TeDIN / IRiS
Traceability of equipment & Document for INnovative solutions
Increased Reality for innovative Solutions

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CONTEXT

The assembly of a satellite is complex and requires a very high level of quality. In AIT (Assembly Integration Tests) phase, to perform the activities, the operators must follow many procedures and carry out the traceability of all the actions. As the time spent in AIT is one of the most important costs during the satellite manufacturing, the digitalization and access to data is essential to limit this time. It is in this context that TeDIN/IRiS was developed.

GOAL

Using the 3D models made under CATIA / 3dVia of satellite equipment, the objective of TeDIN/IRiS is to help operators identify and visualize the equipment to be mounted and to ensure the traceability of these operations.
All necessary information for unit mounting and traceability are gathered and digitalized into one application. This application is considered as one basic brick of satellite Digital twin. The solution is thought by the AIT team for the AIT team.
So, the goal of TeDIN/IRiS is to increase competitiveness by:

- Modernizing methods
- Using real-time digital traceability
- Eliminating recurrent document preparation
- Eliminating the search for information in operation
- Reducing errors

A 3D MODEL SOLUTION CENTERED

The solution is centered on a 3D models tree, built under CATIA / 3dVia from the design office (see Fig. 1.). This tree is shared with other departments for other needs (Mechanical, …). TeDIN gives a 3D visualization of digital mock-up on tablet (TeDIN view, see Fig. 2.) and this ability to work directly on a tablet gives greater freedom to the user.
The solution gives also to the operator, thanks to a layer concept, the capacity to visualize the concerned element for the task in a full 3D context. This 3D assembly can just as well model a complete satellite, a subsystem or simply a piece of equipment. At a satellite level, the typical task is to mount a piece of equipment, while at equipment level, the task can be a repetitive action such as gluing identical elements for instrumentation.

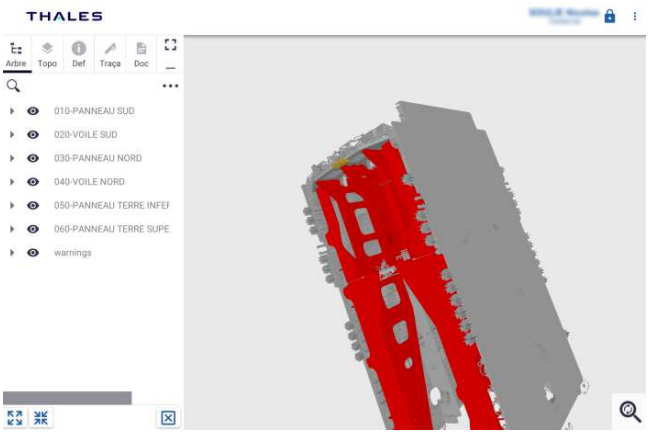

Fig. 1. 3D models tree in TeDIN


Fig. 2. Use of TeDIN on Tablet in AIT

TRACABILITY & IDENTIFICATION

Apart from offering a 3D visualization, one of the main functions of TeDIN is to perform a digital traceability of the tasks. This traceability contributes to quality, but requires identification of both the operator and the equipment. On operational user side, it is mandatory for security issue to know who executes the task. This is done by reading the personal badge of the operator. On equipment side, if it is possible, the identification is done by scanning barcode previously applied on it. Finally, the traceability is done by entering mandatory data, specific to each task, and this can be completed by asking operator to take one or a few photos. For each task, all its data, equipment values, status, photos, … are linked to the operator identity and time-stamped.

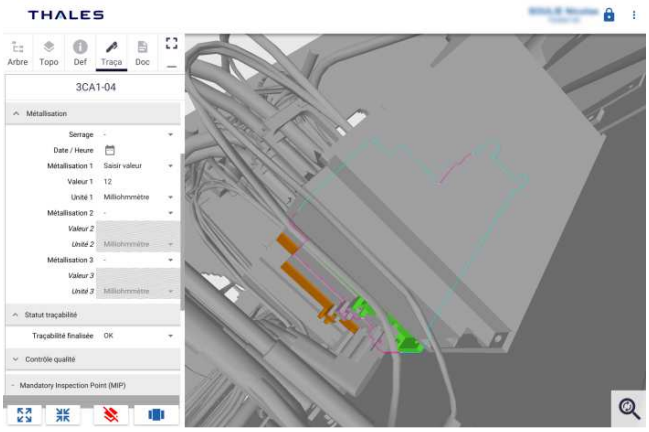

Fig. 3. TeDIN traceability

DATA ACCESS & INTERCONNECTIVITY

The solution takes in input, a 3D models tree with its metadata, and a standardized file, which is a merged collection of data coming from many documents. The application can be connected to Thales Alenia Space proprietary task manager in order to simplify the retrieval of the task.
Despite the fact that the solution gives to an operator a 3D visualization and traceability tools, the execution of the task is not always completely simplified, so it is important to keep and have access to the original information. This is why the application may provide:

- Definition data documents: Gluing, Tightening torque, Flight connections, Provisional / definitive assembly, Metallization, Business reminder, …
- A referential access: standards, manufacturing instructions, …
- Others digitals medias specific to the task : documents, images, and videos as tutorials for example, …

AUGMENTED REALITY MODULE

Developed at first as a stand-alone solution, IRiS software was later embedded in TeDIN. IRiS module offers a visualization in Augmented Reality on Glasses (IRiS view, Fig. 4.). This module allows, in addition to the tablet, to see in augmented reality elements to mount. The tracking of environment and positioning of 3D element is realized thanks to different kinds of markers. 2D markers (Fig. 5.), are easy to integrate both in 3D and in real world, but limited in term of precision, while 3D markers give better positional precision, but are more restrictive at physical installation, i.e. on a satellite for example. The use of 3D markers is particularly suitable for table assembly.

Fig. 4. IRiS module in use in AIT with HoloLens headset

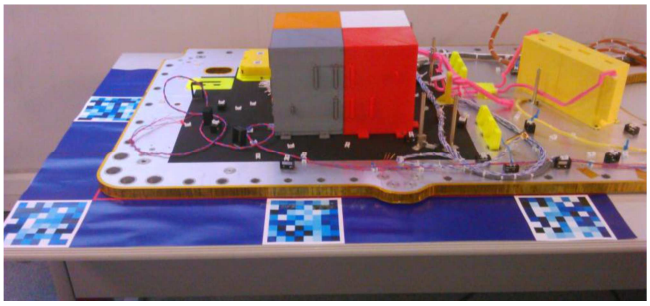

Fig. 5. Example of use of 2D markers for IRiS module

HARDWARE & SOFTWARE

The current hardware and software used are:

- Microsoft Surface Pro Tablet
- Microsoft HoloLens Headset for IRiS module

- NFC Badge reader for identification and security
- Barcode reader
- Unity 3D framework of Unity Technologies for software part

CONCLUSION

Today, the solution is used in AIT, and helps operators reduce the time spent on their tasks.
The main next step, is to have a real-time visualization of satellite mounting and control status in order to optimize the process and the scheduling.
The foreseen evolutions for this solution are:

- To allow a real-time visualization of satellite mounting and control status in order to optimize the process and the scheduling.
- To cover Control and Inspection tasks, typically for Mandatory Inspection Point.
- To connect the product with smart tools, in order to record mounting data in traceability: tightening torque for example.
- To connect the product with an Augmented Reality projective.
- To connect the product with a remote-assistance product, to provide assistance of an expert, in order to unblock a situation as soon as possible.

In any case, it is necessary to keep an eye on the material evolution because it is the most limiting point today, mainly for the augmented reality part, both in terms of performance and comfort.