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Lessons learned from the development of LIT - Laboratory of Integration and Test at INPE - Brazilian National Institute for Space Research

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Abstract

The Brazilian National Space Research Institute (INPE) has developed since 1979 an Assembly, Integration and Test centre participating fully in the nation's space program, providing the engineering and technology, including the assembling, integration and test verification of spacecraft, instruments, and subsystems.

Inaugurated in 1987, the testing and integration laboratory (LIT) has supported numerous successful missions ranging from the first, MECB/SCD-1, which launched in 1993.

Support laboratories, as contamination control, calibration, electronic parts, at the state of the art levels were implemented at the same period.

In 1999 the building and the test facilities capacities were beginning to show their limitations in terms of its capability to support larger and heavier satellites. It was decided to start a second development phase incorporating new test facilities inside an extension of the existing building. This phase was completed in 2008.

Due to the evolution of Brazilian space programs, with larger, complex and heavier satellites, especially telecommunication payloads, a new extension project started in 2012.

This paper will document the lessons learned with the processes associated with the design, development, programming, and construction efforts of the different implementation phases of the laboratory. It will illustrate the following:

• The first approach for documenting the objectives of the facilities to cover the needs at INPE/LIT and the benchmarking process for comparison with other international organizations' laboratories.

• For each extension project, the description of the existing technical limitations which are the reasons for the new objectives of the next step.

• The approach of identifying layout and workflow requirements—location, floor plan, employee circulation, ground support equipment development and installation during testing, high bays, mechanical and harness assembly, solar panels integration and testing, flight hardware staging, situation rooms, and public viewing.

• The approach of identifying technical facility requirements— for example clean-room capabilities (ISO 8), mechanical and thermal-vacuum test facilities, EMC and telecommunication test facilities.

• The approach of identifying infrastructure requirements: air handling, power, cooling, lighting, fire detection and fighting, redundancy, and security for classified missions.

• Quality reviews and monitoring during facilities implantation.