A factory 4.0 "made in Safran" for the mirrors of the Extremely Large Telescope

What is the link between making mirrors and understanding the mysteries of the universe? The Extremely Large Telescope (ELT)! Safran Reosc is a major contributor with its high performance optics for astronomy. And it is with advanced means of production that Safran will produce the mirrors which play a crucial role in the observation of the stars.

On February 4, 2020, Safran Electronics & Defense and Safran Reosc inaugurated a brand new factory dedicated to the manufacture of the M1 mirror segments of the Extremely Large Telescope (ELT). Based on Safran Electronics & Defense site in Poitier's, this building has been fitted with the latest generation manufacturing technologies. No less was needed for the future telescope which promises to considerably improve the knowledge of the scientific community in the field of astrophysics.

L'ELT, the telescope of superlatives

ESO / L. Calçada

The ELT will be the world's largest and most powerful optical telescope. Its size will be four to five times that of current telescopes. Its power will allow it to detect stars 26 times less bright and to track organic molecules.

What is the point ? To improve scientific knowledge on the origin of galaxies. With its observation radius of 25 light years, black holes and exoplanets orbiting a star other than the Sun will be within our reach.

But we will have to wait a little longer! Under construction in Chile at an altitude of over 3,000 meters, under the supervision of the European Southern Observatory (ESO), the ELT should collect its first light in 2025. And Safran plays a crucial role in this project.

Safran Reosc, a major stakeholder

As part of the ELT program, Safran Reosc has once again demonstrated its world leadership in the design, production and integration of high performance optics for astronomy. Of the five ELT mirrors, all were entrusted to this company founded in 1937, today a subsidiary of Safran Electronics & Defense and which now employs 175 people.

Contracts were awarded at a fast pace: the M4 mirror in 2015, the M2 mirror in 2016, the M3 and then M1 mirrors in 2017 and finally, the M5 mirror in 2019. Commercial success is on the agenda. The industrial challenge too!
Safran

**A major production challenge**

The polishing of each of the mirrors must guarantee an almost perfect image reproduction of stars located thousands of light-years away. Thus, on the M1, the surface defects must not exceed 15 nanometers RMS. This would be equivalent to the height of a ladybug if each segment was reported on the scale of France! The polishing process therefore proves to be extremely meticulous, and this is one of the expertise of Safran Reosc.

However, thoroughness and mass production are difficult to combine! On its own, the M1 mirror contract requires the polishing in 3 years of 931 hexagonal 1.45 m point-to-point aspherical and off-axis segments, i.e. the completion of one segment per day.

Safran Reosc’s industrial resources were not designed to cope with such production rate. In 2018, Safran Electronics & Defense, its parent company, therefore made an entire building at its Poitiers site available to its subsidiary.

**To get a factory 4.0**

5000 m² are dedicated to the production of the M1 mirror segments. Safran Electronics & Defense has built an industrial tool for the future. From the interconnectivity of the means of production to the exploitation of digital manufacturing data in connection with the 3D model of the segment and robotization, the solutions for the factory 4.0 are arriving in force in the Poitou region. This is to provide the mirrors that will reveal the secrets of the universe.