

## L-1649A Super Star

Lockheed L-1649A Super Star Projekt | Lufthansa Super Star gGmbH (LSSG)

Issue 1 | 2017



### Dear Friends of the Lockheed Super Star project,

We take great pleasure in welcoming everyone to the 8th edition of the Super Star Chronicle! As all issues before, this year's X-mas edition is filled with a wealth of inside information, especially tailored for you – our highly valued sponsors.



In this issue of the Super Star Chronicle we would like to introduce Sebastian Barheier, Project Manager Components L-1649A. He is responsible for the overhaul of components being commissioned by the technical project management in Auburn to Lufthansa Technik in Hamburg. This complex process not only demands a lot of thinking 'out of the box', but equally important, highly skilled team members. Needless to say, the overhauled components must live up to the most stringent quality standards set by both Lufthansa Technik and the FAA as certifying authority. At the example of the Super Star 'flight control boosters' and 'reverse engineering' of eight jackscrews, driving the wing flap mechanism, we explain the unique challenges Barheier and his team members are facing on a daily basis.



Apart from those fascinating reports about our current restoration items, we look back at the 'golden age' of air transport, six decades ago, when Lufthansa received its first of four ordered Lockheed L-1649A Super Stars.

Those of you who wish to read and see more about the fascinating Super Star project, are cordially invited to take a look at the regularly updated LSSG website [superstar.lufthansa.com](http://superstar.lufthansa.com). This site is the prime information tool for everyone interested in the Lufthansa Lockheed Super Star project. Please take a few minutes of your precious time and join us on an intriguing time travel from the vintage Super Star service in the 'Golden' 1950's, via the current restoration project, up to a sneak preview of the future Super Star operation by LSSG.

Even though our project has advanced so well during 2017, our 'once-in-a-lifetime' undertaking would not be possible without your outstanding generosity and support. Therefore we would like to express again our heartfelt thanks and gratitude on behalf of the whole Super Star team! We truly hope that you appreciate our eighth issue of the Super Star Chronicle.

Yours truly,

August Wilhelm Henningsen  
Chairman of the LSSG advisory board

Sebastian Reichel  
LSSG Managing Director

Werner Knorr  
LSSG Managing Director

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#### View on Auburn

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#### Background reports

We would like to introduce Sebastian Barheier, Project Manager Components L-1649A. He is responsible for the overhaul of components being commissioned by the technical project management in Auburn to Lufthansa Technik in Hamburg.

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#### Safety first

Three Super Star cabin doors will be equipped with modern slides, complemented by two dinghies to be used in case of a ditching. We look at their development and a first 'live' test in Auburn.

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#### Reverse engineering

Due to the lack of in-depth documentation, Sebastian Barheier and his team 'reverse engineered' replacement jackscrews being at least as good as the original parts when leaving the factory in the 1950's.

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#### Flashback

60 years ago, the first of four ordered Lockheed L-1649A's was delivered to Lufthansa. We look back at the start of Super Star operations six decades ago.

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## Highlights of the year 2017

**✚ The year 2017 was filled with an array of special highlights. Since the completion of the primary structure overhaul of the fuselage, wings and empennage, the Super Star technical teams in Auburn and Hamburg switched their main focus to the overhaul and installation of secondary structural parts.**

In the meantime all four overhauled engine nacelles have been re-attached to the Super Star wings. While only the inner nacelles serve as main landing gear wells, both the outer and inner nacelles are packed full of aircraft system components. The cabin supercharger compressors are connected to the outer engines, which are needed to keep up the cabin pressure while flying at high altitudes. The wings have begun to regain their original shape as the leading and trailing edges plus wing tips are in the process of being reinstalled. Additionally the aerodynamic, wing to body fairings were attached. The overhauled main landing gears will be installed in the wheel wells after the inner nacelles have been fitted with cables and hoses, connecting the engines in front of the nacelles. Only then will the Super Star again stand on her own three gears. The Super Star team expects this very special milestone of the L-1649A project to happen in 2018. In parallel to this the wooden racks, which have, for many years, held the aircraft in a stress free position to enable overhaul work, will be dismantled. Amongst other things, this stress free mounting is a prerequisite for the current installation of flap rails in the exact angle. Back in 2016 the horizontal and vertical rudder overhaul was completed. When covered with a special fabric by a specialist company, the rudders will return successively to their original position at the aircraft empennage. In a short while the characteristic look of the Super Star with its three fins will be reinstated. The Super Star technical team is not only working at high pressure on the prerequisites for the installation of the new glass cockpit but in parallel they devote a lot of time and effort on the test and overhaul of complex flight control components.

Furthermore the first overhauled components are being installed in the forward underfloor hydraulic bay of the Super Star fuselage. One floor up, the team outfits the future passenger cabin with floor panels and seat tracks. They are a prerequisite for the installation of the already completed passenger seats. The year 2017 was filled with lots of intensive hard work, bringing the project a big step closer to completion.

The mounting of the four nacelles is furthermore a pre-requisite for the installation of the four Curtiss-Wright engines, which, like the landing gears, have already been overhauled to pristine condition by specialists for big piston engines.

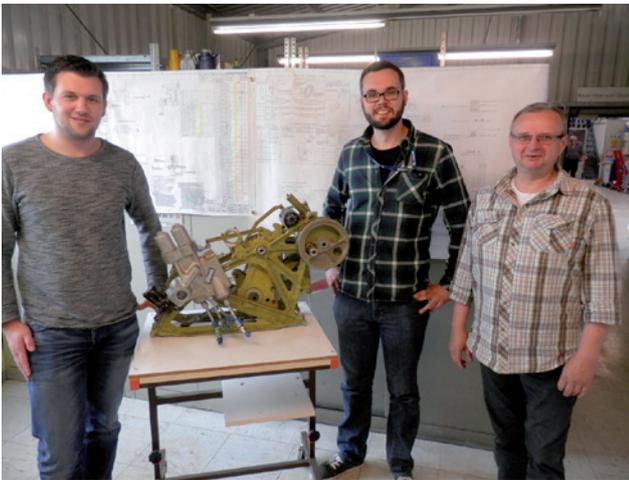
In a short while the restoration of the Super Star empennage will be completed. The main structure returned to the Super Star tail last summer, is to be followed by the overhauled rudders once they have received their new fabric covering. As soon as the rudders are mounted, the Lockheed L-1649A will regain its iconic look with the characteristic triple tail.



## Breaking new grounds

✚ **Sebastian Barheier, Project Manager Components L-1649A, is responsible for the overhaul of components being commissioned by the technical project management in Auburn to Lufthansa Technik in Hamburg. This complex process demands a lot of thinking 'out of the box' and highly skilled team members.**

When talking about his department, component manager Sebastian Barheier jokingly refers to his team of experts as “the five question marks”, because at the start of each overhaul process, the challenging tasks cause big question marks to show up on their faces. These question marks soon develop into a professionally overhauled and certified component part, which has become daily routine for Barheier and his colleagues. Needless to say, the overhauled component must live up to the most stringent quality standards set by both Lufthansa Technik and the FAA as certifying authority.



***From left to right: Lufthansa Technik component experts Sebastian Barheier and Jan Klee meet RTG overhaul manager Klaus Totzke, to discuss the planned flight control booster test campaign. (Wolfgang Borgmann)***

Sebastian Barheier explains: “Many parts commissioned to my department lack a clear instruction by Lockheed on how to test and overhaul the component.” When the L-1649A Super Star entered service with Lufthansa in 1957, new components were readily available in the airline maintenance department to replace damaged parts. Not so in the year 2017, when available replacements are the exception, not the rule. “Detailed repair instructions weren’t required in the old days, as worn out parts went straight into the trash. Currently we are in a very different position and more than happy if we own a certain component, no matter in which condition, as it may be the only one in existence!” explains Barheier.



***Sebastian Barheier, Lufthansa Technik Project Manager Components Lockheed L-1649A, takes a close look at the test installation, developed in cooperation between Lufthansa Technik and RTG. (Wolfgang Borgmann)***

It needs a lot of expertise and sensitivity to determine the right approach to a new challenge. Thinking ‘out of the box’ is required by the Lufthansa Technik team, which has currently more than 200 components under maintenance.

Being unable to take parts from the shelf, and with little or no documentation from the original manufacturer at their disposal, the component team has to rely on its own knowledge when seeking solutions for overhaul processes, or the design of newly fabricated replacements. As with the design of testing and overhaul concepts for three, so called ‘flight control boosters’. Located in the center and rear fuselage sections, these three boosters enhance the rudder inputs, originating from either the pilots, or the autopilot on the flightdeck. The booster induced flight control signals operate the ailerons, elevators and rudders via a complex, electro-hydraulically steered mechanism.

The three boosters are currently being tested at a specialized maintenance shop, located in Northern Germany. In close cooperation with the Lufthansa Technik team, the RTG company developed a test bench and testing procedures, fulfilling all stringent requirements determined by the certifying authorities.

Again, this demanded a high degree of creativity from everyone involved, as detailed testing instructions by Lockheed were not available. Sebastian Barheier: “I even had to embark on a journey through time, imagining how the Lockheed engineers designed this component some 60 years ago. Based on these findings, my team and I could start developing modern testing procedures for these components.”

This is just one of many examples, highlighting the complexity of the Lockheed Super Star overhaul.



## Safety First

✈ When the Lockheed L-1649A owned by Lufthansa Super Star gGmbH (LSSG) was certified in 1957, Lufthansa ordered the most sophisticated equipment available for commercial airliners at the time. This included components and systems designed for the evacuation of passengers and crewmembers alike. In retrospect these were quite simple aids, as airlines expected from their passengers to abseil along ropes hanging out of the emergency exits, or to jump out of danger on cloth slides, which, at best, were held at tension by two crew members on the ground.

Although not demanded by the authorities, as the Super Star will be certified according to the original data sheet of 1957, LSSG, Lufthansa Technik and the Luftfahrt Bundesamt (LBA) as certifying authority, have agreed to apply in all areas of cabin refurbishment only the highest possible safety level. This includes the systems available for passenger and crew evacuation in case of emergency.

Based on this principle, the Super Star cabin design team began in 2015 to develop a state-of-the-art safety concept. Numerous ideas were developed, checked and discarded, until the design engineers determined a system to be handled in a simple and safe mode. Three cabin doors will be equipped with modern slides, complemented by two dinghies to be used in case of a ditching.

As the evacuation of up to 40 passengers must be possible even under the worst circumstances, the Lufthansa Technik design team chose the same type of emergency slides as built in the Boeing 757-200 jetliner. Due to a comparable geometry between both aircraft types, all three slides will enable a speedy and safe evacuation, even if the nose gear or one of the main landing gears should have collapsed.



Although none of the cabin doors are of the same size, and every door opens in a different way, the system developed by Lufthansa Technik can be used universally at each of the three doors. The slide mechanism is stowed in a small wardrobe, measuring 100 x 40 centimeters, mounted on the floor aside of each exit. The slides are securely tied to integrated pullout shelves, resembling a medicine cabinet. In case of emergency they are pulled in front of the door, unfold due to their own weight and inflate autonomously. The whole sequence can be initiated by one crewmember only. The Super Star team proved in life tests that no more than 22 seconds pass between the evacuation signal of the captain, until the first passenger leaves the aircraft safely via the deployed slide. The evacuation of all 40 passengers via just one available door would have taken 68 seconds – 22 seconds less than demanded by the regulations for modern passenger aircraft.

The Super Star slide design is another example for the unique know-how demonstrated on a daily basis by the LSSG and Lufthansa Technik teams.

## Reverse Engineering

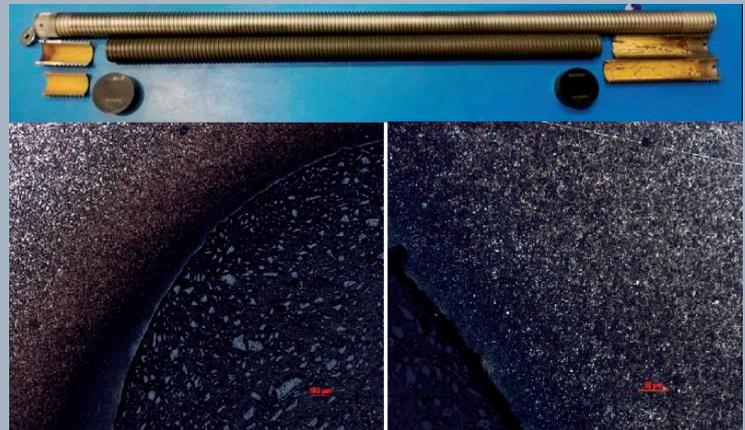
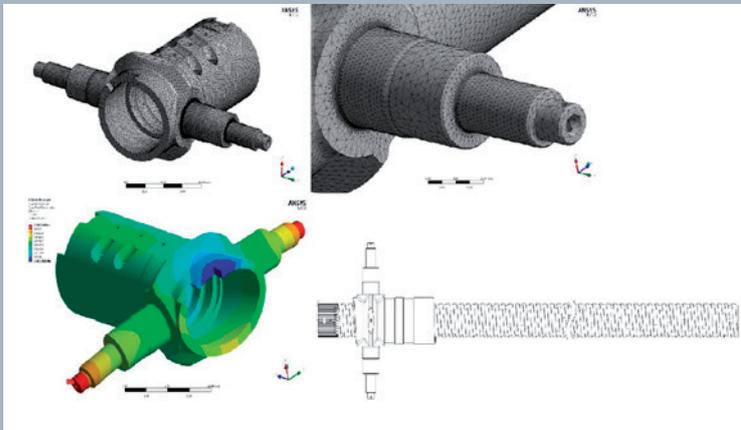
⊕ **Only the best in the business have been chosen to work on the Super Star. But sometimes, even the greatest personal experience and most sophisticated technical devices, needed to ensure a safe component overhaul, are unable to deliver immediate answers.**

**Leaving nothing to chance, in these rare cases the Super Star component team trusts in 'reverse engineering'.**

"Might be" or "could be" are no-go phrases for Sebastian Barheier's Super Star component overhaul team. They

limit, only a new fabrication of these flight safety relevant parts was deemed possible. The Super Star component overhaul team chose UmbraGroup, a long-term Italian cooperation partner of Lufthansa Technik, specialized on the repair and production of jackscrews for modern airliners, for this task.

Barheier explains: "it was essential for us to understand the production method applied by Lockheed in the 50's, which isn't described in the original technical documentation. The only way to gather this crucial information was a metallurgical examination by electron microscope of the parts in question."



demand solid calculations and technical facts to determine whether a certain component lives up to the standard it was once designed for. When receiving a damaged part, sent from the Super Star team in Auburn to the Lufthansa Technik component experts in Hamburg, Barheier and his colleagues are principally facing two options. If the in depth technical analysis leads to the conclusion that the damage is within given tolerances, defined by Lockheed 60 years ago, a repair is the obvious first choice. But if the tolerance limits are exceeded, the damaged component has to be rebuilt from scratch.

In both cases, Tom Blakely, head of the Super Star project engineering in Auburn, is responsible for issuing the FAA conform detailed technical instructions. Sebastian Barheier and Tom Blakely are in permanent contact to define the best possible way forward in terms of safety, time, and, last but not least, cost.

Both managers are determined to seek a solution for even the biggest challenges. Like the rebuild of eight jackscrews, driving the wing flap mechanism. As all of them were out of

Only this insight view, down to the molecular level, delivered the desperately needed answers in terms of safety margins, expected lifetime, applicable flight cycles, weight and rigidity.

Based on these scientific examinations, Lufthansa Technik, in cooperation with UmbraGroup, 'reverse engineered' replacement jackscrews being at least as good as the original parts when leaving the factory in the 1950's. Though only eight new jackscrews are needed for installation on the aircraft, two further samples have been ordered for qualification tests. Again, nothing is left to chance, as the meticulously calculated and fabricated parts have to prove the correctness of the theoretical calculations in exactly defined qualification tests. The gathered calculations and test results are finally presented to the FAA as certification agency. Only when the FAA as final instance has given its go-ahead, the reverse engineered jackscrews will be installed on the Super Star.



## 60th Super Star Jubilee

Sixty years ago the first Lockheed Super Star was delivered to Lufthansa

⊕ **When Lufthansa purchased their new flagships of the fleet in March 1956, Lockheed promised to deliver the first of four ordered L-1649A's not later than 31st October 1957. In contrast to most other aircraft types, Lockheed did not only meet that date, but delivered the first plane five days before the deadline, predicted one and a half years earlier!**

The first Lufthansa Super Star to be delivered was the aircraft registered D-ALUB, followed by D-ALAN in December of that year. Next in line was D-ALER on January 9, 1958, with D-ALOL completing the quartet eight days later. Just one month afterwards, Lockheed closed the L-1649A production line with the delivery of the 44th aircraft built, which was handed over to Air France.

Lufthansa waited six months, since the delivery of the first ship, before the Super Stars entered scheduled service. The time was used for the remedy of various technical issues, post delivery modification of the cabins, pilot and ground crew training as well as public relation flights with invited members of the press and frequent customers.

On February 13, 1958, Lufthansa invited dignitaries to participate at the first non-stop North Atlantic service, exclusively offered on board a Super Star. Lufthansa chief pilot Rudolf Mayr piloted the L-1649A from Hamburg to Frankfurt, to be followed by the 6.189 kilometers long non-stop hop across the ocean to New York. This service was initially offered once a week in both directions, followed by daily services with the start of the 1958 summer timetable. In the first months of operation, the

Super Stars were equipped with 15 seats in Tourist Class, 59 seats in Economy Class, four First Class seats and another four seats in a "De Luxe" Class.

### First Class luxury never before seen

On September 4th 1958, Lufthansa announced the birth of their 'Senator' First Class service between Germany and New York. Exclusively offered on board the four Lockheed L-1649A Super Star flagships, it was in the Golden Age of Aviation, probably the most luxurious way to cross the North Atlantic on board an aeroplane. The first passengers on board the premiere flight were treated to a level of comfort and service never before seen and which contributed to the highly regarded reputation and legendary status of the Super Star. In addition to 'Comforette' First Class seats, an on-board lounge awaited passengers during the flight for 'a twaddle, fancy games or a serious business talk' according to a period Lufthansa brochure. Of course this was the 1950s, an era before our modern inflight entertainment gadgets like earphones and personal video screens. In the bygone 'golden' propeller era, talking with the crew and fellow travelers, watching the passing clouds out of the windows and fine dining were the only 'in flight entertainments.'

Comfort was the byword. Apart from fully reclining seats there were also sleeping berths that folded down from the cabin ceiling during night flights. The Lufthansa Super Star carried a maximum of 32 premium passengers all of whom were pampered in its exclusive all First Class cabin.

## A big 'Thank You' to our sponsors!

✚ The Lockheed L-1649A project is a modern-day tribute to American and German ingenuity and engineering. But this 'once-in-a-lifetime' undertaking would not be possible without the outstanding generosity and support of our highly valued sponsors who are subsequently mentioned below. We herewith like to express our heartfelt thanks and gratitude to each and everyone on behalf of the whole 'Super Star' team!

Your support honors our common aviation heritage and paves the way for aviation history in the making!



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