



R100 – National Satellite Test Facility

Scope:

- ✦ NSTF Background and Objectives
- ✦ NSTF Aims and Scope:
 - Requirements and Drivers
 - Facilities and Capabilities
 - Location
- ✦ Physical Context- Campus Masterplan
- ✦ Site and Facility Security
- ✦ Working With Industry
- ✦ Staff and other Resources
- ✦ Operational Timeline

NSTF Background and Objectives

- ✦ The need for a comprehensive UK spacecraft environmental test facility has been identified through the UKSA's Facilities Gap Study carried out as part of the IGS via surveys and workshops with UK industry over the last 18 months
- ✦ Provision of such a facility will increase UK industrial competitiveness and strategic capability (particularly relevant post Brexit), enabling the complete environmental test of large spacecraft in one location
- ✦ STFC's new R100 facility for RAL Space provides an ideal foundation upon which to establish the NSTF:
 - ✦ Campus location within UK Space Gateway
 - ✦ Infrastructure in place
 - ✦ Demonstrated skills and expertise working with industry (including spacecraft level TVAC)
 - ✦ Facility development plan in place forming a foundation for NSTF
 - ✦ Established demand from industry to provide NSTF capabilities based on R100 capability



NSTF Requirements and Drivers

- ✦ NSTF aims to provide UK industry with a “one stop shop” for complete environmental testing of complex spacecraft and space systems
- ✦ Specific facility needs and requirements established through dialogue with specific input from Airbus D&S, TAS UK, SSTL and LM UK plus associated supply chain
- ✦ UK MoD needs also addressed
- ✦ Key requirements:
 - ✦ Full EVT for satellite size up to 7 tonnes (wet)/ envelope 3.5m x 3.5m x 7m (transportation container)
 - ✦ Secure and Tempest Compatible
 - ✦ ISO9001 and ESA Certified (possibly UKAS)
 - ✦ Available by mid 2019
 - ✦ Able to process at least 3 spacecraft EVT campaigns per year



NSTF Facilities

◆ Core Facilities Comprise:

- ◆ Clean Rooms for large satellite preparation + Solar Array Deployment
- ◆ C of G and moments of inertia
- ◆ Vibration & Pyro Shock
- ◆ Acoustic
- ◆ LSTC - Thermal Vacuum
- ◆ EMC
- ◆ CATR - Compact Antenna Test Range

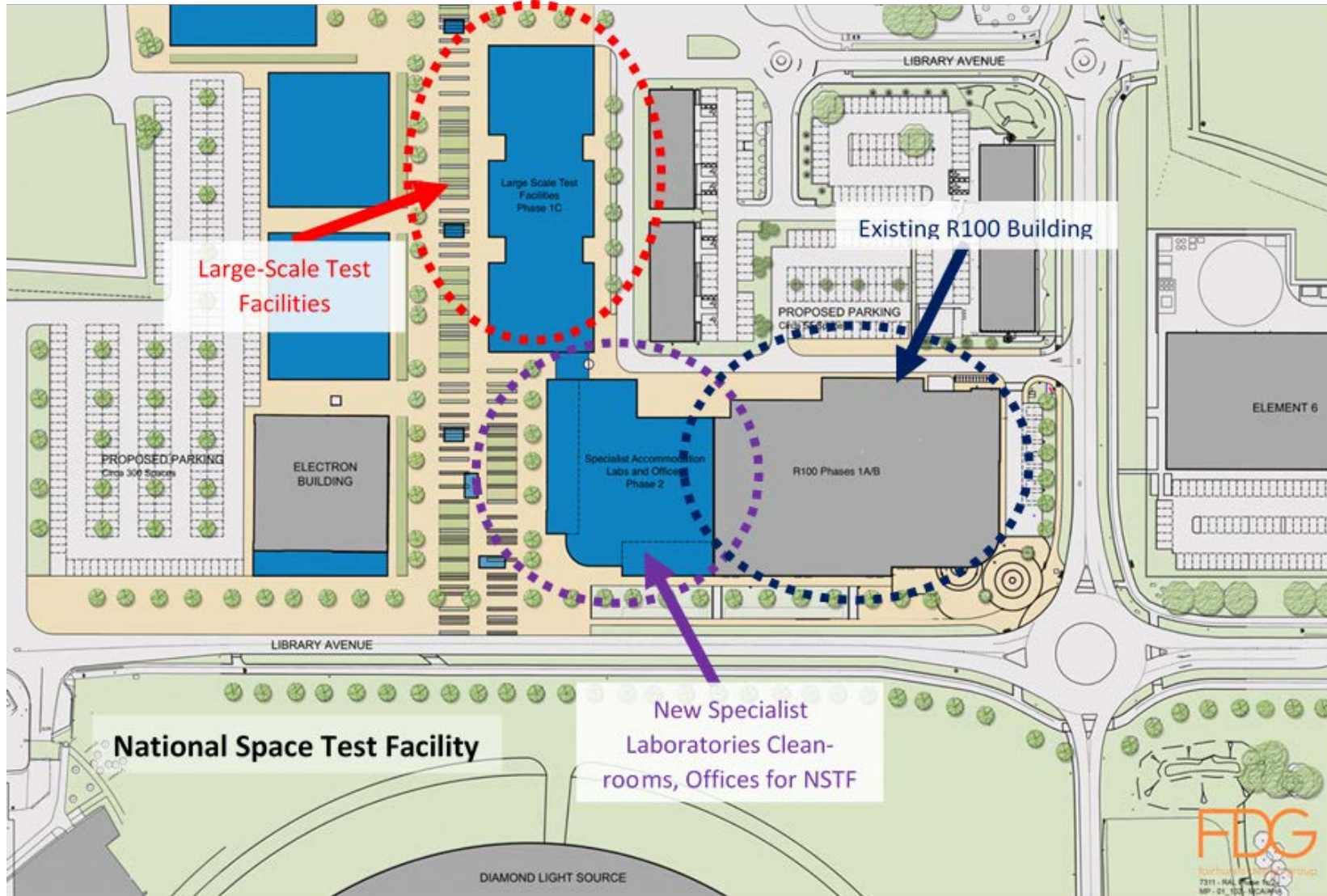


NSTF - Drivers

- ✦ Satellite size
- ✦ Satellite mass
- ✦ Transport container size and mass
- ✦ Cleanliness levels
- ✦ Crane hook height and capacity
- ✦ Test specifications
- ✦ Amount of MGSE\EGSE
- ✦ Interaction between facilities
- ✦ Facility sound & vibration isolation
- ✦ Test equipment storage
- ✦ Size of customer team
- ✦ Number of satellites\customers
- ✦ Resilience
- ✦ Security



NSTF - Location



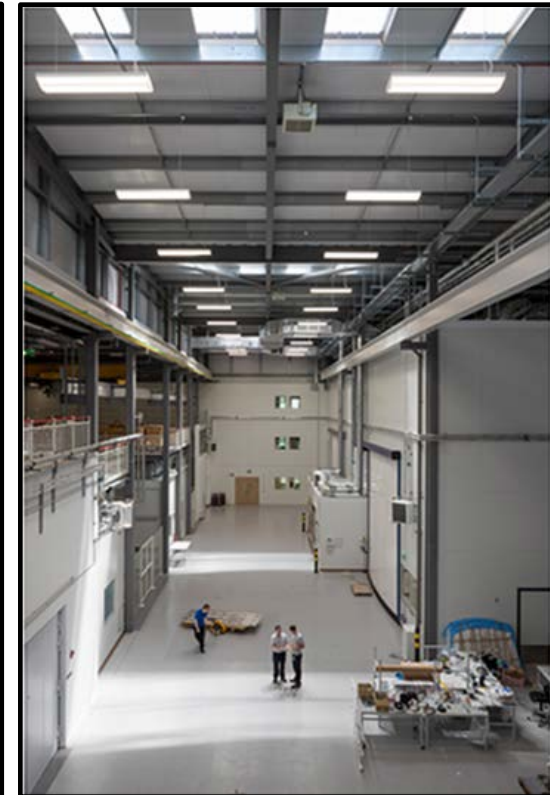
R100 – Campus Master Plan



Large Satellite Preparation Facility

Comprises of a large clean room\rooms and associated Electrical Ground Support Equipment Area (EGSE) for the preparation and checkout of satellites prior to and between tests. The facility can also be used for Solar Array deployment tests and Satellite Integration.

Baseline - High Bay of 43m x 17m x 13m at class 100,000 for telecom satellites and Clean Room of 18m x 15m x 13m at class 100/1,000 for science class satellites



CofG and Moments of Inertia Facility

C of G and MOI Testing is normally carried out prior to vibration testing and the equipment used can either be accommodated in the Large Satellite Preparation Facility or in the Vibration Facility.

Baseline – APCO or similar machine with a 7 tonne capacity



Large Satellite Vibration Facility

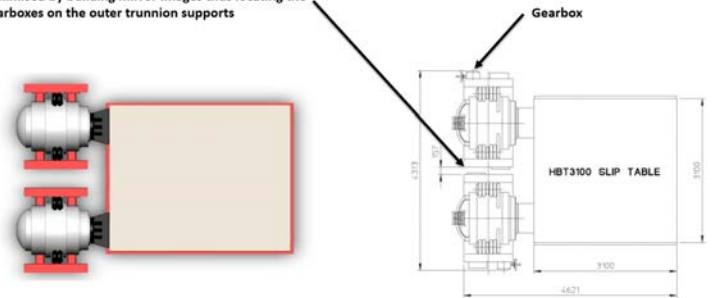
The Vibration Facility can operate as part of a whole satellite testing programme or just for vibration testing. This facility would also be able to carry out limited shock testing. Subs system shock testing will be a part of Phase 1B.

Baseline - 2 x LDS V984 160kN (320 kN Total) thrust shakers, combined with a suitably sized slip table, located in a pit so that slip table is at floor height and located within a class 100,000 area. 500 data channels.



Dual V984 – HBT3100 Slip table - Concept

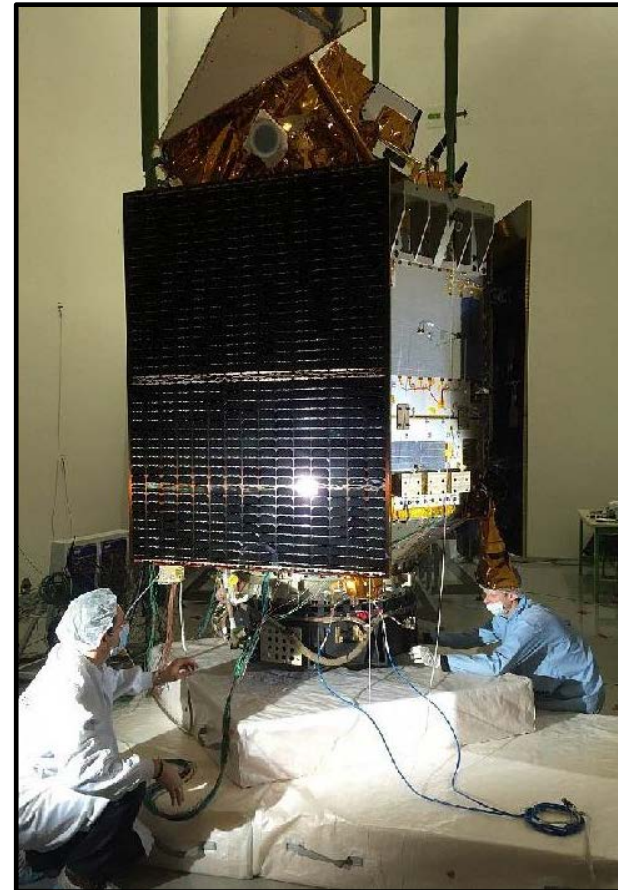
The gap between the two vibrators has been minimised by building mirror images thus locating the gearboxes on the outer trunnion supports



Pyro Shock Testing

Pyro shock testing is required to simulate separation of the nose cone fairing and the satellite from the launch vehicle. This testing is normally carried out by firing the satellites clamp band release system.

Baseline – This testing can be carried out in a number of areas, but if not carried out in the Vibration Facility may require a portable monitoring system to be used to capture test data. Implications for storing and firing pyro devices will need to be addressed.

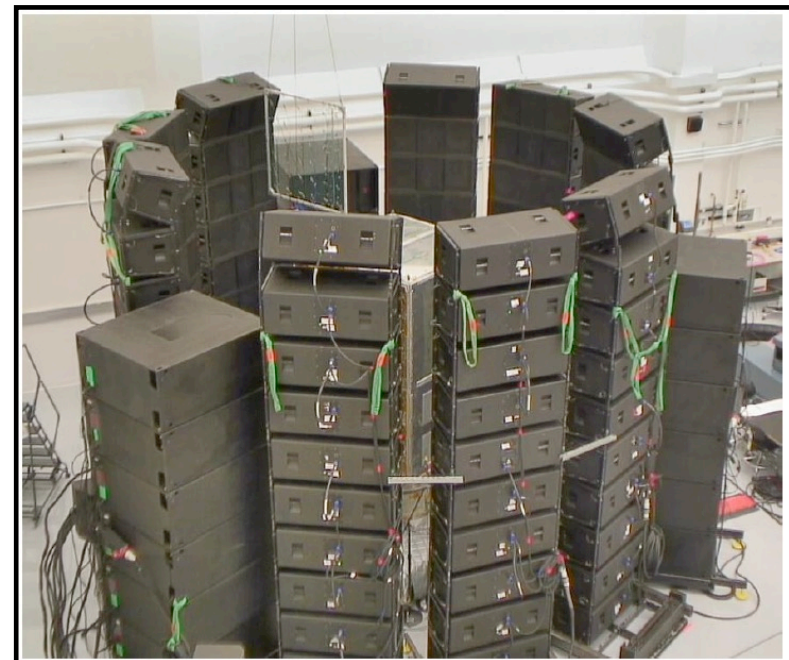


Large Satellite Acoustic Facility

Requires either a Reverberant Chamber (RATF), where acoustic loading is generated by using a large feed horn and a compressed gas, or by Direct Field (DFAT), where the acoustic loading is generated by a bank of amplifiers and loud speakers.

The RATF method would require a dedicated facility whereas the DFAT would be performed in the Vibration Facility and utilize it's control and monitoring system.

Baseline is currently DFAT Facility - System with 500 data channels tbd + microphones



Large Space Test Chamber

The facility (LSTC) will be used for thermal vacuum testing of complete satellites or modules. It is not planned to use this facility for calibration activities.

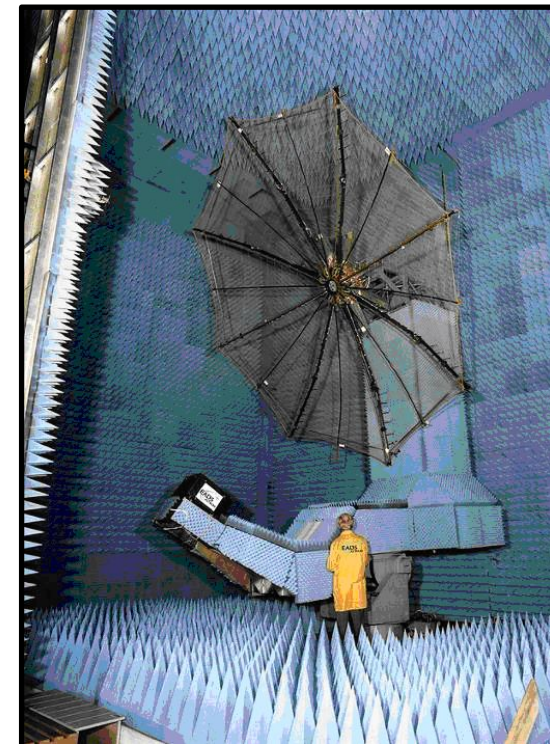
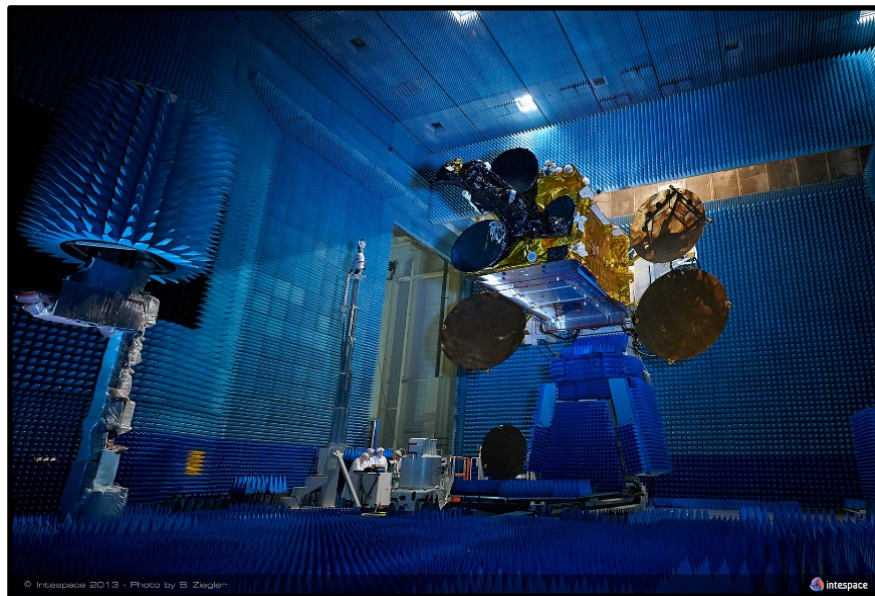
Baseline - 8m diameter (7.5m inside shroud) x 8m (tbc) long vacuum vessel with tbd number of shroud panels, one full size door into a 100,000 class area, there will be a second smaller door at the other end of the chamber for personnel access. 1,000 test item data channels etc.



EMC and CATR Facility

Provides an electrically sterile environment, by using an anechoic chamber for the measurement of a satellites emissions and for testing a satellites resilience to electrical emissions. The CATR a controlled environment for the testing of a satellites antenna.

Baseline – Currently we are looking at the two facilities EMC and CATR sharing one anechoic chamber, but there are a number of challenges with this approach, should it not be feasible then two separate facilities will be required.



Working With Industry

- ✦ NSTF will operate (at least initially) on the same proven basis as existing STFC RAL Space facilities:
 - ✦ Basic facilities operated and supported by RAL Space
 - ✦ Programme specific staff and resources provided by industrial user
 - ✦ First come/ first served with committed facility slots; inevitable programme slips accommodated on a negotiated basis
 - ✦ Services charged at full economic return rates

- ✦ Evolution of operating models may be evaluated in conjunction with industry, STFC and other stakeholders once NSTF fully established



R100 Schedule for Facility Equipment and Buildings

R100 NSTF Planned Schedule

