

**TEST FLIGHT AND
DEVELOPMENT
CENTRE**



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FLIGHT TESTING IS OUR PROFESSION – AN OVERVIEW OF TEST FLIGHT AND DEVELOPMENT CENTRE

**Lieutenant Colonel Gerard Schuite
Telemetry System Manager TFDC
South African Air Force**

ABSTRACT

The aim of this presentation is to give an overview of TFDC's capabilities as a flight test centre and the approach with respect to the management of flight testing.

KEY WORDS

Overview of TFDC, capabilities, flight test management

INTRODUCTION

The South African Air Force's Test Flight and Development Centre (TFDC) at Bredasdorp, conducts the major portion of experimental and Research & Development flight test work in the RSA.

The strategic positioning of TFDC with a large volume of airspace, allowing for flexibility during flight testing, as well as its capabilities and facilities are the envy of many foreign Aerospace Companies.

TFDC was officially established on 10 August 1975 at AFB Waterkloof. With the entry of the RSA into the Aerospace Industry and the establishment of the sophisticated technical facilities of the Overberg Test Range (OTR) for the space programme, TFDC was relocated in the Overberg in 1987 and has during the past 23 years, with a relatively small work force, flown approximately 30 000 flying hours and conducted more than 2 000 flight test programs.



An Aerial view of TFDC with the main runway in the foreground (10 000ft) and the secondary runway in the background. (Photo: TFDC photographic section)

CAPABILITIES

GENERAL

The scope of the projects at TFDC, vary from short to long duration, low to high cost, moderate to high technology, and low to high risk. Some of the tasks currently include the qualification of the locally developed maritime surveillance suite, the locally developed electronic warfare suite, performance tests, flutter tests and various smart weapons.

Denel's Overberg Test Range also plays an important part in the conduct of flight test trials. Accurate spatial positioning, optical and radar tracking of airborne targets is provided. Cine-theodolites are located throughout the test range for visual tracking of aircraft and released stores, while the laser track mount and Doppler tracking radar's are used for accurate multi-target tracking.

To ensure proper support and the highest possible success rate the capabilities and skill of technical telemetry personnel plays an important role. Furthermore the dependability and availability of the telemetry equipment utilised during the flight test is considered as equally important.

To ensure the latter, TFDC has adopted the Product Support Supplier (PSS) concept for the maintenance, support and operation of the telemetry ground station and maintenance

of approximately 50% of the airborne telemetry equipment. Reunert Defense Logistics (RDL) is presently contracted as the PSS for the telemetry system at TFDC.

TFDC has, during 1997, launched an active program to improve the TM data acquisition capability by providing the state-of-the-art equipment including data processing, data displays and to meet future test programs. The TM data acquisition system improvement program includes the planned procurement of equipment to replace old or obsolete equipment and equipment for system checkout and verification.

TELEMETRY GROUND STATION

The telemetry ground station, due to the earlier weapons boycott, comprises equipment from various suppliers. The present capabilities of the ground station includes reception of telemetry data in P-band and/or L-band. In both bands, a dual receiver approach with diversity combining is utilised. For the P-band frequencies, Microdyne and ATNE equipment are used with manual tracking and for L-band ATNE receivers and diversity combiner in conjunction with a 3 meter parabolic dish antennae capable of auto tracking.

In the L-band the capability also exists to relay video data from an aircraft which is often used during release clearances and providing the client with a visual of what is happening with his product.



Ground telemetry control station. Data display in digital, analogue and brush recorder format as per requirement. (Photo: TFDC photographic section)

The upgrade process for the ground station includes processing and display of 1553 format data and new more advanced data recorders to name but two. It must be mentioned that any change to the ground system is always measured against the total telemetry system, meaning that compatibility and synergy with the rest of the telemetry system must always remain.

AIRBORNE TELEMETRY

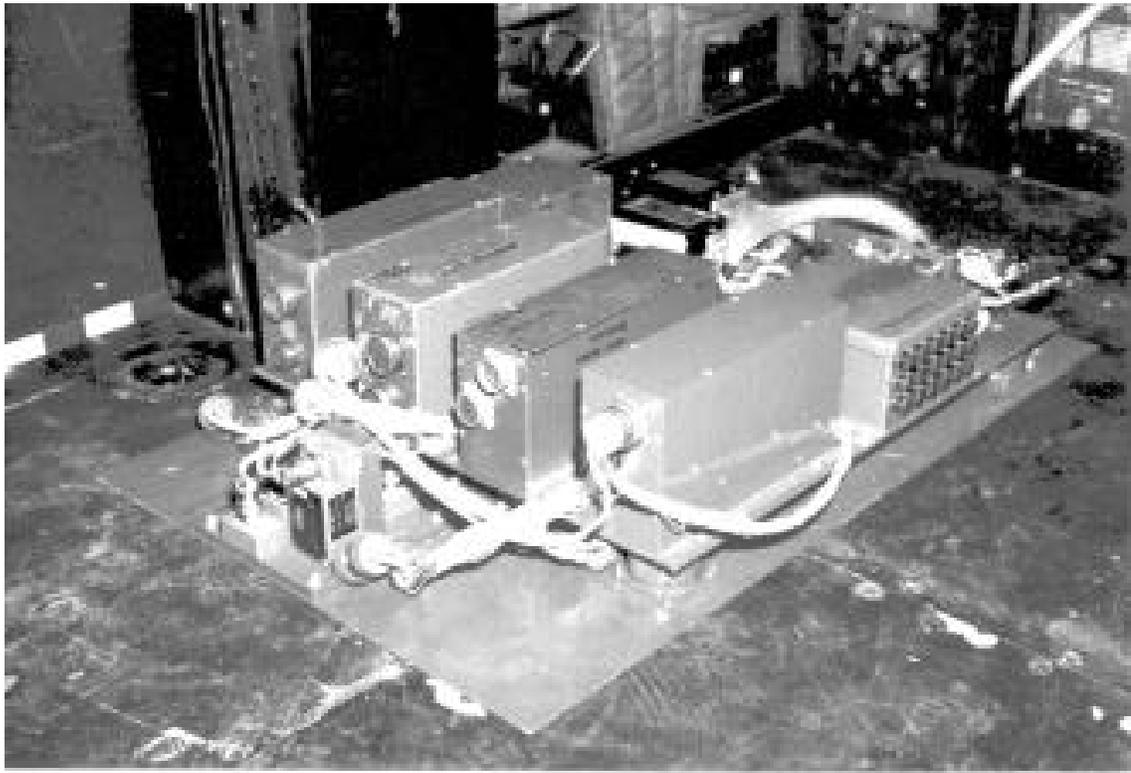
The flight test instrumentation section at TFDC is responsible for the design, installation and maintenance of all telemetry related tasks and onboard installations.

This section is also in the process of upgrading certain equipment which include new data recorders and development of a "miniature" telemetry strap-on pack that utilises a processor for first level processing and accumulation of required data. The main objective of this development is a decrease in weight and installation time and an increase in capability.



TFDC flight test instrumentation personnel busy fitting a SAAF Alouette III with a telemetry strap-on pack for low rotor RPM flight trials. (Photo: TFDC photo section)

This concept has been in existence since the early 80's. What is however significant is the fact that TFDC is moving in a direction that is vital in flight testing, namely, more cost-effective means of data collection.



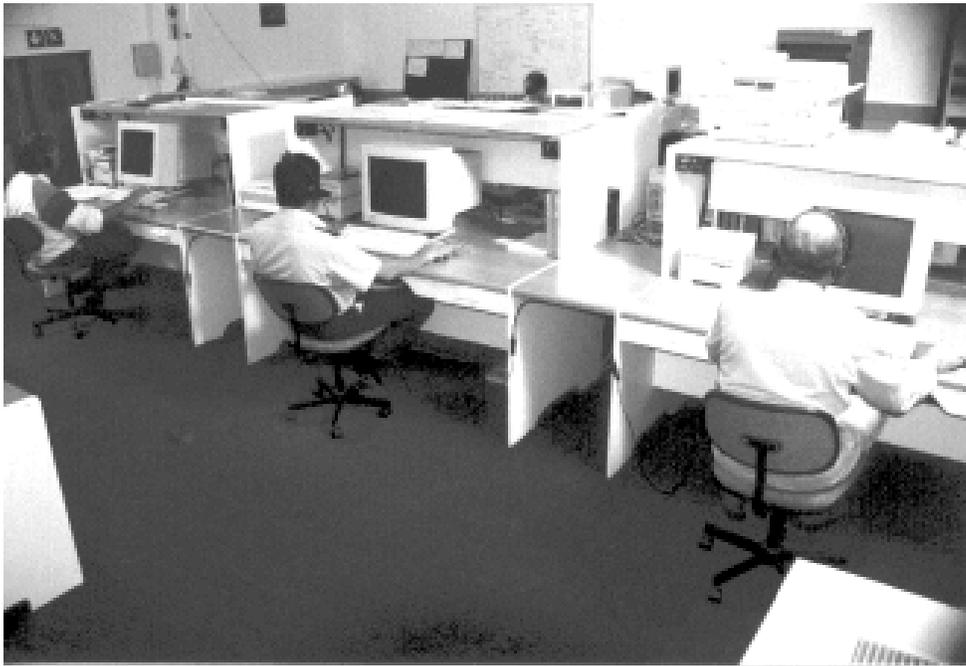
Detail view of strap-on telemetry pack as developed by TFDC. (Photo: TFDC photographic section)

The onboard telemetry section is also supported by a comprehensive and highly skilled R&D section who is responsible for the design and manufacture of all electronic circuitry required for signal conditioning and display requirements.

DATA REDUCTION

The facility responsible for data reduction and real-time processing and display of telemetry data received a mayor boost a few years ago with the acquisition of an OS90 system. Apart from its vast processing power it also extended TFDC's capability to display real-time telemetry data to the customer giving him visibility of what is happening with his product and thus making him part of the total process.

The telemetry ground station and the OS90 in the data reduction room is linked via fibre optics to ensure proper high speed transfer of data from the receivers to the processor for real time data processing and display.



Personnel monitoring real time data of a flight test on terminals connected to the OS90. (Photo: TFDC photographic section)

To ensure availability as well as supportability, TFDC has signed a back-to-back contract with L3 Communications that includes notification and correction of software bugs as well as any configuration changes/redundancy of components.

APPROACH TO FLIGHT TESTING

FLIGHT TEST SAFETY

The hazardous nature of flight testing places a high premium on safety of flight. To ensure that all flight tests are conducted with the safety as a key factor, TFDC uses a System Safety Specialist to manage the flight test safety aspect as a systems engineering process. This ensures that all possible negative influences on the safe conduct of a flight test is eliminated or at least made visible.

By utilising this approach and taking into account the exploratory nature of the flight test task, TFDC has managed to achieve impressive flight safety statistics with extremely low flight test incident rates.

FLIGHT TEST MANAGEMENT PROCESS

TFDC is functionally controlled by Director System Integrity, via the Staff Officer Test Flying (SOTF). This in effect results that all flight testing conducted by TFDC is tasked by SOTF. At TFDC the scheduling of the tasks are managed by the Flight Test Director.

During a trials management meeting, which is held once a week, all tasks are conceptualised, prioritised and task leaders appointed.

It is the responsibility of the task leader to ensure that the rest of the process is executed with the flight test report as the end result. To achieve this, there are various steps that must be followed to ensure success. Figure 1 gives a broad outline of the process.

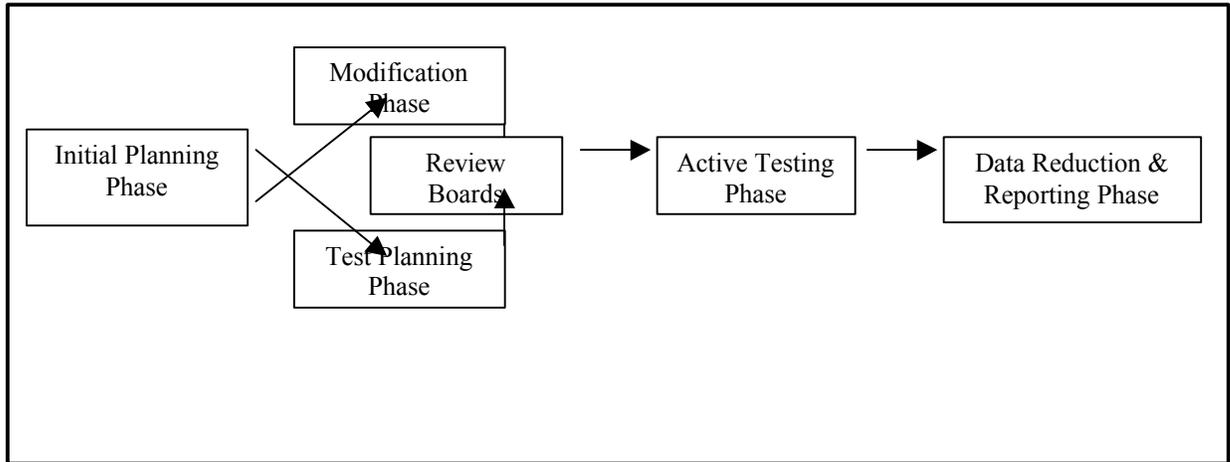


Figure1: Flight test management process

To ensure that the total process is optimised and cost effective, TFDC management believes in innovative thinking. This approach can be explained as follows:

In order to survive in today's marketplace, an organisation and that includes TFDC, must above all, be successful in innovation. By innovation in flight testing it is meant the ability to create new ideas that are critically judged, modified and then finally used to establish new and better approaches, methods, or devices.

Having said this it is also important to keep in mind that for instance to get from point A to point B one can use a VW or a Cadillac, meaning that care must be taken that when something is good enough it should be implemented and used. Remember that 'best' is the enemy of 'good'.

CONCLUSION

The financial implications (and/or constraints) and complexity of the modern test aircraft and ground support equipment, telemetry data acquisition equipment, data processing and display equipment will in future be major considerations in the consolidation of test activities. A further element, namely, the need for increased visibility by the customer will also influence the total flight test process.

Keeping the above in mind it is pertinent that the South African telemetry community work together and consolidate test events wherever possible to ensure survival of all. This approach also includes the sharing of innovations, making visible research and trends wrt acquisition of new equipment to ensure compatibility between the various telemetry users but maybe the most important, is the sharing of successes and failures so that we can learn from each other.