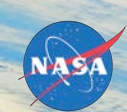


JWST is an international partnership between NASA, ESA and the CSA.



# JWST mission status

Pierre Ferruit (ESA JWST project scientist)

ESAC 2017 JWST workshop – 04-06 October



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European Space Agency



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# Acknowledgements



***All along this presentation you will see results from work conducted by a large number of teams in Europe, USA and Canada.***

***Many elements of this presentation are based on existing presentations prepared by other members of the JWST project, the instrument teams and STScI.***



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# Contents of the presentation



***Introduction.***

***The JWST mission and Europe***

***Mission status***

- ***The launch date and its recent move to Spring 2019.***
- ***Hardware status and pictures.***
- ***What's next on the ground?***

***Conclusion.***



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# The European participation to JWST



**JWST is a partnership between NASA, ESA and CSA.**

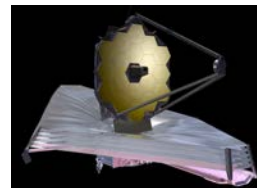
- *High-priority endeavor for the associated astrophysical communities.*

**ESA (and CSA) have been present since the very early phases of the mission.**

- *They were invited to join the project in 1997 at a time when the telescope was still called the "Next Generation Space Telescope" (NGST).*
- *The contribution of Europe to the mission gets consolidated around 2000.*

**In return for this contribution, at least 15% of the total JWST observing time will go to ESA member state applicants.**

- *Following the same scheme than the one successfully applied to HST.*



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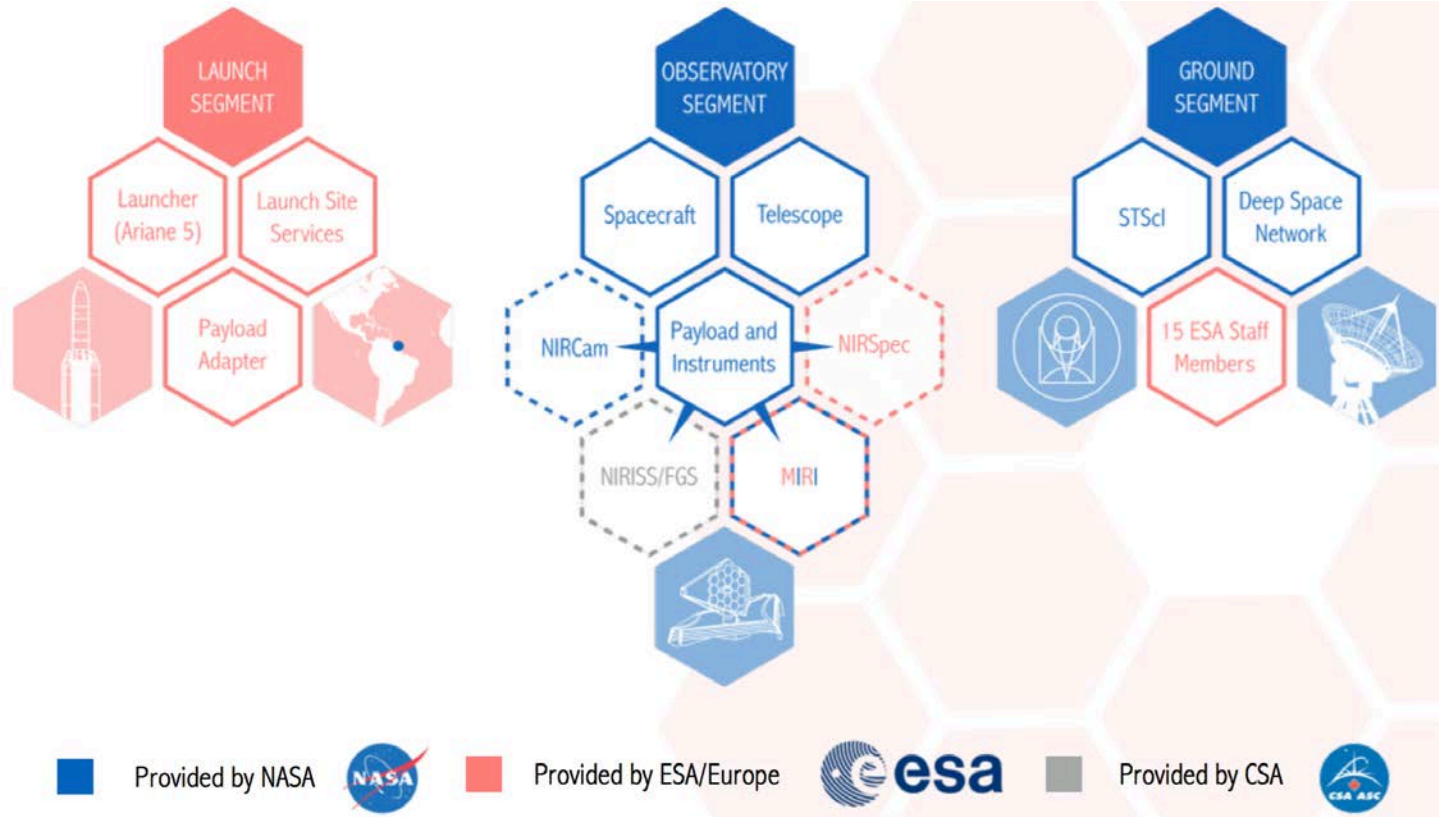


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# The European participation to JWST



**Important and visible participation involving ESA as well as European institutes and industry.**



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Credit for the figure:  
Nora Lützgendorf

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# The European participation to JWST



Credit: Arianespace - ESA

**JWST will be launched by an Ariane 5 ECA rocket for the spaceport of Kourou in French Guyana.**

As of October 2017, the Ariane 5 rocket tallies 81 successful launches in a row. More than 60 of them conducted with the ECA version.





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# The European participation to JWST



## NIRSpec - Near Infrared Spectrograph



### MODES



Fixed Slits (FS):

→ Single sources, bright stars



Multi-Object spectroscopy (MOS):

→ Rich fields, extended targets



Integral Field Spectroscopy (IFS):

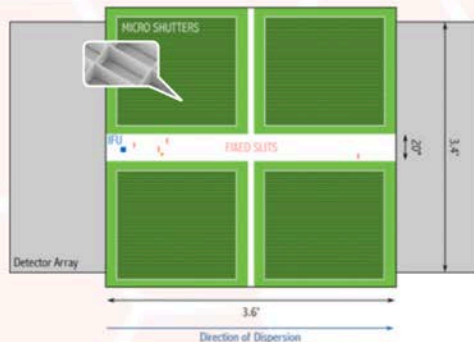
→ Sources with few arcsec extent



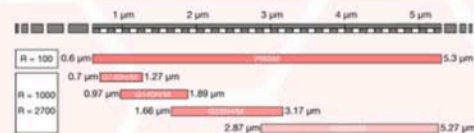
Bright Object Time Series (BOTS):

→ Exoplanets

### FIELD OF VIEW

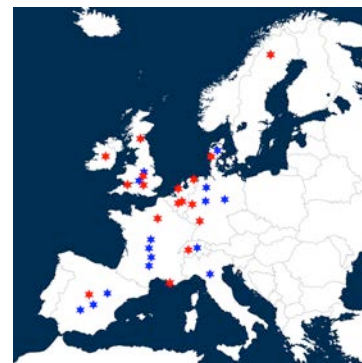


### WAVELENGTH COVERAGE



**NIRSpec was built by a consortium of European industrial company for ESA with contributions from NASA.**

Consortium led by Airbus Defence and Space.



A truly European endeavor.  
Blue = NIRSpec  
Red = MIRI

Credit G. Wright



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# The European participation to JWST



## MIRI - Mid Infrared Instrument



### MODES



Imaging:

→ Rich fields, extended targets



Coronagraphic Imaging:

→ Exoplanets



Low-resolution Spectroscopy (LRS):

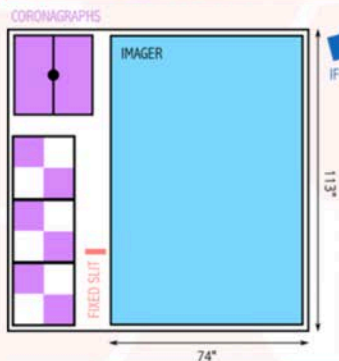
→ Sparse fields, single objects



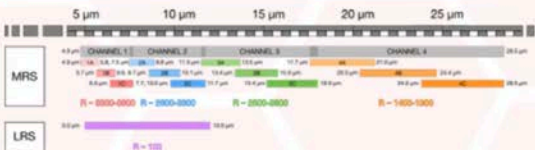
Medium-resolution Spectroscopy (MRS):

→ Sources with few arcsec extent

### FIELD OF VIEW

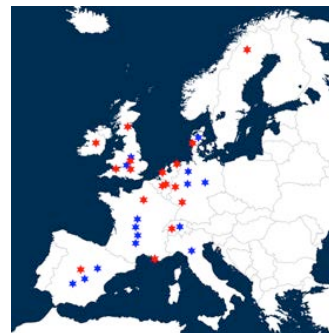


### WAVELENGTH COVERAGE



The MIRI optical system was built by a consortium of nationally funded European institutes led by G. Wright.

Its detectors and MIRI's cryogenic cooler system were provided by NASA JPL.



A truly European endeavor.  
Blue = NIRSpec  
Red = MIRI

Credit G. Wright





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# The European participation to JWST



**A team of ESA scientists and engineers is also working alongside their US colleagues at STScI.**

The ESA scientific operation team is led by Marco Sirianni and will include a total of 15 scientists and engineers by the time JWST is launched.



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# JWST is now launching in Spring 2019



**Since 2011, the mission had remained on schedule and on cost. NASA recently took a detailed look at the remaining integration and testing steps.**

**The conclusion of this schedule assessment was that some activities were taking or would take longer than initially planned and this led to move JWST's launch date.**

## **JWST is now to be launched in Spring 2019**

**(formal 90-day launch period covering March-June 2019)**



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# JWST is now launching in Spring 2019



**This change is not driven by concerns with the hardware or with the expected performances of the observatory.**

**→ All tests and measurements so far indicate that JWST remains the amazingly powerful observatory you all expect it to be!**

**JWST is a very complex mission and the decision from NASA shows that they are not cutting corners. The focus is on making sure the telescope and the spacecraft have been carefully integrated and thoroughly tested by the time they launch.**



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# JWST is now launching in Spring 2019



**JWST has a commissioning period of 6 months, so we are now talking about a start of cycle 1 in Winter 2019.**

**See talk by J. Valenti on the scientific and proposal timeline after the coffee break.**





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# JWST hardware status



**At this stage of the integration, all JWST elements have been integrated in two big sub-systems:**

- **The telescope and its instruments (this sub-system is called OTIS).**
- **The spacecraft and the sun-shield.**



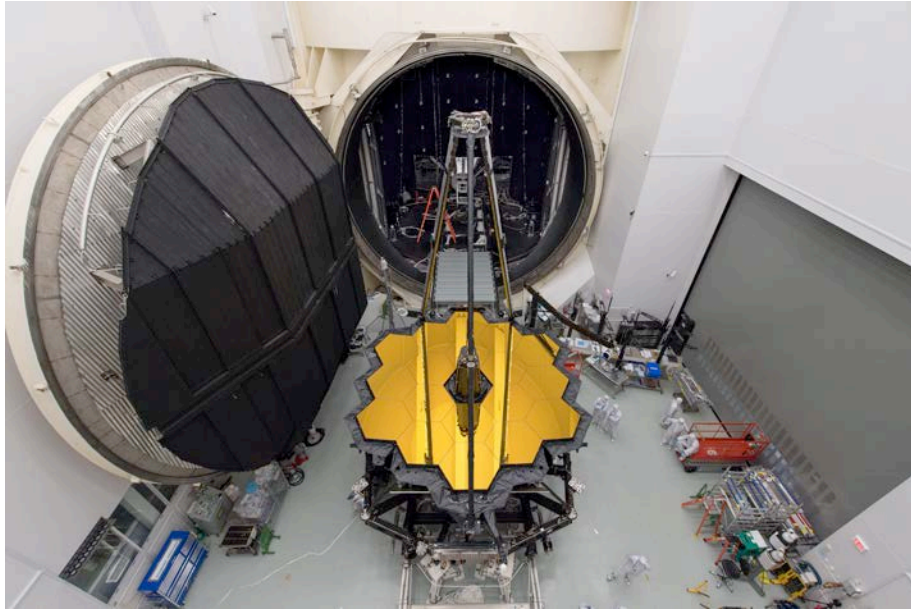
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**JWST's payload module (telescope + instruments = OTIS) just went successfully through the key parts of its major test campaign.**



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Credits: NASA/Chris Gunn

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# JWST hardware status - OTIS



**Making sure the telescope and the instruments can survive the harsh conditions of a rocket launch: acoustic and vibration testing.**



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Credits: NASA/Chris Gunn

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# JWST hardware status - OTIS

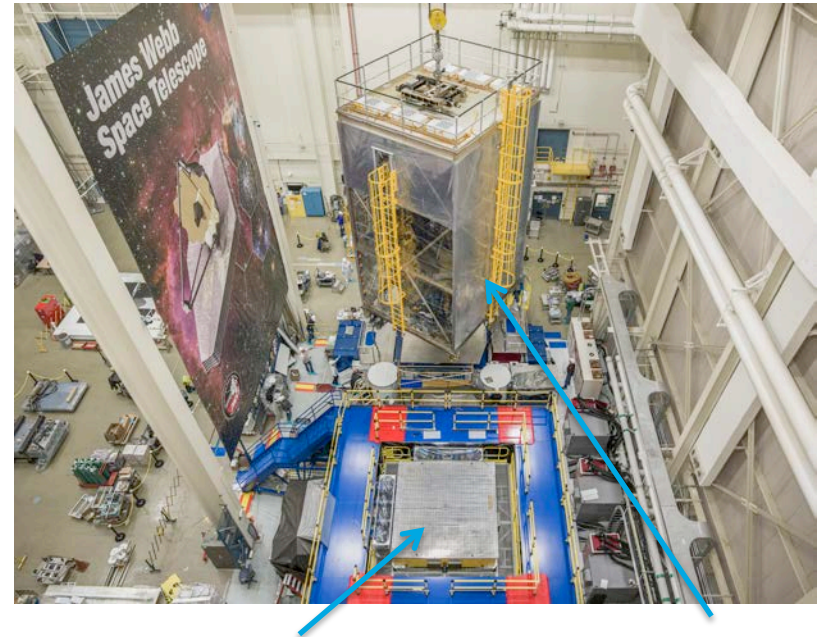


**Making sure the telescope and the instruments can survive the harsh conditions of a rocket launch: acoustic and vibration testing.**



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Credits: NASA/Chris Gunn



Vibration table

OTIS

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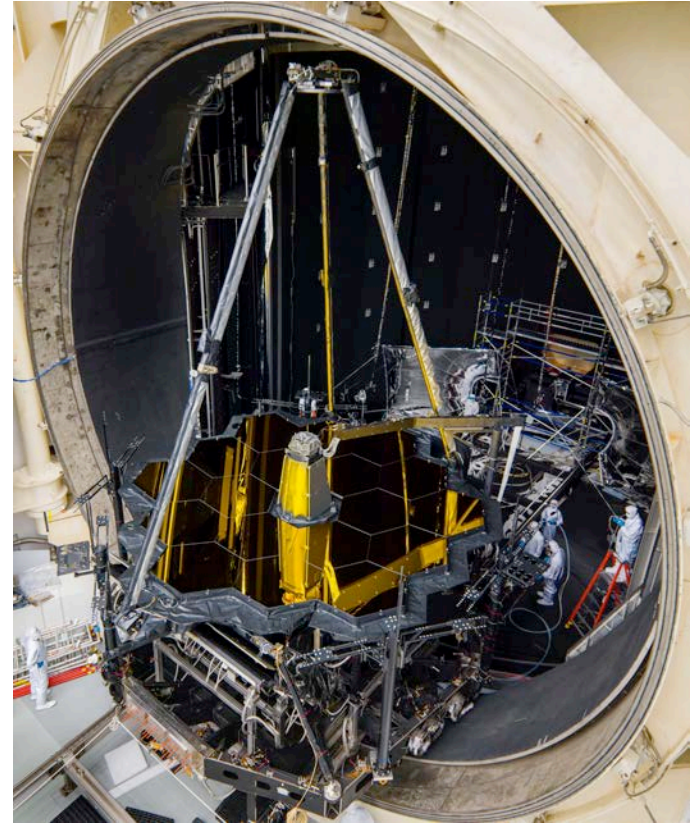
# JWST hardware status - OTIS



**The last step involves a deployed OTIS and a huge cryogenic test chamber at NASA's Johnson Space Center in Houston, Texas.**

Here the telescope and the instrument are brought down to their operating temperatures and they are thoroughly tested.

This includes multiple tests of the performances of the telescope and its mirrors (wavefront errors, stability, phasing...).



Credits: NASA/Chris Gunn

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# JWST hardware status - OTIS



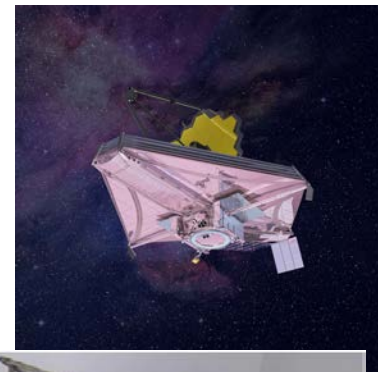
**We are almost done with the environmental testing of OTIS.**

- **Acoustic testing → successfully completed.** 
- **Vibration testing → successfully completed.** 
- **Cryogenic testing → more than 2/3<sup>rd</sup> complete, we are in the warm-up phase already.**

**All test results so far indicate that the telescope and its four instruments will be fit for launch, are in good shape and perform well.**

**Of course problems are encountered but they are fixed along the way and no show stopper has been identified.**

**In parallel, the integration of the spacecraft and the sunshield proceeds at Northrop-Grumman's premises in California.**



### Forward Sunshield Unitized Pallet Structure Attached to the Spacecraft Bus (Northrop Grumman)





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# Status – spacecraft and sunshield



**One particularly complex piece of hardware is the sunshield. Manipulating its elements under 1G is never easy or simple. Its integration, folding, unfolding are done meticulously and carefully!**







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# Status – spacecraft and sunshield



These activities are taking more time than initially planned but they are getting done without cutting corners.



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# What's next on the ground?



- Complete the environmental testing of OTIS and ship it to Northrop-Grumman's premises.
- Complete the integration and testing of the spacecraft + sunshield block.
- Put everything together.
- Test deployment.
- Go through one last series of acoustic and vibration tests.
- Check everything is still right after these tests.
- Pack everything and ship JWST to French Guyana (we are literally shipping it because it will go there by boat through the Panama Canal!).
- Get ready for launch in Kourou.
- **Launch!**



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## Conclusion



**JWST is in good shape!**

**We still have a lot work in front of us.**

**Launch in Spring 2019 and start of scientific observations  
in the Winter 2019!**

**A very powerful observatory that will provide  
plenty of opportunities for excellent science!**

I hope you will enjoy this workshop.

***Thanks for your attention***