stabilization is expected after the delivery of the Focal Plane Assembly FM and the completion of the alignment of the two telescopes on the PLM.

Gaia launch in 2013


Data Processing (DPAC)

Global view

CU1-CU8 are working at full speed

End-to-end tests are on-going. Rehearsal campaign Jun-Jul 2012

Operations plan in matured state
DPAC activities for commissioning are in planning phase

Full sky high-density IDT run at DPCB-CESCA
90 Mio observations, 24^h telemetry (about twice average Gaia day)
Processed in less than one day (28 processors at CESCA)

Gaia Science Implementation Review: Oct-Des

Steps towards CU9

Science Implementation Review

Goals are to judge:

•the capability and adequacy of the data processing to produce the final catalogue

•the verification and validation processes of catalogue

•the balance among the level of completeness and detail of the scientific treatment of the several CUs (homogeneity)

Conclusions are:

- The panel judges the situation of the DPAC to be firmly under control from a scientific view-point.
- The Review documentation and presentations give confidence that the scientific foundation which underpins the DPAC system is sound
- The question and answer sessions demonstrated that DPAC has a deep understanding of the complex scientific issues underlying Gaia data processing.

Towards the creation of CU9

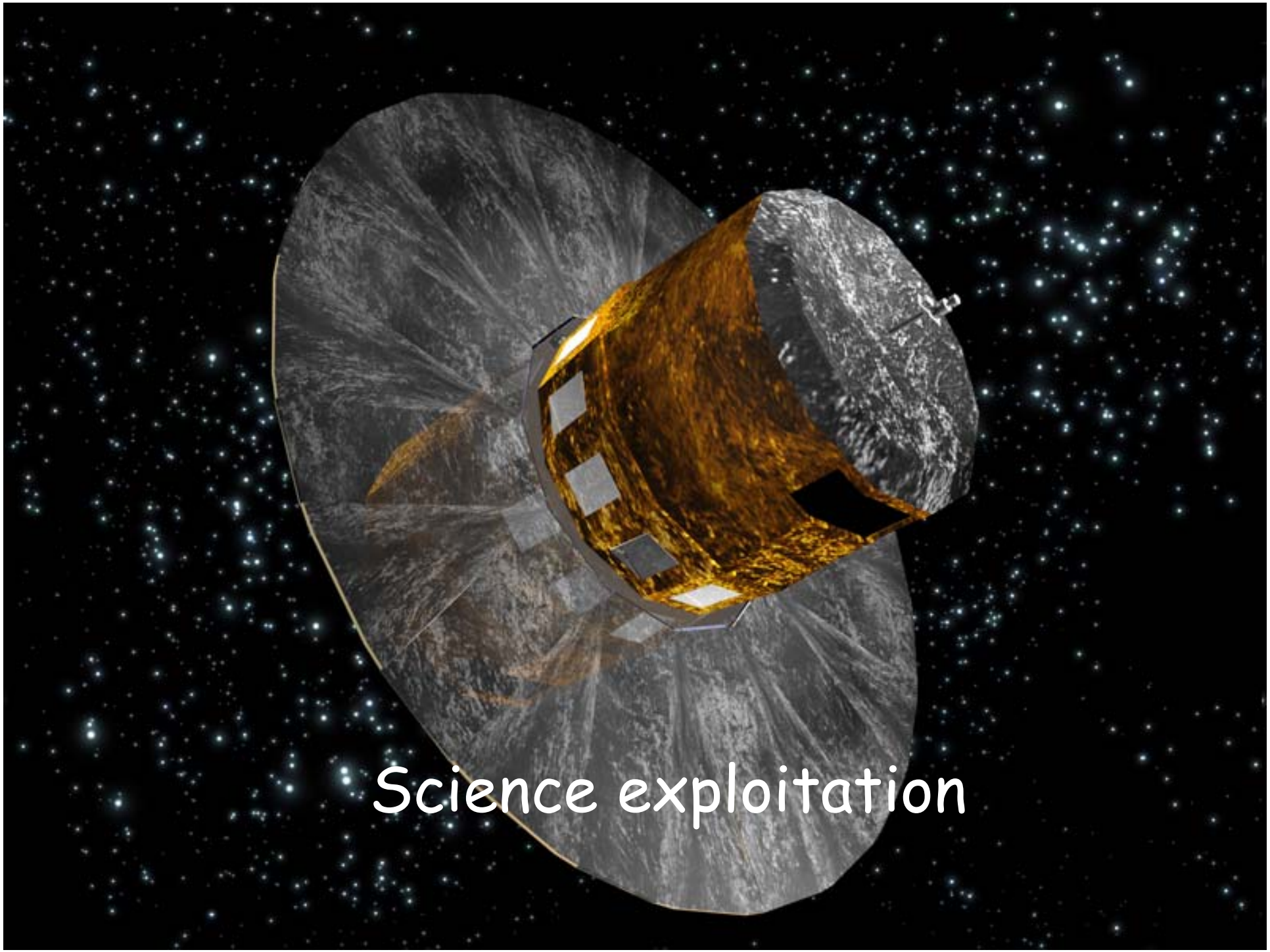
GAP: Gaia Archive Preparation WG
has been set up to formulate the DPAC approach to the archive (CU9)

Rough idea of current schedule for AO

* March 2011 : issued call for Letters of Interest - new people included in GAP
* Feb 2012 Agree release scenario
* Sept 2012 Commence response writing
* Nov 2012 First complete draft of response
* Nov 2012 Announcement of opportunity (short)
* Jan 2013 Hopefully successful negotiations and acceptance
* Feb 2013 Preliminary set up work
* Aug 2013 (Launch) - Start regular CU9 work

Meanwhile:

- **GENIUS "Gaia European Network for Improved data User Services": proposal submitted to EU-FP7 2012**
- Close cooperation with DPAC and GREAT


Science exploitation

Gaia science networks

GREAT-ESF and REG have a very good health:

- 7 workshops scheduled in 2012
- *5th Great Plenary Meeting*, 4 - 6 Jul 2012, Rome, in the framework of the European Week of Astronomy and Space Science, EWASS
- GUMS Gaia Universe Model Snapshot available for training scientific exploitation (meeting during SEA-Valencia, TBC)

GREAT-ITN: all students in place and PhD projects initiated

- 3 schools in 2012

Coordination for acquisition of on-ground data complementary to Gaia

- **Gaia-ESO spectroscopic survey**
- WEAVE
- ... other projects resulting from this meeting ???

Data release scenario (I)

Gaia Science Team has drawn up a list of desirable data releases

- to release data as early as possible
- incremental releases in terms of new data and rellevant improvement of precision

DPAC has produced a release scenario accounting for the GST requests and the current operations planning. Constrains:

- launch+6 months: cruise to L2, commissioning, DPAC systems initialization
- 6 months of nominal scanning for (nearly) full-sky coverage
- disentangling parallaxes and proper motions needs 18 months of data
- processing, calibration, validation
- each data release needs 3 months from production to the public archives

This scenario has been submitted to the AWG and will be the **basis for the AO of CU9**

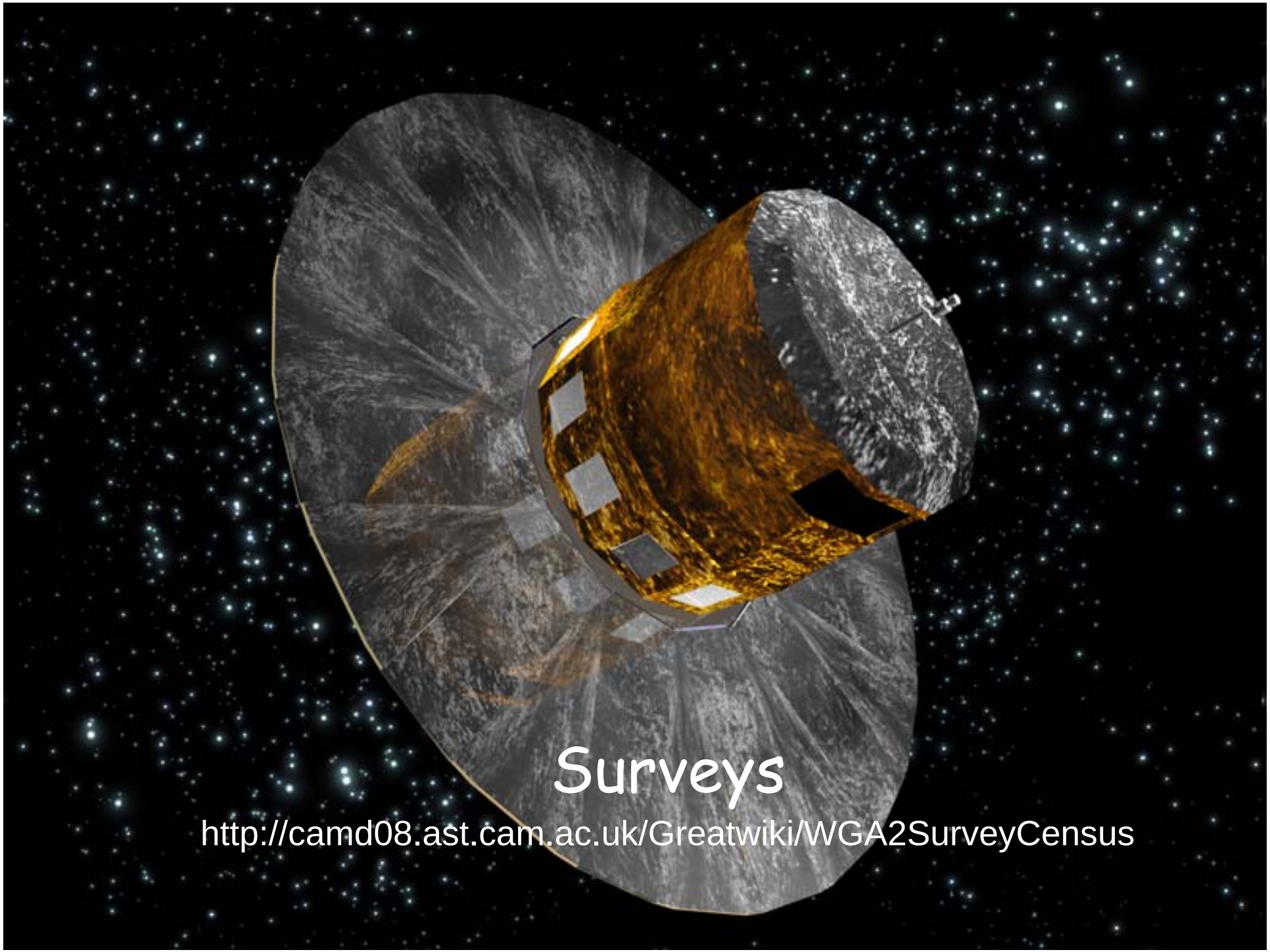
(in addition early releases of transient sources and Near Earth Objects to IMMCE)

Data release scenario (II)

First release: launch + 22 Months Aug-2013 →June-2015	• Positions (α,δ) and G-mag for single-like stars (90% of the sky) • the Hundred Thousand Proper Motions (HTPM) catalogue based on the Hipparcos stars
Second release: launch + 28 Months Dec-2015	• Updates of above + • **Mean radial velocities for stars** with non-variable radial velocity (90% of the sky)
Third release: launch + 40 Months Dec-2016	• **Positions (α,δ), proper motions, and parallaxes** and G-mag for single stars (90% of the sky) • Orbital solution for period between 2 months and 75% of the observation duration • Integrated photometry RP/BP • Spectrophotometry from RP/BP for sources for which astrophysical parameters are simultaneously released • **Source classification based on BP/RP and astrometry** for stars with sufficiently high quality data • Mean RVS spectra for sources where single epoch spectra are usable and APs are simultaneously released

Data release scenario (III)

Fourth release: launch + 65 Months Jan-2019	Updates of all above + • Source classification plus **multiple stellar astrophysical parameters** derived from BP/RP, RVS and astrometry for the majority of stars • **Variable star classifications and parameters** as available, and the epoch photometry • **Solar system results** with preliminary orbital solutions and individual epoch observations • Non-single star catalogue
Final release: End Mission + 3 years (36 months) **Aug-2021/2022**	Full astrometric, photometric, radial velocity catalogue • All available variables and non-single stars solutions • Source classifications (probabilities) plus multiple astrophysical parameters derived from BP/RP, RVS and astrometry for stars, unresolved binaries, galaxies and quasars. Precision improved with respect to 4th release. Some parameters may not be available for fainter stars. • Non Single Stars solutions and exo-planet list • All epoch and transit data for all sources • All Ground Based Observations made for data processing purposes (or links to it)


Surveys
http://camd08.ast.cam.ac.uk/Greatwiki/WGA2SurveyCensus

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gaia

Photometric surveys

Survey	Years of operation	Lambda/ band	Area	Mag limit	Bands
IPHAS	2003-2008	optical	0.2π N	20	Hα,r',i'
UKIDSS	2005-2012	infrared	0.7π N	19.4 / 17.8	Y,J,H,K,H_2
VHS	2010-2014	infrared	2π S		J, K_s + Y,H for Gal. Caps
VMC	2010-2014	infrared	2π S		Y,J,K_s
VVV	2010-2014	infrared	2π S	20/18	Z,Y,J,H,K_s
VPHAS+	2012	optical	0.2π S	21	Hα + u',g',r',i'
Pan-STARRS	2012-2022	optical	3π N	24	g,r,i,z,y
SkyMapper	2009-2014	0.33-0.96μm	2π S	22.9 / 21.5	u,v,g,r,i,z
LSST	2015-2025	0.33-1μm	3π S	24.5	u,g,r,i,z,y

Euclid, Glimpse, WISE

Spectroscotric surveys

Survey	Instrument	Status	Years of Operation	Mag.	Lambda (μm)	no. Objects	R	σ_RV km/s[1]
RAVE	6dF/UKST	operational	2003-2010	9-12 (V)	0.84-0.88	10^6	7500	<3
SEGUE-II	SDSS/APO	operational	2008-2014	14.5-23.5 (g)	0.38-0.91	350000	2000	4-24
MARVELS	SDSS/APO	operational	2008-2014	8-12 (V)	0.49-0.58	33x11000	5100	0.012
LAMOST	LAMOST	being comm.	2009?-	< 20.5 (g)	0.37-0.9	???	2000, 12000	?
					0.51-0.55			
					0.83-0.89			
WINERED	PI-inst	under dev.	2009?-	14/17 (*)	0.9-1.35	???	28000/100000 (***)	<1
APOGEE	SDSS/APO	partly-funded	2001-2014	<13.5 (H)	1.52-1.69	100000	20000	0.5
GES	VLT/FLAMES	operational	2011-2015	I<16				
	VLT/UVES	operational	2011-2015	I<19				

Astrometric surveys

Survey	GR/ SP	Status	Years of Operation	mag	Lambda (micron)	no. Objects	Sigma (mas)	PM (mas/yr)
Pan-STARRS	GR	prototype	2012-2022	15-24	optical	10^10	3-25	3-25
URAT	GR	partly funded	2009-2014	14-21	optical	10^9	5-100	5-100
LSST	GR	partly funded	2015-2025	17-24	0.3-1	10^10	1-10	0.2
Nano-JASMINE	SP	under dev.	2013-2014	<8.3	z (0.9)	10^5	-	1
JASMINE	SP	under dev.	2016-2021	<14	z (0.9)	10^7	0.01	0.004
J-MAPS	SP	phase A	2012-2017	2-15	optical	4x10^7	0.35-5	0.05-0.1

Summary of status

Industrial development ongoing

- Delays can be expected → launch in 2013

Data processing in good health

- GSIR successful
- end-to-end tests ongoing
- First steps for CU9: GAP, GENIUS

Scientific exploitation

- Data releases scenario established
- GREAT & REG: meetings, exchange of visits, ESRs FP7
- Additional spectroscopic survey: Gaia-ESO