

TEST CELLS



SAFRAN TEST CELLS,

FOR A COMPLETE TESTING SOLUTION

TURNKEY TEST CELLS OR UPGRADES, TEST EQUIPMENT, DATA ACQUISITION AND CONTROL SYSTEMS, SERVICES

Safran Test Cells (formerly known as Cenco), a subsidiary of Safran Aero Boosters, has specialized for over 60 years in Aero-Engine Test Facilities for the Commercial & Military Market (turbofan, turbojet, turboshaft & turboprop engines).



60

YEARS OF EXPERIENCE

4

IN HOUSE TEST CELLS

9100

EN/AS9100 CERTIFIED.
ISO 14 001, OSAH 18 001.

THE ONE WHO DESIGNS, INSTALLS, COMMISSIONS, SUPPORTS TEST FACILITIES, ADAPTERS AND TEST NACELLE EQUIPMENT.

THE ONE PART OF SAFRAN AERO BOOSTERS, TECHNOLOGICAL PARTNER TO THE ENGINE OEM'S.

THE ONE OPERATING 4 IN HOUSE TEST CELLS, 1 TEST CELL SIMULATOR & 3 DEMO TEST CELLS.

4

OFFICES FOR A GLOBAL 24/7 SERVICE

TEST CELLS DEPARTMENT
EUROPE BELGIUM & FRANCE



→ → → 85

SAFRAN TEST CELLS USA
MINNEAPOLIS



→ → → 110

SAFRAN TEST CELLS
SINGAPORE



→ → → 9

COMPLETE OFFER AND INTEGRATED SOLUTION

Safran Test Cells offers turnkey test facility projects as well as upgrade solutions (re-furbishment or new engine capability). Its added value lies in A to Z project management - from design to manufacturing, installation and service support - compliant with EN9100 standards.

Their clients include the most demanding aero-engine manufacturers, MRO operators, Airlines and Air Forces. It has completed 200 projects across the entire range of test cells on the market: solutions for development, production and MRO testing of turbofans, turbojets, turboprops, turboshafts, APU, components, for military and commercial applications.

The 4 flagship products are :



TEST CELLS

ENGINE AND COMPONENTS TESTING FACILITIES AND SUBSYSTEMS



TEST EQUIPMENT

ADAPTERS AND TEST NACELLE EQUIPMENT (BELLMOUTH, COWLS, BOATTAIL, EXHAUST NOZZLE)



DACS

DATA ACQUISITION AND CONTROL SYSTEM



SMS

SUPPORT, MAINTENANCE & SERVICES



1 out of 3 large test cells worldwide



More than 200 TNE and 650 adapters delivered



More than 100 DACS in operation



24/7 support on 3 time zones

THE VOICE OF THE CUSTOMERS

"AGAIN - VERY PLEASED WITH THE ONGOING GE-SAFRAN COLLABORATION HERE IN PRAGUE"

GE Aviation Czech

"NDTL'S EXPERIENCE WITH SAFRAN'S CYRES SYSTEM HAS BEEN OUTSTANDING. SAFRAN HAS PROVEN TO BE CAPABLE OF MEETING FOUR OF THE TOP NDTL REQUIREMENTS FOR A DATA ACQUISITION SYSTEM."

Notre Dame Turbomachinery Laboratory

"SAFRAN TEST CELLS ENCOUNTERED THESE CHALLENGES IN STRIDE AND HANDLED THEM IN A PROFESSIONAL MANNER BY THE PROJECT TEAM AND THE ACTIVE INVOLVEMENT OF MANAGEMENT."

N3 Engine Overhaul Services



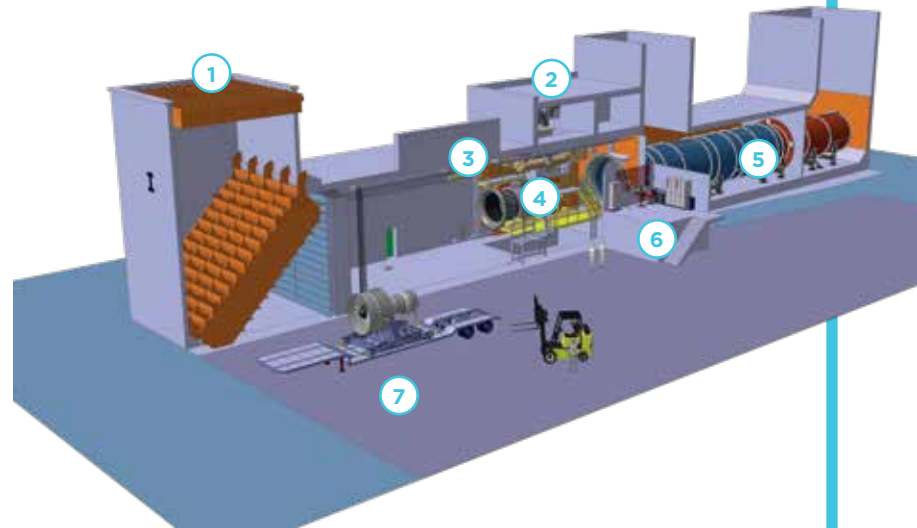
TEST CELLS

TEST CELLS

SAFRAN TEST CELLS OFFERS TURNKEY TEST FACILITY PROJECTS AS WELL AS UPGRADE SOLUTIONS WHICH ENHANCE ENGINE CAPACITY.

Its added value lies in A to Z project management, from design to manufacturing, installation and product service support.

Their clients include the most demanding aero-engine manufacturers (Safran Aircraft Engines, Pratt & Whitney, General Electric or Rolls-Royce), the largest MRO operators, together with airlines and many airforces and it has completed 200 projects across the entire range of test cells on the market.



- ① Inlet // ② Fuel/Air/Oil/Electricity // ③ Thrust Stand // ④ Engine Adapter
⑤ Exhaust // ⑥ Data Acquisition & Control System // ⑦ Engine Handling

80+

ENGINEERS TO DEVELOPP
YOUR TESTING SOLUTION

4

IN HOUSE TEST CELLS FOR
NEW TECHNOLOGY AND
MATERIAL VALIDATION

2

POLES OF EXPERTISE FOR
AERO-ACOUSTIC ANALYSIS

Whatever your testing
needs are, Safran Test
Cells can help you.

PROJECT TYPE

In addition to turnkey projects, our range of solutions covers various specialties: adapters for engine capability upgrades, thrust stands, turboshaft/turboprop test beds, auxiliary systems (fuel, engine start...), aero-acoustic studies and solutions, handling equipment...

Safran Test Cells also has experience in developing specific and tailor-made systems (vacuum vessels, cross wind generator, variable fan nozzle, fine static vane actuation...).



Aeroacoustic study and solution



Variable fan nozzle



Turbofan test cell



Turboshaft mobile test bed

Safran Test Cells designs and realizes test cells for commercial and military engines of all types (turbofan, turbojet, turboshaft, turboprop, APU) and developed testing solution for bearing chambers and engine compressors.



Thrust stand & adapter

SOLUTION TYPE

Safran Test Cells will orient its solution according to the type (MRO, production, development) and frequency of the tests, aero-acoustic constraints (open air and closed test cell), tested vessel, test configuration (engine installed or uninstalled), customer wishes... So that your test solution will exactly correspond to your needs.



Installed / uninstalled engine test



Open air test cell

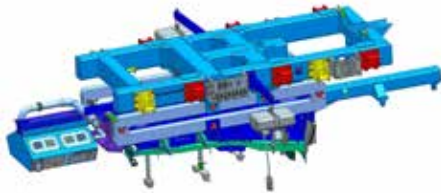
TEST CELLS



TEST EQUIPMENT

ADAPTERS AND TEST NACELLE EQUIPMENT.

Safran Test Cells designs, manufactures and installs a wide range of specific test equipment used for indoor and outdoor testing, using both composite and metallic material.



Engine test adapter



Test Nacelle Equipment (TNE, sold under the name Eolines®)

THE

1

LICENSED FOR ADAPTERS
AND TEST NACELLE
EQUIPMENT






MORE THAN

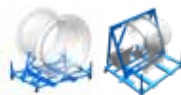
900

ADAPTERS AND TNE
DELIVERED WORLDWIDE

Safran Test Cells can
propose an integrated
offer with TNEs
and adapters, for
optimized interfaces
management

PRODUCT LINE

	 Bellmouth	 Cowling	 Nozzle & Plug	 Boattail	 Adapters
CF34-8C/E	•	•	•	•	
CF34-10A	•	•	•	•	
CF34-10E	•	•	•	•	
CFM56-5B	•	•	•	•	
CFM56-7B	•	•	•	•	
GENX-1B	•	•	-	-	
GENX-2B	-	-	-	•	
GP7200	-	•	•	•	
LEAP-1A	•	•	-	•	
LEAP-1B	•	•	-	•	
LEAP-1C	•	-	-	•	
Silvercrest	•	-	-	-	
GE9X	-	-	•	•	
TRENT 900	•	•	-	•	
TRENT 1000	•	-	-	•	
TRENT XWB	•	•	-	•	
					CF34-10E CFM56 GENX-1B LEAP-1A LEAP-1B LEAP-1C Silvercrest TRENT LM2500, GE90, CF6, CFM56-2&-3, PW4000, V2500, PW 1100, PW 1200, PW 1500, PW2000, CJ1000, GEnx-2B, LM500



Safran Test Cells can provide a complete adapter / TNE / storage carts solution.

TEST CELLS



DACS

DATA ACQUISITION AND CONTROL SYSTEM

Safran Test Cell's DACS, Cyres and Ceres, includes the hardware and software installations needed to collect all the engine parameters, to operate the engine and the facility and to monitor the running of the test.

IMPROVED RELIABILITY

Cyres and Ceres include integrated troubleshooting tools and are supported 24/7 on 3 continents with remote access capabilities for online direct interventions.



60+

ENGINE TYPES TESTED

100+

DACS IN OPERATION

1000+

SIGNALS CAPACITY
(INCLUDING HIGH
FREQUENCY)

Ceres is our legacy
and we will support
it. Cyres is our future,
with its new features
and products being
developed. Conversion
plan an option
available

857 TEST CELL AT SAFRAN AIRCRAFT ENGINES, PARIS



① CONTROL ROOM

- Single access point to all subsystems

② VISUAL MONITORING

- With permanent CCTV recordings
- Integrated automatic FOD detection

③ DECENTRALISED ACQUISITION

- Higher accuracy
- Reduces electromagnetic perturbations

④ EXTERNAL SIMULATION BENCH*

⑤ INSTRUMENTATION ROOM

- Includes facilities and engine control PLC and engine FADEC interface

⑥ ⑦ FUEL SKID AND PRESERVATION SYSTEM

- Redundant sensors for accurate measurements
- Automated control for time and cost efficiency

⑧ ELECTRICAL ROOM

- Conditioning and distribution of power
- Uninterruptible Power System



CONFIGURE

Define sensors list, steady states and transient recording, etc.



MONITOR

Create your visualization screens.



COMPUTE

Create the calculations for all the realtime computed parameters



POST-PROCESS

Analyze test data, create reports



AUTOMATE

Automate your test up to a full automatic system including throttle movement



CALIBRATE

Control your measurement accuracy



CONTROL

Control your engine and facility

TEST CELLS



SUPPORT, MAINTENANCE & SERVICES

Safran Test Cells offers a large range of Engine Test Cells Services, including audits, equipment upgrades and long-term maintenance programs under its SMS branch.

These services are provided by a multi-skilled dedicated workforce who combine their expertise with the know-how of Safran, a high-tech international group.



4

OFFICES FOR A GLOBAL 24/7 SERVICE

- > BELGIUM
- > FRANCE
- > USA
- > SINGAPORE

Our mission is to enhance your test facility operation by providing optimal test cell performance, availability and risk management services.

Safran Test Cells supported base

With 150 people based in three different time zones (USA, EU and Asia), the SMS division provides round-the-clock availability (24/7 hotline support), high flexibility and proximity to our various customers.



CUSTOMER SUPPORT

- Test facility life cycle support
- Driven by your needs
- Reactivity 24/7
- Calibration services
- Service bulletins



MAINTENANCE

- Corrective maintenance
- Preventive maintenance
- Maintenance improvement for sustainable operations
- Maintenance System management



OTHER SERVICES

- Operational or technical audits
- Five years maintenance plan
- Obsolescence management
- Spares management
- Capacity planning
- Upgrades
- Test Cell Investment feasibility studies
- DACS Training

TEST CELLS

TEST SIMULATOR

**THE INTERACTIVE TOOL FOR
TIME EFFICIENT TRAINING AND
CONFIGURATION TESTING**

The simulator reproduces a complete control room interface and simulates test cell and engine behaviours (normal sequences, incidents, accidents).



Maximize

**YOUR TRAINING EFFICIENCY
AND YOUR CREW CAPABILITY
FOR HANDLING INCIDENTS**

Minimize

**YOUR FUEL BURN, THE
ENGINE RISK, YOUR TURN
AROUND TIME (TRAINING
AND CONFIGURATION
CHANGE)**

**Realistic engine
simulation based
on Safran Test Cells
international library
and experience**



TRAINING WITHOUT ENGINE

The test cell simulator is an interactive tool to train your crew on the job at all times, without fuel burn or engine risk.

It is designed to provide a realistic interface and engine response to train operators on normal engine operation such as

- engine dry & wet motoring
 - engine start
 - break-in
 - trim-balance
 - performance testing
 - preservation
- And more.

IMPROVE OPERATION SAFETY

In addition to normal operations, the instructor can trigger anomalies anytime during the simulation to train the operator to handle unusual events such as

- Fire
 - High temperature
 - High vibration
 - Abnormal starting condition
 - Loss of primary engine control
-

Each event is recorded and can be replayed for debriefing purpose.

TEST CELL CONFIGURATION

The test simulator can also be used as a configuration platform to

- prepare, configure and validate engine specific software, service bulletins, automated sequences, visualization screens
- upload validated configuration to the real test cell
- replay, export or trend data without interrupting operations

