

Flight Inspection Service improvement using Replicator

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ABSTRACT

During Flight Inspection runs, well-known misunderstanding and consequent delays was noted between the Aircraft team and the Airport maintenance team due to exchange of information limited to the VHF conversation. The flight inspector is not able, using only voice communication, to transfer in real time to the maintenance engineer all the data available on-board.

For a few years, ASECNA(1) uses an on-board to ground real time data transmission system during flight inspection. This capability has allowed to improve the missions condition and to reduce the flying hours. This paper describes the system and the operational aspects.

(1) ASECNA : AGENCE POUR LA SECURITE DE LA NAVIGATION AERIENNE EN AFRIQUE ET A MADAGASCAR.

PURPOSE

To provide flight inspection data in real time for all radio navigation aids directly to the ground maintenance engineers, Sagem DS has developed the REPLICATOR.

This new equipment which takes into account the feedback of the users replaces the first generation of equipment called “On Board to ground curve transmission” which has been in operation during 4 years.

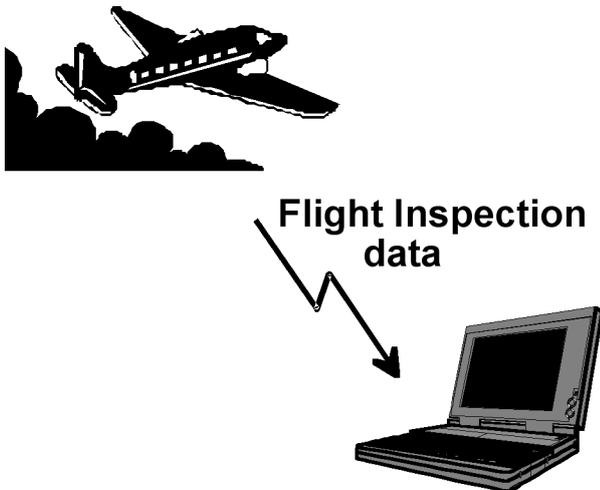


Figure 1: Replicator concept

OBJECTIVES

During the flight inspection of radio navigation aids, some inspection runs with beacon setting require continuous dialogue between the ground maintenance team and the flight inspector.

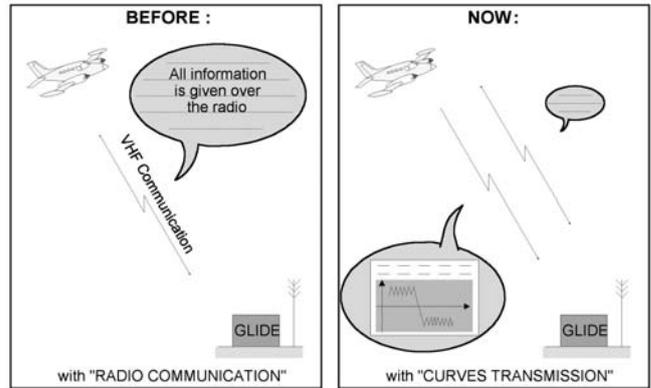


Figure 2: Before and after scenario

As the dialogue between the on-board and the ground team was limited to a voice communication with a VHF transmitter, and as the ground team had no way to see immediately the results of his adjustments and to locate the aircraft position during and between the runs, Sagem DS has designed the Replicator, a functionality which improves the dialogue and saves time.

This capability is to provide in real time flight inspection data for all radio navigation aids directly to the ground maintenance engineers. It must not need any training, and beacon adjustments must be carried out quicker than before.

CONCEPT

Main features:

- The Replicator can display all the data which are available on board, so that the ground maintenance team is able to monitor all information (real time parameters, curves, mean computation results, aircraft position,...) depending on the inspected beacon,
- The parameters which are displayed on the Replicator are selected by the flight inspector,
- As the data transmission is in real time, the beacon adjustment modify instantaneously the curves and the parameters displayed on ground,
- The set up of the equipment is so easy that the maintenance team needs no special training.

How it works:

- First of all, data are acquired on board by the acquisition unit,
- They are computed to be displayed to the flight inspector,
- At the same time, they are transmitted to the ground station,
- The ground computer displays and plots received data automatically in real time (for each new run, the curve plotting starts and stops automatically, ...) because it is controlled by the aircraft flight inspection system,
- Furthermore, the flight inspector continuously controls the ground computer so that he can define all the parameters which characterise the curves.

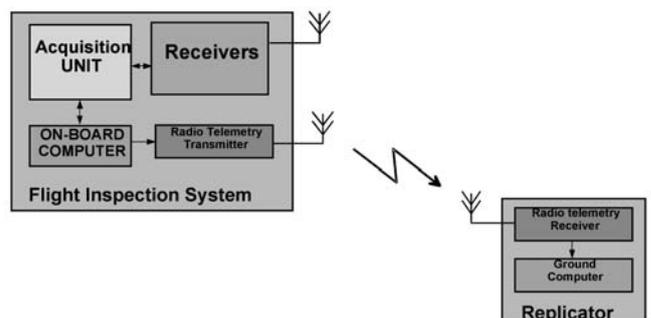


Figure 3: General block diagram

OPERATIONAL ASPECTS

Initial set-up:

At the initial delivery, a specific Replicator's default configuration (parameters selection, scales,...) can be set-up into the system. This allows to plot specific ground curves instead of the same as the on-board ones.

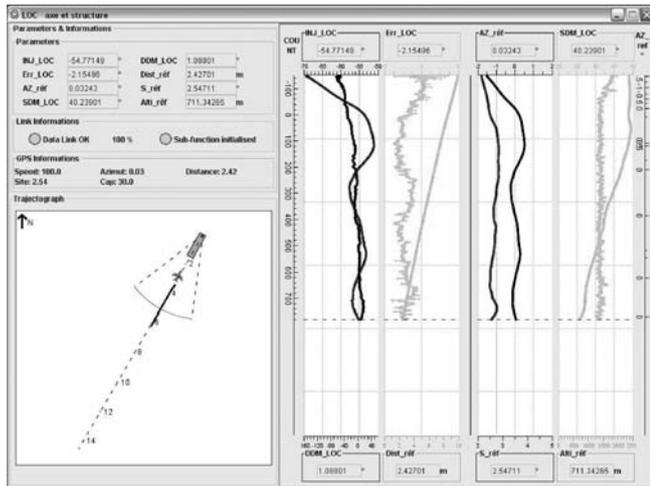


Figure 4: Ground operator display

On board operations:

As the Replicator's default configuration (parameters selection, scales,...) has already been set-up into the system, the Replicator is automatically controlled by the Flight Inspection System when the mission starts.

However, the flight inspector can, at any time, consult the curves being transmitted to the Replicator and modify the parameters and scales in real time in accordance to the needs of the mission.

Ground installation and operations:

The Replicator is composed of 3 parts which take 5 minutes to set up. The laptop computer is installed into the shelter of the beacon to be calibrated and simply connected to the radio receiver which takes place out side with the antenna.

Then, the ground engineer has only to switch on the equipment and the equipment runs automatically. The operator has only to watch the display, no action is required on the Replicator during all the mission.

CUSTOMER'S FEEDBACK

After four years of operational conditions, the feedback confirms that this function considerably reduces the flight inspection flying hours. The improvement is so clear that some final customers are now requesting it as a mandatory service. It ensures them that the flight inspection operations are to be carried out within the minimum amount of time while increasing the quality of the service.

The Replicator is now requested by the ground maintenance teams because it improves the relationship between on-board and ground engineers. It can sometimes be specially effective when the teams are not speaking in their native language.

Ground maintenance team improvement:

- The Replicator considerably improve the dialogue with the flight inspector.
- As the aircraft trajectography is displayed during all the flight, it is easy for the ground engineer to manage his time so that he is always ready to do the good thing at the good time.
- As the data are plotted during the runs, the ground engineer can check the effects of his adjustment. In case of error, he can see it in real time and take it into account immediately. So the setting is quicker and more accurate.
- As mean results are displayed at the end of the runs, there is no risk of error du to a misunderstanding as when they were only listed by VHF communication.

TECHNICAL IMPROVEMENTS

Taking into account the feedback of the users for the last 4 years, a new design which is compatible with all the radio navigation aids (ILS, DME, VOR, TACAN, MLS, GNSS, VHF, NDB, ...) has been studied and put into operation.

During this development, additional improvements have also been implemented:

- A higher data rate transmission,
- A new Man Machine Interface,
- A larger display.

CONCLUSION

A significant reduction, around 15%, of the flying hours was noticed by ASECNA during standard flight inspection. This time saving is increased for more complex flight inspection as commissioning.

In addition, the improvement of the relationship between the on board and the ground maintenance team is so efficient that the users now request this capability as mandatory.