Overview and Status of the James Webb Space Telescope Observatory

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The James Webb Space Telescope (JWST) is a large aperture (6.5 meter), cryogenic space telescope with a suite of near and mid-infrared instruments spanning the wavelength range of 0.6 microns to 28 microns. JWST's primary science goals are to detect and characterize the first galaxies, study the assembly of galaxies, star formation, and the formation of evolution of planetary systems. JWST has a unique design based on the concept of passive cooling by means of a multi-layer sunshield to achieve the telescope's cryogenic operating temperature. Each of the five layers of the sunshield is approximately the size of a tennis court, and made of aluminized kapton. By maintaining an observatory attitude whereby the sunshield keeps the telescope in the shade from the sun's rays, the telescope and science instruments can operate at cryogenic temperature (~40 K). On the sun facing side of the observatory the spacecraft bus houses most of the electronic sub-systems, and provides a platform for the solar array and communications hardware. JWST is sufficiently large that it cannot fit inside the fairing of its Ariane 5 launcher without being stowed in a more compact configuration, so the ability to deploy its major sub-systems such as the telescope optics and sunshield after launch are another major feature of the observatory. Development of observatory is making rapid progress as major hardware sub-systems near-completion. Polishing of the JWST telescope mirrors is complete with 18 primary mirror segments, the secondary mirror, tertiary and fine steering mirror all gold coated and through acceptance testing. Engineering test articles of each sunshield membrane layer are underway. The first layer 3 membrane is complete and is undergoing testing to evaluate its tensioned shape for compliance with alignment tolerances. As each major sub-system is tested, the expected scientific performance of the observatory can be evaluated using test results and integrated system models of the observatory. We will discuss key performance parameters of the observatory, including thermal performance, image quality, sensitivity, and the ability to achieve background-limited observations. The observatory deployment after launch will also be discussed in the context of recent sub-system testing of deployment mechanisms.