

# 24<sup>th</sup> SFTE EC Symposium

Society of Flight Test Engineers 11-13 June 2013 Braunschweig, Germany German Aerospace Center





## About DLR

DLR, the German Aerospace Center, is Germany's national research centre for aeronautics and space. Its research and development work in aeronautics, space, energy, transport, defence and security is integrated into national and international cooperative ventures. As Germany's Space Agency, DLR is tasked with the planning and implementation of Germany's space programme. In addition, two project management agencies have been established to promote DLR's research.



DLR is the largest civilian operator of research aircraft in Europe. Its versatile fleet comprises 13 wholly-owned aircraft. DLR conducts research into Earth and the Solar System, it delivers important data for the preservation of our environment and develops environment-friendly technologies to enhance power supply, mobility, communication and security. DLR's research portfolio ranges from basic research to the development of products for tomorrow.

DLR operates large research facilities for its own projects and also acts as a service provider for customers and partners from business and industry. It also promotes and encourages new scientific talent, provides advice to politicians and is a driving force in the regions that are home to its 16 sites.

DLR employs 7400 people; the Center has 32 institutes and facilities at 16 locations in Germany: Cologne (headquarters), Augsburg, Berlin, Bonn, Braunschweig, Bremen, Göttingen, Hamburg, Jülich, Lampoldshausen, Neustrelitz, Oberpfaffenhofen, Stade, Stuttgart, Trauen and Weilheim. DLR also has offices in Brussels, Paris, Singapore and Washington DC.



# **DLR Braunschweig**

The main activities of the German Aerospace Center (DLR) joint sites of Braunschweig and Göttingen are aviation and transportation research. Located at the Research Airport in Braunschweig, DLR continues the tradition of the Deutsche Forschungsanstalt für Luft- und Raumfahrt (DFL), founded in 1936, and employs there about 1000 highly-qualified scientists and engineers.



Unique high-performance facilities, research flight and automotive vehicles, flight simulators, air traffic simulation facilities, wind tunnels in the European DNW foundation (German-Dutch Wind Tunnels), mobile rotor test stands and test stands for material and noise tests are available for experimental research.

Test equipment for sophisticated experimental technology is designed and manufactured in the modern workshops of SHT – Systemhaus Technik. An in-house office of airworthiness surveys the safe operation of complex experimental installations in fixed wing aircraft and helicopters of the Flight Experiments facility. The certified Rail SiTe<sup>®</sup> provides DLR with the competence to support industry in the certification of their rail system components. Furthermore DLR consults users in the application of composite fiber technologies and new materials in industry.







## 24th SFTE EC Symposium

## **Defeating Murphy's Law in Flight Test**



Volcano Ash Hunter: Measurement flight mission flying over Eyjafjallajökull with DLR's Falcon 20E-5 In flight test sometimes the most unlikely things happen. Who would have known that a simple series of pitot static tests would have to be stalled twice in two consecutive years because of volcano eruptions and that the pitot statics aircraft – DLR's Falcon 20E-5 - would be known today as Volcano Ash Hunter. But it does not require a volcano - sometimes it's just the regular stuff like the weather, technical problems, the technician who goes skiing and breaks his leg the day before the campaign or request for visit forms which magically vanish. It can be the high risk testing which works out just fine and at the very moment when everyone thinks you're done something completely unrelated to the test goes wrong.

For flight testers, "lesson's learned" are the most important outcome of flight test next to its primary test objective. It

helps us to make the next test even safer than the one before or to make it happen at all in spite of Murphy's law. We'd like to hear your flight test stories, what you learned and how you safely prepare for the unknown and unexpected that always awaits us.

The symposium will take place at DLR Braunschweig premises in the Hermann-Blenk-Saal.

### Organisation

The SFTE EC 2013 Symposium is organized by the following people from the Institute of Flight Systems and DLR Flight Experiments: Peter Baumann, Tanja Bracke, Oliver Brieger, Christoph Deiler, Petra Fleischhauer, Joachim Götz, Stephan Graeber, Maximilian Graser, Bianca Gursky, Thomas Heinecke, Ina Niewind, Tobias Wilmes.

### **Programme Overview**

Tuesday, 11 June 2013	09.00 - 17.00	Technical Sessions
	17.00 - 21.00	Reception at "phæno"
Wednesday, 12 June 2013	09.00 - 17.00	Technical Sessions
	19.00 - 22.00	Symposium dinner at "Al Duomo"
Thursday, 13 June 2013	09.00 - 12.30	Technical Sessions
	14.00 - 18.00	Technical Tour

## **Dinner Speaker**

### **Hannes Ross**

Born in 1938, Hannes Ross received a degree as Diplom Ingenieur from the Technical University in Berlin, where he also became a member of the Akaflieg Berlin. After 2 years of work for VFW in Bremen on VSTOL projects he immigrated to the USA and was employed by McDonnell Douglas in St. Louis working 3 years on the F-15 programme during the conceptual- and definition Phase.

He came back to Germany in late 1970 and started to work at MBB Ottobrunn in the advanced design department. Working on various international programmes he participated since 1975 in the conceptual design and technology studies for the TKF/Jäger-90.



He was leading the first manned post stall combat simulations at the IABG in 1977 and became head of predesign and concept development for the Eurofighter in 1978.

From 1985 until 1995 he was Programme Manager of the X-31 for MBB/Dasa. 1991 he succeeded Dr. Wolfgang Herbst as VP Advanced Design and Technology at Dasa. After retirement in 2001 he started to lecture at the Technical University in Munich.

2004 he joined the Swiss based "Solarimpulse Team", founded by Bertrand Piccard and André Borschberg, which developed the manned solar powered aircraft HB-SIA, currently flying across the USA from Moffett Field to New York.

He is a member of the DGLR, AIAA and RAeS and has received a number of awards (AIAA Design Award 1995, DGLR Team Award 1996 and 2011, ICAS von Karman Award 2003) and has published numerous papers in the field of Advanced Design.

### **Dinner Speech: Fun of Flying**

The dinner speech will address the "Fun of Flying" Including explanations / interpretations of aeronautical terms.

Wait and see and enjoy!

## Keynote Speaker

## **Prof. Peter Hamel**



Peter Hamel received a Dipl.-Ing. and a Dr.-Ing. degree from the Technical University Braunschweig, and a SM degree from the Massachusetts Institute of Technology (M.I.T.), all in Aerospace Engineering. During his stay at the Technical University Braunschweig he became a Founding Member of three Centers of Excellence (Sonderforschungsbereiche), namely Flight Guidance 1970-1980, Safety in Air Traffic 1985-1994 and Flight Measurement Techniques 1995-1999.

Peter Hamel was a long time member and German National Coordinator of the NATO-AGARD Flight Mechanics/Flight Vehicle System Integration Panel (FMP/FVI, 1972-1997). He chaired the Working Group on Rotorcraft System Identification (1988-1990) and directed the Lecture Series LS 104 on Parameter Identification (1979) and LS 178 Rotorcraft System Identification (1991).

He was an invited member of the M.I.T.-Department of Aeronautics and Astronautics: Corporation Visiting Committee (1994-2000) and of the ESA Hermes Aerodynamic Shape Technology Panel, and chairing the ESA-Panel 4 on Aerodynamics, Aerothermics & Flight Control during the PDR of the Hermes Space Vehicle (1988-1991).

He is an AIAA-fellow and past recipient of recognitions such as AHS Gruppo-Agusta-Award (1995), the NATO-AGARD/RTO Scientific Achievement Award 1995 and the von-Kármán-Medal 1998, AHS Alexander-Klemin-Award 2001 and the DGLR Ludwig-Prandtl-Ring 2007.

### Lecture: Flight Testing for Stability & Control – Some DLR History

The presentation will address the beginnings in the year 1953 at the Braunschweig Airfield after the research facilities of the former DFL/LFA at Braunschweig-Völkenrode were cannibalized and had to be closed in 1945. Some early flight data analysis tools using paper & pencil techniques such as Root-Locus Method and Time Vector Analysis were introduced and Stability Analysis & Testing of Parachute-Payload Systems started due to special government requirements. The importance of system identification tools will be discussed, and some flight test results performed with DLR's variable stability aircraft and in-flight simulators HFB 320 FLISI, BO 105 ATTHES, VFW 614 ATTAS and EC 135 FHS will be emphasized.

Transatlantic co-operations will be high-lighted. They include Steep Landing Approaches for Noise Abatement (USAF/DLR), GRATE/ATLAS – Flight Testing for unmasking HQ Deficiencies (NASA/DLR/WTD 61), ADS-33 complementary HQ testing (USArmy/DLR/NASA), X31A VECTOR (USNavy/NASA/EADS/DLR/WTD-61), and Active Stick complementary HQ testing (USArmy/NASA/DLR).

## Keynote Speaker

### **Horst Philipp**

Born in 1937, Horst Philipp started the flying carrier as a glider pilot in1955, entered the new Luftwaffe in 1956, joined the German Forces Flight Test Center in 1962, went through the French Test Pilot School in 1967 and did military and civil experimental test work ever since.

Some professional highlights were the F-104 ZELL zero length rocket launch, VTOL-test bed trials and prototype flying of the VAK 191 VTOL fighter, the Alpha Jet



development, Saab J37 Viggen test bed trails, flying US fighters from F-15 to F-20, the French Mirage 2000 and finally the Luftwaffe MIG 29. He logged several first flights, collected about 9000 hrs mainly in Flight Test Service and was recently involved in the reverse prototyping of restored WWII fighters Focke Wulf Fw190 and the Messerschmitt Me 262, logged as Type Nr. 93 and Nr. 94.

He survived two prototype accidents (turboprop amphibian, SEP- spin testing). His SETP membership award carries the Date 19th of December 1974. Horst Philipp earned the Ray Tenhoff Award for "presentation of the most outstanding paper" in 2000.

### Lecture: Flight Testing the Historical Flying Machine G.W.21 Replica B

The story began back in 1934 when newspaper reports concerning early activities of powered aviation in the USA turned up again. A sport reporter described in great detail how he witnessed a powered flight in August 1901. He stated that he saw a machine with the inventor Gustave Whitehead on board, covering a distance of half a mile in powered flight.

No photographic proof accompanied the report, but he added his own drawing showing a Flying Machine with a high wing monoplane configuration. The newspaper reports led to the original glass-plate photographs, showing the inventor in front of an obviously fully developed Flying Machine, identified as Whitehead "No.21." Furthermore, several eyewitnesses stated that they had observed how Whitehead repeatedly conducted powered flights over a distance of half a mile at an altitude of four to six feet.

Eventually two full scale replicas where built. The first one in the 1980's in Bridgeport, Connecticut, where Whitehead had lived and a second one in the 1990's in the village of Leutershausen, Germany, were Whitehead was born. The latter one was subject to an extensive flight test programme conducted at the German Forces Test Centre at Manching.

# Symposium Programme Day 1

Tuesday, 11 June 2013

09:00 - 10:00	Registration and Welcome Coffee
10:00 - 10:10	Welcome and Opening Statements C. Buck, SFTE EC President
10:10 - 10:30	<b>Opening Session</b> S. Levedag, Head of DLR Institute of Flight Systems O. Brieger, Techn. Director of DLR Flight Experiments
10:30 - 11:15	<b>Keynote 1</b> Flight Testing for Stability & Control – Some DLR History P. Hamel
11:15 - 12:00	<b>Keynote 2</b> Flight Testing the Historical Flying Machine G.W. 21 Replica B H. Phillip
12:00 - 13:30	Lunch Break
Session 1 There are never Chair: Klaus-Uv	r clouds in the sky unless the setup is complete. ve Hahn (DLR Institute of Flight Systems)
13:30 - 14:00	Hurry, Worry or What-Not: Minimising the Risks J. Fawcett (Airbus)
14:00 - 14:30	We Always Did It This Way J. Schwochow (DLR)

- 14:30 15:00Building Your Defenses Against Murphy's Law<br/>G. Whites, D. McDonald (Boeing)
- 15:00 15:30 Coffee Break
- 15:30 16:00How Murphy Stroke a Testpilot in Private and on Duty: A Case Study<br/>M. Rüdinger (German Airforce / WTD 61)
- 16:00 16:30 Murphy's Law Hits You, When You Expect It the Least: Stall Testing on a Transport Category Airplane M. Hierle, S. Gemsa (DLR)
- **16:30 17:00** Flight Testing of the Grob 120 TP T. Brenner, M. Cremer (Grob, Messwerk)
- 17:00 21:00 Bus transfer and Reception at "phæno" in Wolfsburg

# Symposium Programme Day 2 (Morning Sessions)

Wednesday, 12 June 2013

Session 2 The problem with taking the easy way out is that the enemy has already n Chair: Oliver Brieger (DLR Flight Experiments)	nined it.
Flight Testing the Airbus Military A330 Multi Role Tanker Transport (MRTT) Hose and Drogue AAR Systems: Challenges, Successes and Lessons Learned S. Fernandez (Airbus Military)	09:00 - 09:30
What Kind of Murphy's Can You Expect During a Flight Test Campaign? Barracuda UAV Flight Test Campaign 2012 Marc Frattini (Cassidian)	09:30 - 10:00
The Missing Link - How to Optimize Pressure Calibration Using the Tower Flyby Method C. Mallaun, A. Giez (DLR)	10:00 - 10:30
Coffee Break	10:30 - 11:00
Evaluation of an Electro-Magnetic Seeker Head Using a Hybrid Simulation and an Instrumented Test Bed Helicopter F. Meignien, S. Tessereau (DGA)	11:00 - 11:30
One of Airbus Military Ways of Defeating Murphy's Law in Military Systems Flight Testing J. Rodenas (Airbus Military)	11:30 - 12:00
Flight Test Preparations of the Ground Collision Avoidance System (GCAS) on the Saab Gripen Fighter B. Rubensson (Saab)	12:00 - 12:30

### Lunch Break

12:30 - 14:00



Air to Air Refuelling Tornado vs. MRTT

# Symposium Programme Day 2 (Afternoon Sessions)

Wednesday, 12 June 2013

### Session 3

Logic is a systematic method of coming to the wrong conclusion with confidence. Chair: Rudolf Bischoff (Cassidian Flight Test)

14:00 - 14:30	Do you like Toulouse or: How to Make Optical Wing Deformation Measurements Happen on Large Transport Aircraft R. Meyer, T. Kirmse, F. Boden (DLR)
14:30 - 15:00	The Empire Test Pilot School: 70 Years of Flight Test. How Founding Principles Continue to Influence Our Future M. MacLeod, P. Edwards, D. Moore (ETPS)
15:00 - 15:30	Coffee Break
15:30 - 16:00	Murphy's Law Squared - Flight Testing of Automated Closely Spaced Parallel Approaches R. Geister, H. Becker (DLR)
16:00 - 16:30	"El Arenosillo" Test Range: Learnt Lessons from Flight Test for Armament Integration Targets to UAVs Tests A. Fortún (INTA)

- 16:30 17:00 SFTE EC Annual Business Meeting
- 19:00 Symposium Dinner at the "Al Duomo" Dinner Speaker: Hannes Ross



DLR Atmospheric Research Aircraft HALO

# Symposium Programme Day 3

Thursday, 13 June 2013

Session 4 Nature always sides with the hidden flaw. Chair: Paul Koks (NLR)	
Engine Ingestion as a Result of Cross Wind During Take-Offs from Water Contaminated Runways J. Gooden (NLR)	09:00 - 09:30
Flight Testing in a University Environment – Challenges & Lessons Learned M. Bromfield (Coventry University)	09:30 - 10:00
UAS Flight Operations in Research: Beating Murphy, Satisfying Scientists M. Schwarzbach (DLR)	10:00 - 10:30
Coffee Break	10:30 - 11:00
Using Photogrammetry to Validate the Localization of Fixed-Wing Mini UAVs G. Wedzinga (NLR)	11:00 - 11:30
Data Gathering for Gyroplane Flight Dynamics and Simulation Research H. Duda, J. Seewald, M. Cremer (DLR, Messwerk)	11:30 - 12:00
Awards and Closing Speeches	12:00 - 12:30
Lunch Break	12:30 - 14:00
Technical Tour DLR Braunschweig	14:00 - 18:00





DLR Simulator AVES

## Phæno



Discovering the world in phæno: touching, trying things out, finding astonishment, playing, exploring, discovering, and above all: unravelling the frequently mysterious natural-scientific phenomena of everyday life on one's own initiative. Over 350 phenomena can be marvelled at in phæno.



Two Visitor Labs, the Science Theatre and the Ideas Forum give visitors even more opportunities to see, hear, touch, smell and feel. A varied programme of events consisting of workshops and discovery tours conveys content that furthers networked thinking and action.

The phæno building in the centre of Wolfsburg looks like a spacecraft that has just landed. Resting on its ten cone-shaped "feet", the concrete structure spanning 154 metres seems to almost hover in the air.



Designed by the Iraq-born architect Zaha Hadid, the imposing structure sits enthroned high above street-level. The exhibition space, resting on conic supports and sublimely illuminated, emerged as the victorious project from an international competition staged in 2000. The London-based architect has devised a home for phæno that breaks with many conventions and that liberates the area beneath it as a kind of urban space in the form of a covered artificial landscape with gently undulating hills and valleys. Since November 2005 now, the futuristic apparition has been raising eyebrows in amazement and making eyes gleam with awe among passers-by.



The inside of phæno seems to be from another world as well: a free-flowing space framed by cast concrete. Without any right angles. Entwined over several levels. An ideal location for adventurers and discoverers. And a fantastic achievement from the London-based architect Zaha Hadid.

Phæno homepage: www.phaeno.de

# Symposium Dinner

The Symposium Dinner will take place in the Restaurant Al Duomo at the Castle Square in the city center. If the weather allows, the reception will be outside in the breathtaking atmosphere of Castle Dankwarderode and the Braunschweig Lion Statue.

The Castle Square (Burgplatz) is comprised of a group of buildings of great historical and cultural importance. The seat of the dukedom of Braunschweig has been located here since the 9th century. Duke Henry the Lion developed the Burgplatz area into a centre of power during the 12th century. The Burgplatz, which includes the castle, the cathedral, the Classicistic Vieweg House and other beautiful half-timbered structures still shows evidence of its medieval ground plan. The statue of the Lion of the Castle (Burglöwe) is located at the centre of the square.

The dinner will take place in the Spiegelsaal (hall of mirrors) of the restaurant.

#### Directions

The restaurant is located in the city center of Braunschweig at the castle square ('Burgplatz') in the same building as the hotel Deutsches Haus.

The next stop for buses and trams is 'Rathaus'. Many bus lines and tram 1, 2, 3 and 4 stop here. Please take bus 413 for a direct connection between 'DLR' and 'Rathaus'.

For those arriving by car there are parking lots in front of the restaurant. More parking spaces are available in the garages 'Packhof' and 'Wilhelmstraße'.

### Adress:

Al Duomo Ruhfäutchenplatz 1 38100 Braunschweig Tel.: +49 (0) 531 / 12 00-490 www.alduomo.de







# **Travel Information**





DLR Braunschweig Lilienthalplatz 7 38108 Braunschweig Tel.: +49 (0)531-295-0

The symposium will take place in Hermann-Blenk-Saal at the DLR site.

The DLR Braunschweig facility is located northeast of Braunschweig city center between airport and the A2 autobahn.

### Address

DLR Braunschweig Lilienthalplatz 7 38108 Braunschweig

### Arrival by train and bus

Please take the bus route 436 from the central railway station or bus route 413 from the city center in the direction 'Flughafen' until bus stop 'DLR'.

### Arrival by car

From the A2 autobahn, take the exit 'Braunschweig-Flughafen' and follow the signs to DLR.

### Arrival by air

Braunschweig airport is nearby but the nearest major airport is Hanover. From Hanover airport it takes approximately 45 minutes by car to get to DLR Braunschweig or about two hours by public transport.

### Useful web addresses

www.sfte-ec.org www.dlr.de www.braunschweig.de official website of SFTE EC official DLR website official website of Braunschweig

### If you have any questions, please contact

Ina Niewind Ina.Niewind@dlr.de +49 (0)8459-80-2595

If you have any problems on-site, you can reach the local secretary of the Institute of Flight Systems at +49-(0)531-295-2651.

# **Public Transportation**

You can conveniently reach the DLR Braunschweig facilities by bus from the city center and the main train station.

### Bus 436: Hauptbahnhof (Main Train Station) to DLR

Hauptbahnhof	5.26	5.56	6.26	every	18.26	19.26
				30		
DLR	5.54	6.24	6.54	min	18.54	19.54
Flughafen	5.55	6.25	6.55		18.55	19.55

### Flughafen -> DLR -> Hauptbahnhof

Hauptbahnhof -> DLR -> Flughafen

Flughafen	6.59	7.29	7.59	every	19.59	20.59
DLR	6.59	7.29	7.59	30	19.59	20.59
				min		
Hauptbahnhof	7.28	7.58	8.28		20.28	21.28

### Bus 413: Rathaus (City Center) to DLR

### Leiferde/Rüningen -> Rathaus -> DLR -> Bevenrode

Rathaus	5.30	6.40	every	18.40
			60	
DLR	5.52	7.03	min	19.03

Beveniode -> DLR -> Rathaus -> Leileide/Ruhingei	Bevenrode ->	DLR ->	Rathaus ->	· Leiferde/Rüninger
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DLR	6.34	7.04	7.34	every	18.34
				60	
Rathaus	6.58	7.28	7.58	min	18.58

Times are valid Monday - Friday. More information on www.efa.de







## Imprint

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