



N3 Engine Overhaul Services

Joint venture between **Lufthansa Technik** and **Rolls-Royce plc**

Thrust is our business.

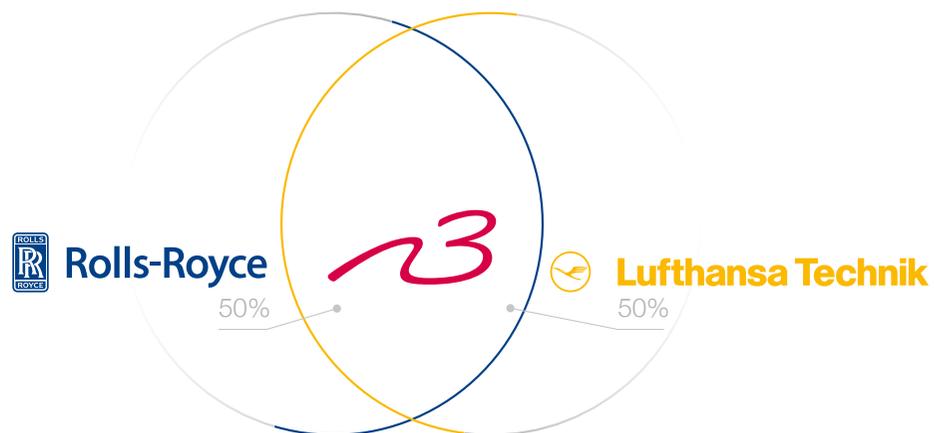
www.n3eos.com

N3 Engine Overhaul Services



N3 Engine Overhaul Services (N3) in Arnstadt, Thuringia, is the European Technology Centre for the maintenance and repair of Rolls-Royce Trent engines and components. The joint venture between Lufthansa Technik AG and Rolls-Royce plc has gained an international reputation as one of the most advanced overhaul centres for large civil aircraft engines, thanks to the high level of reliability, excellent product quality and distinctive process orientation. The growing customer base underlines the positive development of N3.

A highly qualified and motivated workforce of 670 employees, modern machinery and strong customer and process orientation enable the company to provide reliable and efficient flight operations for all its customers.





Location



The N3 Engine Overhaul Services (N3) plant is located in the Erfurter Kreuz industrial area near Arnstadt, one of the most dynamic economic areas in Thuringia. The state capital Erfurt and its international airport is also just a few kilometres away. This central location and the modern transport infrastructure provide links to Germany's most important air traffic hubs in Frankfurt am Main and Munich, as well as European airports such as Luxembourg and Amsterdam.

Engines can be transported to Arnstadt from both locations within a few hours, via the A4 and A71 motorways. Leipzig and Berlin are also within easy reach.

There is excellent potential for skilled workers within the Arnstadt region. The local universities and technical colleges enjoy an excellent reputation throughout Germany.



Our services at a glance – Engine Overhaul



N3 Engine Overhaul Services (N3) is the European Technology Centre for the maintenance and repair of the Rolls-Royce engine models Trent 500, 700, 900 and Trent XWB plus their components.

Within the Rolls-Royce Trent Overhaul network, N3 is leading the way in quality, flexibility and delivery reliability. This is reflected in over 900 overhauls that the company has already undertaken. About 150 – 200 engines per year can currently be processed in the state-of-the-art workshop. The engine testing facility has a capacity of up to 500 tests per year. In 2007 N3 started its operation as the first overhaul centre in the world to employ the efficient and material-saving vertical disassembly and assembly process known as “Vertical Strip & Build”. This prevents vibration and achieves greater fuel efficiency. The success of this method is confirmed by the impressively low rejection rate from the testing facility.

The services offered by N3 include technical support for Rolls-Royce Trent engines throughout their life cycle. The core business consists of overhaul and repair for civil large engines of the Rolls-Royce Trent family. In addition to continuous expansion of the core business, N3 has also broadened its expertise with the development of supplementary services like tear-down of engines, onsite support and campaign services.

Product Portfolio



Trent 500



Trent 700



Trent 900



Trent XWB

Assembly/Disassembly

- (Predominantly vertical) disassembly and assembly of engines and modules
- Hospital Line

Engine Testing

- 500 tests per year possible
Testing of engines with up to 150,000 pounds of thrust
- Test capacity for various Rolls-Royce projects



Our services at a glance – Component Repair

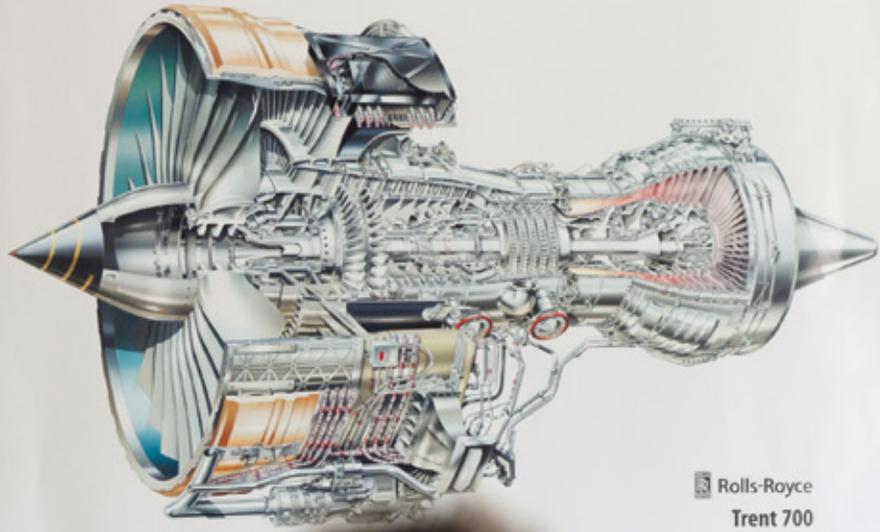


A wide range of innovative inspection and repair procedures is employed in N3 Engine Overhaul Services (N3) to provide customers with optimal maintenance results and the highest product quality. The product portfolio embraces the maintenance and repair of the Rolls-Royce engine types Trent 500, 700, 900 and XWB. Where the individual engine components are concerned, N3 also offers inspection and repair services for the series Trent 800, Trent 1000 and RB211-535 over and beyond this. In 2017 N3 enlarged its capability by implementation of shot peening repair, a specific metal working process.

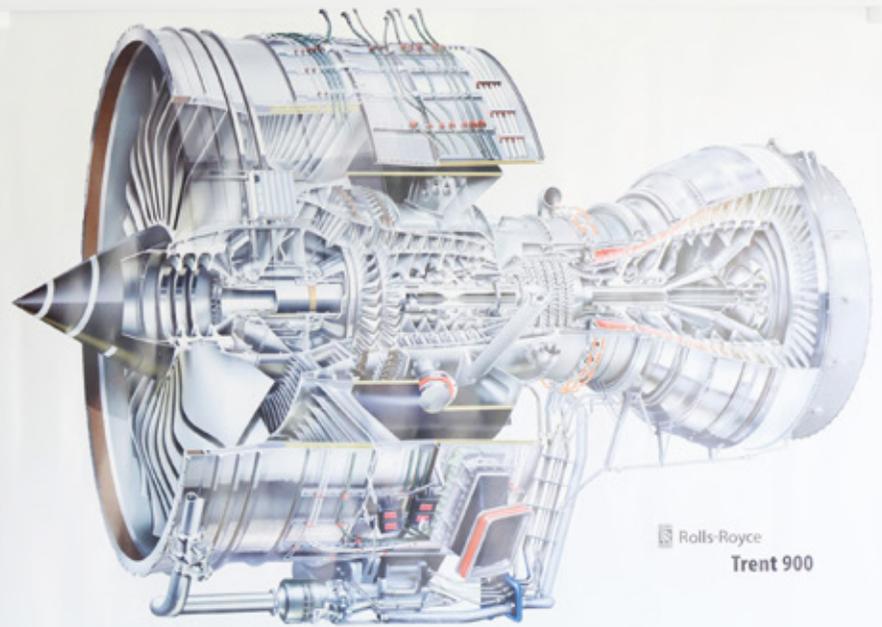
In order to give customers the option of inducting components for inspection and repair, the parts business will be further expanded in the next years. N3 focuses mainly on the commodities Discs, Blisks, Cases, Shafts and LRPs (Line Replaceable Parts).

Component Repair

- | | |
|--|--|
| · Component cleaning, Non Destructive Testing and Coordinate Measurement Equipment | · Lab Capabilities |
| · Component Painting and Thermal Coating | · Standard Repairs |
| · Machining Capabilities | · Composite Repairs / Fan Case Milling |
| · Blasting Capabilities | · Thermal Spraying |
| · Welding and Heat Treatment | · Shot Peening |
| · Off-site support (on demand) | |



Rolls-Royce
Trent 700



Rolls-Royce
Trent 900



Customer Relationship Management



More than 40 airlines from around the world now rely on the expertise of N3 Engine Overhaul Services (N3). Excellent logistical links to the most important aviation hubs in Frankfurt and Munich allow engines to be delivered quickly to N3 for processing. Regular surveys show that N3 customers are extremely satisfied with the service performed by N3.

N3 customer service includes:

- Orders handled by interculturally trained key account managers
- Access to the N3 online Customer Information Platform, with an option to download all the important engine overhaul documents, always available and up to date
- Fully equipped offices for customer representatives to arrange on-site appointments
- Regular information and best practice exchange between N3 Engineering team and Rolls-Royce experts



Quality & Responsibility



N3 Engine Overhaul Services (N3) has approval to undertake maintenance and repair work for the Rolls-Royce Trent 500, 700, 900 and XWB engine models. The company has an integrated management system and a safety management system to ensure highest product safety and quality standards.

The quality assurance mechanisms that have been introduced and the internal database for dealing with non-conformance and problems ensure perfect delivery of overhauled engines to the customer. The entire N3 team is aware of this great responsibility.

Numerous certificates from business partners and organizations reflect the high quality of work performed.

An important principle at N3 is the protection of the environment, and the obligation to promote the welfare of employees and the community. All new business processes are checked at an early stage for their environmental impact, and any necessary measures are implemented.

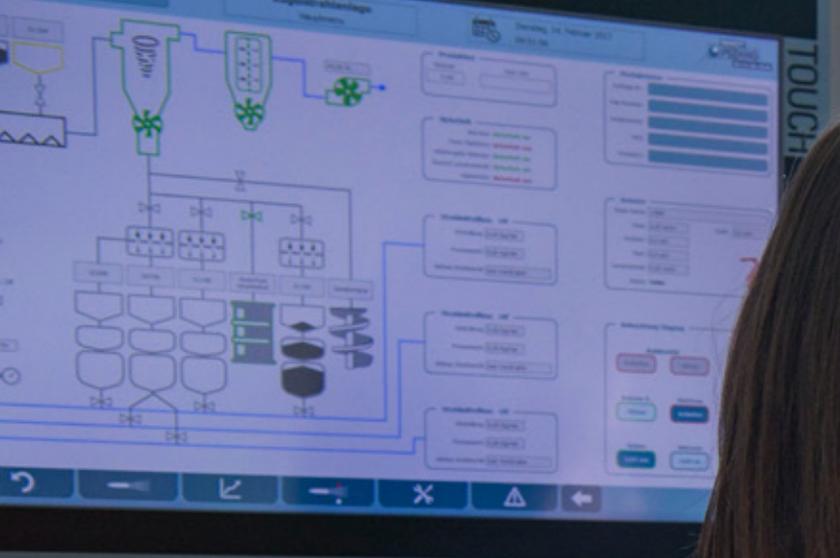
The engine testing facility is currently one of the most advanced, largest and most environmentally friendly facilities in an overhaul centre.

Nadcap

N3 Engine Overhaul Services has Nadcap certification for the following processes:

- Aerospace Quality Systems (AQS) - accredited since July 2014
- Coatings (CT) - accredited since July 2014
- Non-destructive Testing (NDT) - accredited since January 2015
- Surface Enhancement (SE) - accredited since October 2017
- Chemical Processing (CP), Heat Treatment (HT) and Welding (WLD) are planned in 2018

Evidence of Nadcap accreditation for certain special processes is a specific requirement of Rolls-Royce plc for all "Maintenance, Repair and Overhaul" (MRO) suppliers, which includes N3.



X002

Regulator-Kalibrierzettel

Regulator	Regulator-Bezeichnung	Regulator-Überspannung
1	Regulator 1	100 V
2	Regulator 2	100 V
3	Regulator 3	100 V
4	Regulator 4	100 V
5	Regulator 5	100 V
6	Regulator 6	100 V
7	Regulator 7	100 V
8	Regulator 8	100 V
9	Regulator 9	100 V
10	Regulator 10	100 V
11	Regulator 11	100 V
12	Regulator 12	100 V
13	Regulator 13	100 V
14	Regulator 14	100 V
15	Regulator 15	100 V
16	Regulator 16	100 V
17	Regulator 17	100 V
18	Regulator 18	100 V
19	Regulator 19	100 V
20	Regulator 20	100 V

Die Kalibrierung erfolgt durch den Regulator an dem Messgegenstand, welche ein verbindliches Datum und Signatur aufweist.

USB-Schnittstelle zum Flack-PC System

Engineering



Engineering competencies are essential to differentiate a company's products and services. The N3 Engine Overhaul Services (N3) engineering enables a continuous improvement and a sustainable development of the technologies to improve its products and services. A team of qualified engineers for engine overhaul, repair and tooling development and production planning constantly expand their technical expertise.

Customized solutions and tooling developed by N3 have already become best practice within the Rolls-Royce network. The service portfolio of N3 contains also individually created worksopes and concepts for the management of mature engines. The own developed IT tool enables the planning team to provide transparent shop control at any time, and any place within the company. Gated work streams according to lean principles ensure a best in class TRT performance.

The motivated engineering team is an innovation driver to improve the engine reliability and provide a zero-defect delivery to N3 customers.



Employees



The highly qualified N3 Engine Overhaul Services (N3) workforce, with their passion for quality and continuous improvement, is the driving force behind the success.

The company offers its employees tasks with variety and responsibility and modern working conditions. Occupational health and safety are given top priority.

N3 is the most attractive employer and the best training organisation in the region.

Since 2008 N3 has been training the next generation of its specialist workforce. Graduates of the vocational training are among the best in their field in Germany.

Training and lifelong learning play an important role in the company. Daily interaction among employees is characterised by openness, respect and tolerance.



Prospects



New customer requirements, complex technologies and rapidly changing market conditions within the aviation industry demand an organisation that is flexible and able to adapt quickly. With its broad technological processing capacity, N3 is ready to meet this future demand for the overhaul and repair of engines and components. N3 facilities are at the cutting edge of technology and guarantee efficient, environmentally friendly processes in cleaning, inspection and repair.

In 2016, N3 has been authorised to maintain and repair Trent XWB engines, installed in the Airbus A350. This is a sign of increased collaboration and commitment between the parent companies Lufthansa Technik and Rolls-Royce. Consequently N3 is an important partner for the ramp up of Trent XWB.

The N3 team is constantly striving to be the world's best partner for the maintenance and repair of the Rolls-Royce Trent engines and their components.

Thrust is our business.

Contact

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