ADAC perspective on HEMS operation and training

Thomas Gassmann

Director Business Development & Sales

Agenda

1 Introduction: ADAC and Air Rescue

2 Components of a safe & succcesful HEMS operation

Introduction:

Thomas GASSMANN
Director Business Development & Sales
ADAC HEMS Academy I Germany

- started my career in aviation in a glider at the age of 14
- joined the German Army Aviation in 1979
- officer and helicopter pilot in several positions from line pilot, technical flight test pilot, safety officer to dept. squadron leader.
- studied economics with specialization in organization and IT-systems.
- left the Armed forces after 13 years of service in 1992 to gain more experience in economics and management consulting.
- 1999 till 2011 developing of the HEMS system in the Netherlands as HEMS pilot and base manager, responsible for the greater Rotterdam Area, including one of the world biggest harbour's.
- responsible for several projects from design and introduction of a new fleet of EC135 helicopters into a running HEMS operation to the integration of NVIS systems. All rescue stations in the Netherlands are operating now 24/7 with NVG´s.
- in September 2011 appointed as Director Business Development & Sales and accountable manager at the ADAC HEMS Academy in Sankt Augustin / Germany.
- Member of the Royal Aeronautical Society; Master degree in economics; CPL(H) with more than 3500 flight hours.

Introduction: ADAC and ADAC Air Rescue

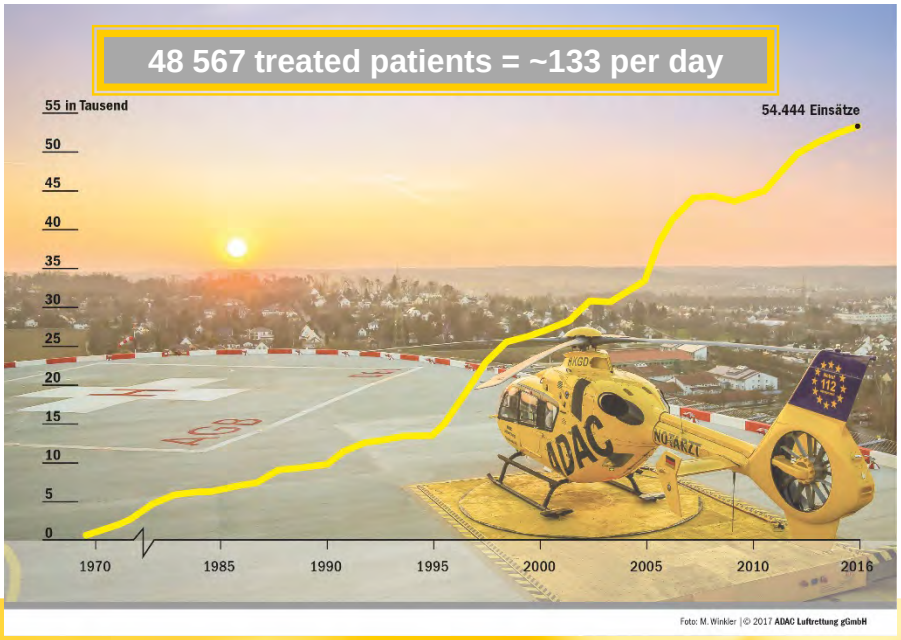
ADAC e.V.: Our Motherorganisation

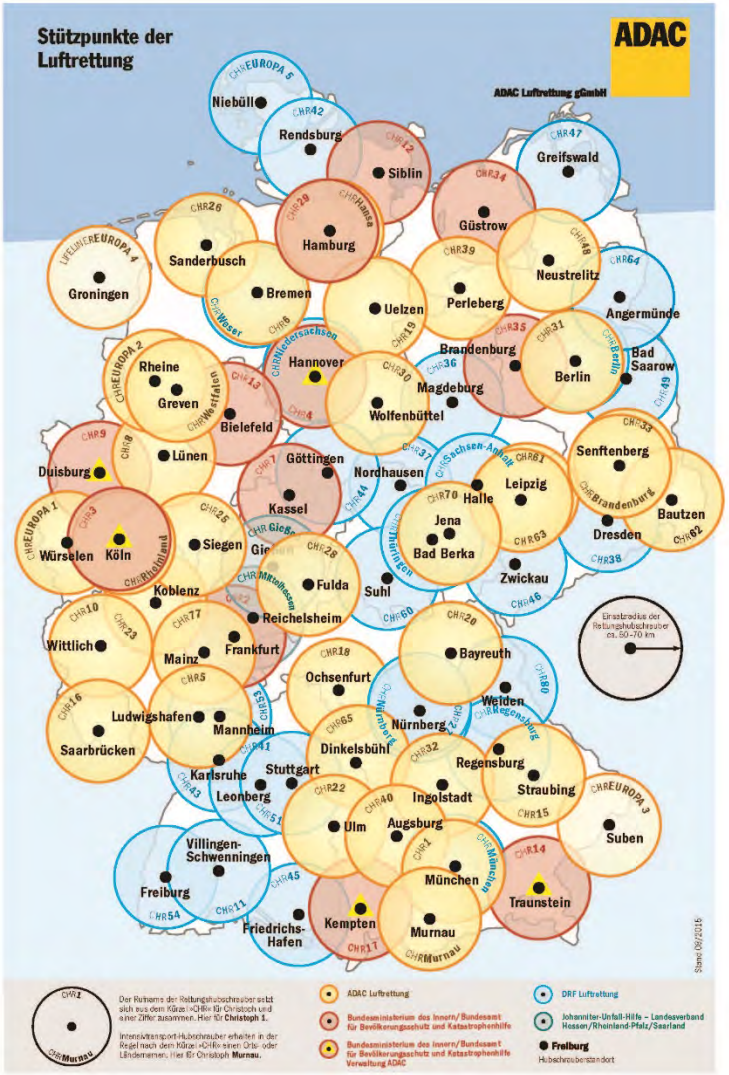
- German Automobile Club with > 19 Mio Members
- Founder of the German Air Ambulance System in 1970
- Key Competences: Roadside Rescue, Consumer Protection, Air Ambulance

Introduction: ADAC and ADAC Air Rescue

ADAC Luftrettung (Airrescue)

- 37 Rescue Stations (4 with rescue hoist, 4 24/7)
- 55 Helicopters: EC135, BK 117, EC145
  all BK117 and EC145 will be replaced by H145 (14, already 11 in service)
- 400 Full Time Employees including 160 Pilots
- In cooperation with hospitals and help organizations:
  250 Hems Crew Members, 680 Doctors
- More than 54.000 Missions / 27.000 FH a year (2016)





A successful and safe HEMS operation is based on many components

Successful HEMS – legal regulations

Regulations

Federal states
Rescue system

Rescue system is part of public health system

EASA
Aviation regulations

EASA
European Aviation Safety Agency

HEMS is Commercial Air Transport regulated under EASA

State
Medical regulations

HEMS in Germany also includes the medical responsibility

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Successful HEMS – legal regulations - Partnership

Regulations

Federal State

Responsible for the rescue service by law

tenders rescue stations according to the needs

ADAC air rescue is an agent, holds the contracts with the partners and provides the aviation part

ADAC

Statutory health insurance funds, bear the major part of the costs

Hospital, provides the doctors and the infrastructure

Fire Brigade

ASB Arbeiter-Samariter-Bund Deutschland e.V.

Deutsches Rotes Kreuz

DIE JOHANNITER

Malteser

Rescue Organizations provide the HEMS TC´s and deploys the helicopter via their dispatch centers

Successful HEMS – Financing and funding in Europe

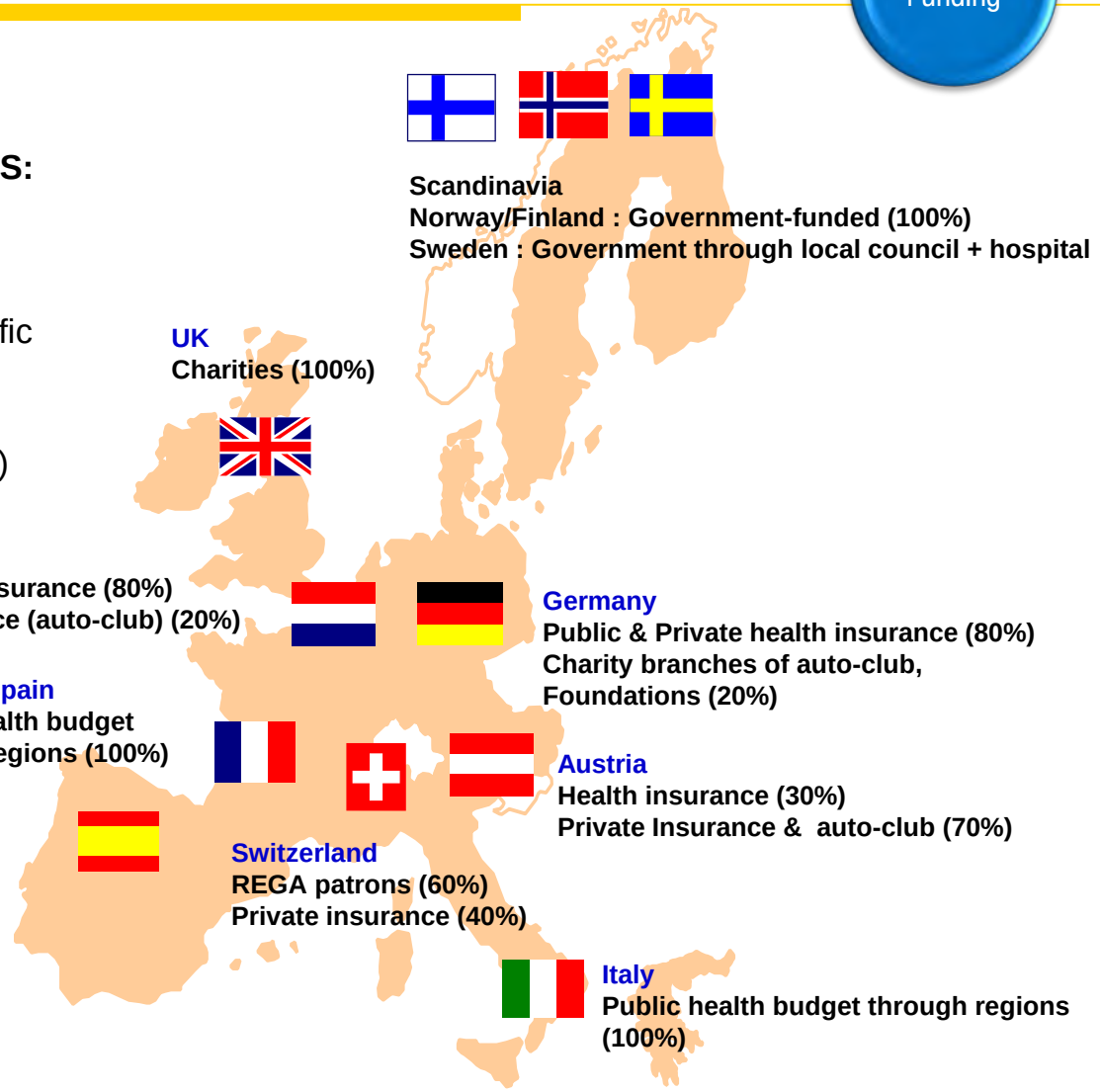
Financing / Funding

Three (3) main "financing models" in HEMS:

- Governmental funding (public health insurance)
- 100% private funding through Charity (specific UK case)
- Mix of Governmental funding and non profit organizations (Automobile Club, Foundation)

Two (2) "financing models":

- traditional (hospital based)" h/c owned & operated by hospitals
- "independent provider model (IPM)" h/c not associated to hospitals and financed by patient revenue (Community based)



Scandinavia
Norway/Finland : Government-funded (100%)
Sweden : Government through local council + hospital

UK
Charities (100%)

Netherland
Public health insurance (80%)
Private insurance (auto-club) (20%)

Germany
Public & Private health insurance (80%)
Charity branches of auto-club, Foundations (20%)

France / Spain
Public health budget through regions (100%)

Austria
Health insurance (30%)
Private Insurance & auto-club (70%)

Switzerland
REGA patrons (60%)
Private insurance (40%)

Italy
Public health budget through regions (100%)

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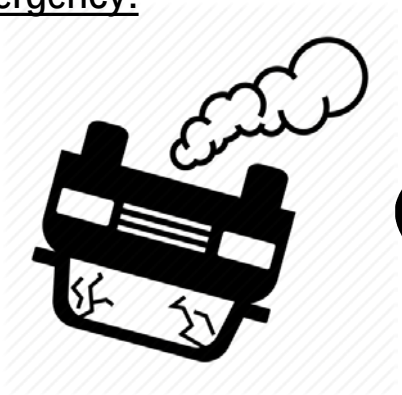
Successful HEMS: Mission Coordination

Mission Coordination

In Case of Emergency:



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or / and

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Successful HEMS: Mission Coordination

Mission Coordination

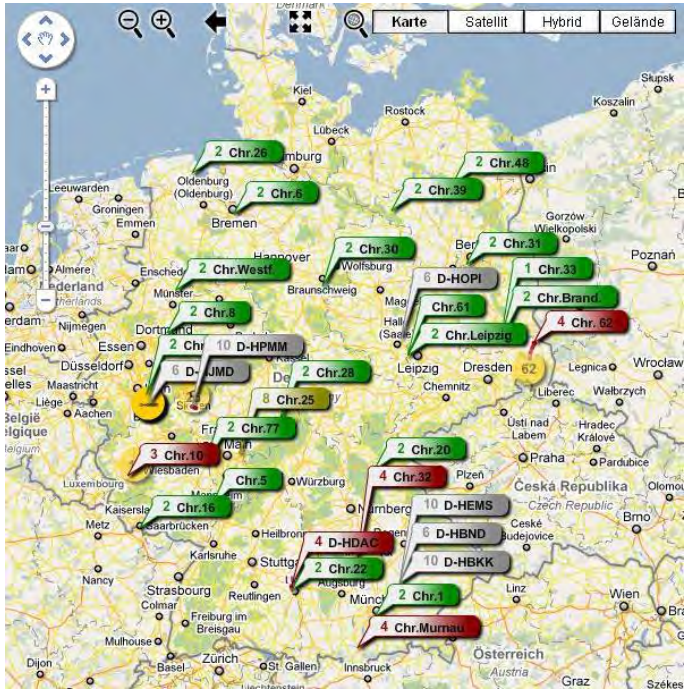
- The mission data are obtained via the radio and via digitally received coordinates (direct to the helicopter)
- 2 minutes after alarming, the rescue helicopter is ready to take off
- The rescue helicopter can reach any site within its 70 km radius around the station within 15-17 minutes
- For secondary missions, the lead time is approximately 10 minutes (15-30 minutes at night)

Successful HEMS: Mission Coordination

Mission Coordination

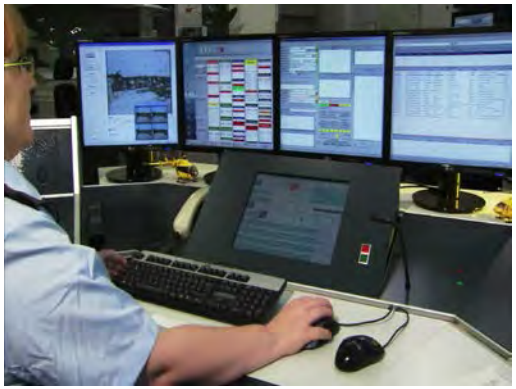
RescueTrack®

- Improved deployment of helicopters.
- Ensuring and optimizing of medical care for the population.
- Reduction of empty flights to increase utilization efficiency.
- Rapid location determination by control centers and flight operations management in case of an incident.



Successful HEMS: Mission Coordination

Mission Coordination



Close coordination between helicopter crew and control center

- injury patterns
- required departments of the clinic
- bed capacity
- weather conditions

Successful HEMS: Mission Coordination - Limitations

Mission Coordination

Poor weather conditions such as:

- fog
- storm
- danger of freezing
- nocturnal landings in unknown terrain

2 Pilots		1 Pilot	
Day			
Cloud base	Visibility	Cloud base	Visibility
500 ft and above	min. 800 Meter	500 ft and above	min. 800 Meter
499 – 400 ft	1000 Meter	499 – 400 ft	2000 Meter
399 – 300 ft	2000 Meter	399 – 300 ft	3000 Meter
Night			
Cloud base	Visibility	Cloud base	Visibility
1500 ft	5000 Meter	1500 ft	5000 Meter

Successful HEMS – Flight Operation

Flight operation

Morning duties:
- at least 30 minutes before start of duty
- Check helicopter, NOTAMS and weather conditions
- Control medical equipment
- Roll out helicopter and prepare for quick start: Take-off within 2 minutes after the call
- Team briefing on weather, NOTAMS, extraordinarily, helicopter conditions and malfunctions,
- everybody happy and healthy?

Mission:
- Within 2 minutes in the air after dispatch
- Pilots starts helicopter (no idea where to go, what kind of accident)
- HCM does navigational preparation digitally
- Doctor requests detailed medical info

Successful HEMS – Flight Operation

Flight operation

Enroute

- HCM supports with procedures, navigation and radio communication, esp with dispatch and hospital
- Everybody happy, no pressure, safety first, safety culture, just culture
- Landing zone normally 2D
- CAT A procedures during landing and take off
- Within a circle of 300 m you find in every city a landing spot, pickup of Med crew by police, bike etc.

On scene

- Crew protection by pilot, helping hand if needed, when helicopter is safe
- HCM supports doctor, holds contact to dispatch and hospital

Transport of patient

- By helicopter: procedure
- By ambulance: doctor is joining the patient, HCM and pilot go for the pickup to make the team complete and mission ready again
- Mission times depend
- Some stations fly 10 missions a day (only daytime period)

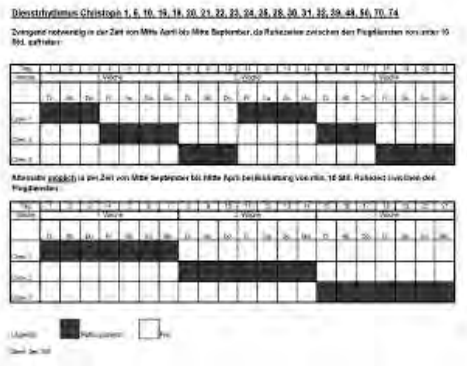
Reporting:

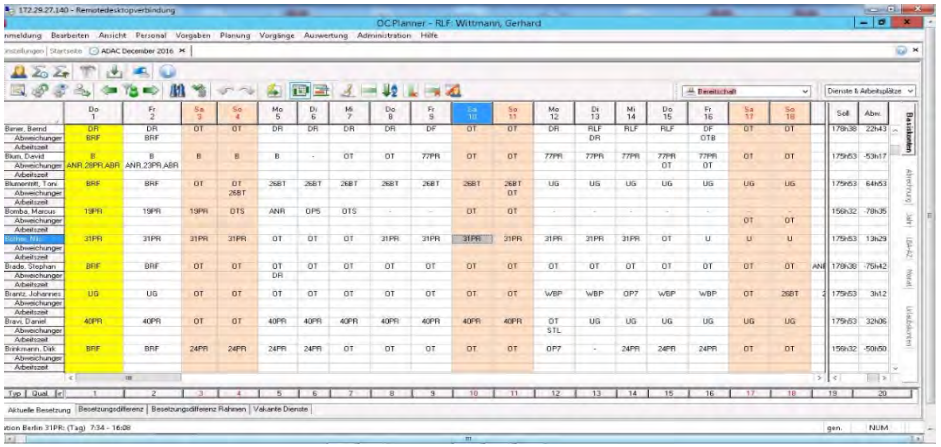
- Digital system called LIKS - Includes pilots and medical reporting

Successful HEMS – Flight Operation – Flight time limitations

Flight operation

- Maximum duty time per day (on 4 days in a row): 15:30 h
- Minimum Rest period after this duty period: 48 h
- Before every duty period: resttime min 24 h
- Average working days per year: 160 days
  (2000 h - contract)





Successful HEMS – Flight Operation: Crew compositon

Crew composition

Rescue Station: Crew composition

- 3 Station-pilots
- 5-8 TC HEMS
- up to 15 emergency physicians

Mission ready:

- from sunrise / earliest 07:00 a.m.
- till sunset

Successful HEMS – Flight Operation: Crew composition

Crew composition

Intensive care 24 h station: crew composition

- 8 Station-pilots
  at night the ITH (intensive care helicopter) is manned with 2 pilots
- 7-12 TC HEMS
- Up to 25 emergency physicians

Mission ready:

- 24 h for secundary transport missions
- Primary rescue form sunrise to sunset

Successful HEMS – Flight Operation: Crew composition - Pilot

Crew composition

Prerequisites for a HEMS pilots
@ ADAC Air Rescue

- ATPL(H) oder CPL(H)
- 1.000 flight hours PIC for commander or 500 flight hours PIC for pilot (Co Pilot Status) - similar environment (Army, Police)
- Minimum of 500 flight hours in HEMS missions for reaching commander status
- Minimum of 20 flight hours at night
- DLR Test

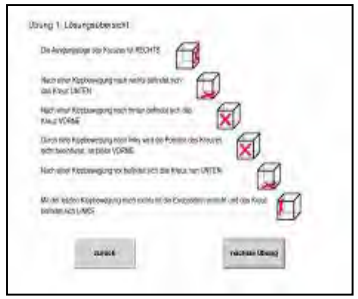
Successful HEMS – Flight Operation: Crew composition - Pilot

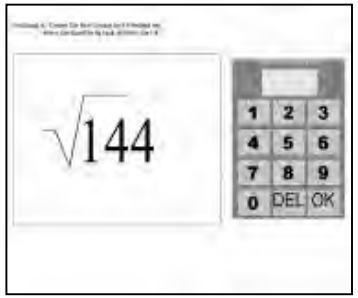
Crew composition

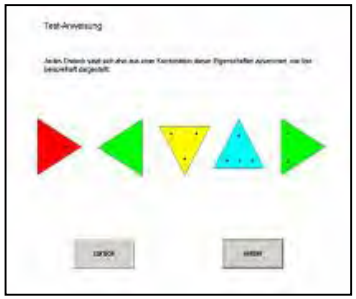
DLR (German Research Center for Airspace and Space) Assessment:

- On order of ADAC airrescue an proffessional psychological assessment takes place.

- Characteristics under investigation:
  - Mathematics
  - Logical thinking
  - Technical understanding
  - Memory visual & acoustic
  - Attention
  - Concentration
  - Spatial Orientation
  - Spatial visualization
  - Psychomotoric capacities
  - Multitasking
  - Personality







Successful HEMS – Flight Operation: Crew composition - Pilot

Crew composition

Trainingschedule after acceptance:

- Dangerous goods training
- Safety and security
- Aeromedical Crew Resource Management (ACRM)
- Flight training (Type Rating)
- Work safety training
- Trainig on emergency and safety equipment
- Initial Briefing / Supervision-time
- OPC & TRPC (2 checkflights in the SIM every year)
- Line check on the rescue station
- Yearly Recurrent Training: all helicopter systems are covered within 3 years

„The best safety device in any aircraft is welltrained crew!“

Successful HEMS – Flight Operation: Crew composition – HEMS TC

Crew composition

Prerequistes and requirements of the TC HEMS:

- Completed training as rescue assistant
- At least three years' professional experience as rescue assistant
- Completion of the HEMS crew member course
  - Internship on the station before thecourse
  - 10days course on helicopter related topis (navigation, communication, CRM, technical asprects of the helicopter, use of checklists, weather, etc. including flights in the simulator
  - Practical training on the rescue station with a kinimum of 10 missions under supervision

Successful HEMS – Flight Operation: Crew composition - Doctor

Crew composition

Prerequisites and requirements for emergency physicians:

- Medical team members are chosen via an standardized assessment in combination with evaluation on social skills during some practical days on the rescue station
- Specialist status (Anesthesiologist, Emergency physician, Internal specialist, Surgeon)
- Rescue service resp. additional emergency medicine diploma
- Emergency physicians employed at the ITH also have to have the intensive transport course according to the regulations (DIVI)
- Basic Helicopter course:
  - Basics of Air rescue , Basics of the helicopter , flight safety aspects , Hygiene and transport of contagious patients, Documentation and quality management, Human factors and teamwork
  - Practical training on the rescue station with evaluation and first flights under supervision
- the official status of the doctor onboard = PAX

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Successful HEMS – Medical Operation (Categories)

Medical Operation

- **Primary medical care (PV)**
  doctor is quickly transported by helicopter to the patient for treatment; afterwards a ground ambulance transports the patient to the hospital

- **Primary mission (PT)**
  patient receives medical care by the HEMS doctor and smoothly transported by helicopter to the nearest suitable hospital

- **Secondary mission (SE)**
  medical indicated transfer of a patient from one hospital to another (= interhospital transfer); so-called intensive care transport if the patient has to be intensively monitored

- **Other mission (SO)**
  search flights, transport of organs or blood as well as missions in case of large catastrophes

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Successful HEMS - Maintenance

Maintenance

Maintenance by ADAC Luftfahrtechnik GmbH with main facility in Bonn-Hangelar and two subsidiaries in Landshut und Halle-Oppin.

- Quick accessibility of all rescue stations
- 24 h standby service at all locations, rapid response units
- 100 subsidiary of ADAC
- Airbus Helicopters Service Centre
- External customers welcome

Successful HEMS - Infrastructure for HEMS operations

Infrastructure / Equipment

- Ideal location for helicopters :
  HOSPITAL with trauma center
- Infrastructure:
  hangar, refueling point, electrical platform, adequate off-duty and recreation rooms for the crew
- Crew concept: doctor and HEMS paramedic are equal teammembers
- Take-off within 2 minutes after alert
- Radius of operation: up to 70 km (primary)
  up to 500 km (secondary)

The Fleet

Infrastructure / Equipment

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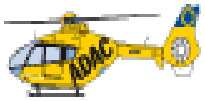
The right fleet for the right mission

Infrastructure / Equipment

Type	Weight MTOW (in kg)	Mission Speed (knots)	Mission endurance (time/distance)	consumption (liters / hour)
EC 135 	3.000 (2.980)	130 kts	1:30 h / 360 km	ca. 230 l
BK 117 B2 	3.350	125 kts	1:00 h / 230 km	ca. 265 l
BK 117 C2 = EC145 	3.585	125 kts	1:00 h / 230 km	ca. 290 l
BK 117 D2 = H145 	3.650	130 kts	1:45 h / 420 km	ca. 330 l

The right fleet for the right mission

Infrastructure / Equipment

ADAC Air Rescue = 100% Airbus fleet:

- Safety issues:
  - fenestron technology
  - high main rotor
  - size and weight (downwash)
  - OTW-view
  - Helionix cockpit / 4-axis ATP
- Right size for the mission (Primary & interhospital)
- Reliable technology in a mature state
- Maintenance costs (Weight/maintenance cost ratio)
- Spare part supply (365/24-7 operation)
- Training advantages
- Noise
- etc.

ADAC-Luftrettung GmbH is investing in the exchange of the BK 117 fleet into the new, more powerful D2 fleet around more than 130 million euros in the next few years

HEMS Academy

HEMS Academy – Flight Training Beyond Limits

Training

- The Academy:
  Integrated training for pilots, doctors and paramedics
  in simulated scenarios - a worldwide unique concept.

- Available for all EC135 and EC145C2 operators (air rescue law enforcement, Off-Shore, executive organizations etc.)
  Wet and Dry lease

- Building started in September 2008
  Open since summer 2009 (medical) / 2011 (flight simulation)

- Full-Flight-Simulators:
  - EC135 EFIS – Level A
  - EC145C2 / EC135 EFIS – Level A
    - These two simulators are additionally certified by
      - the Argentinian Civil Aviation Authority as Level C
      - the Brazilian ANAC as Level A
      - the Russian Civil Aviation Authority as Level D
  - H145 (BK117D2) – Level D
    (expected June 2017, with EASA and FAA Certification)

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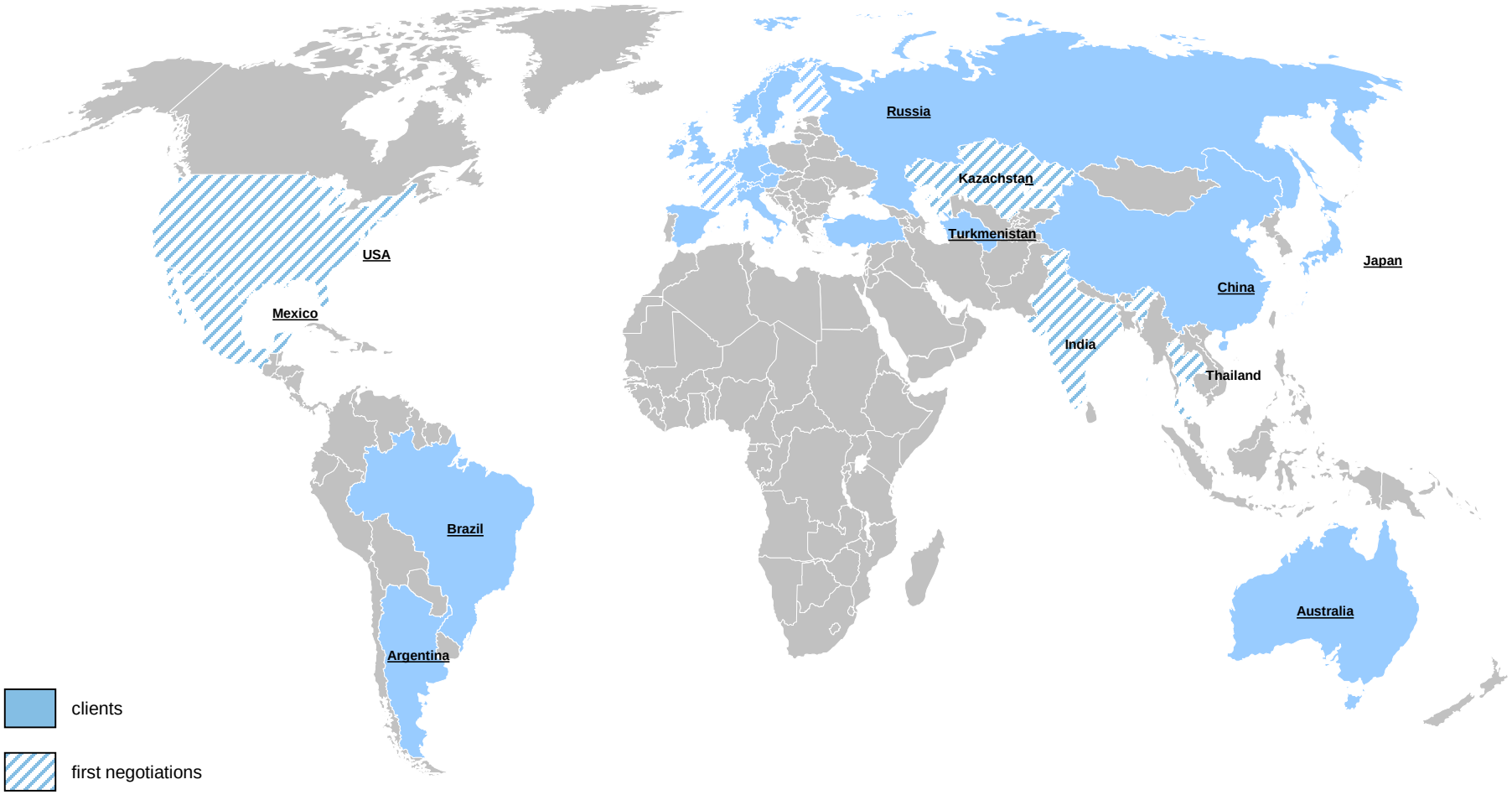
The AHA-World: Clients and Prospects in Europe (May 2017)

Training

The AHA World – Clients and Prospects Worldwide (May 2017)

Training



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General thoughts on training

Training

Training = € / $

Intervention Recommendations (IR)

Flight Operations / SMS / Culture

Training / Instructional

Regulatory / Standards / Guidelines

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General thoughts on training

Training

With modern helicopters what items can I (usefully) train in the real aircraft?

Review of EC145 (BK 117 C-2) Flight Manual Emergency and Malfunction Procedures

Warning indications

Flight manual reference	Reference	Description	Malfunction name	Malfunction description / comment	can be trained usefully in a real A/C
3.2.1					
BAT TEMP warning	FLM BK 117 C-2, 3.2.1	Battery over temperature (above 70 deg C)	BAT TEMP warning	Malfunction will cause warning indications only	no
ENG 1 FAIL warning ENG 2 FAIL warning	FLM BK 117 C-2, 3.2.1	Engine 1 or 2 N1 below threshold	See ref 3.4.1 - 3.4.6	Can also be caused by system effects e.g. fuel starvation	no
FIRE (1)	FLM BK 117 C-2, 3.2.1	Fire in engine 1 compartment	Engine 1 fire	Malfunction will cause warning indications only	no
FIRE (2)	FLM BK 117 C-2, 3.2.1	Fire in engine 2 compartment	Engine 2 fire	Malfunction will cause warning indications only	no
LOW FUEL 1 LOW FUEL 2	FLM BK 117 C-2, 3.2.1	engine 1 or 2 supply tank qty below 24 kg	none	System effects	maybe
ROTOR RPM	FLM BK 117 C-2, 3.2.1 & FLM BK 117 C-2, 2.1	NR high or low	none	System effects	no
		95% or less		steady light	no
		106% or above		flashing light	no
		110% or above		flashing light	no
XMSN OIL PRESS	FLM BK 117 C-2, 3.2.1	XMSN oil pressure <= 1bar	XMSN OIL PRESS 1 warning	Malfunction will cause warning indications only	no
			XMSN OIL PRESS 2 warning	Malfunction will cause warning indications only	no
			XMSN OIL PRESS 1 decrease	Malfunction will force transmission oil indication below minimum over 3 min. System effects limited to indications only.	no
			XMSN OIL PRESS 2 decrease	Malfunction will force transmission oil indication below minimum over 3 min. System effects limited to indications only.	no

Caution indications

Flight manual reference		Description	Malfunction name	Malfunction description	
3.2.1 MASTER (flashing)	FLM BK 117 C-2, 3.2.2	a new caution is being displayed	none	System effect	maybe
3.2.2	FLM BK 117 C-2, 3.2.3				
AVIO OVHT	FLM BK 117 C-2, 3.2.3	Normal operating temperature of COM/NAV, FCDS or AFCS exceeded	AVIO_OVHT caution	Malfunction will cause caution indications only	no
BAT DISCH	FLM BK 117 C-2, 3.2.3	DC power is being supplied by battery only	none	System effect	maybe
BLEED AIR	FLM BK 117 C-2, 3.2.3	bleed air valve and mixing valve remain open after shutting off bleed air heating	Bleed air valve open	Malfunction will cause bleed air valve to remain open even if requested to close. Engine performance may be degraded as a result.	no
BUSTIE OPN (1)	FLM BK 117 C-2, 3.2.3	electrical systems separated	Bus tie 1 open	Malfunction will inhibit bus tie 1 function. May also occur during normal system operation.	maybe
BUSTIE OPN (2)	FLM BK 117 C-2, 3.2.3	electrical systems separated	Bus tie 2 open	Malfunction will inhibit bus tie 2 function. May also occur during normal system operation.	maybe
CAD FAN	FLM BK 117 C-2, 3.2.3	CAD fan failure has been detected during external test	CAD FAN caution	Malfunction will cause caution indications only	no
CAU DEGR on CAD on VEMD	FLM BK 117 C-2, 3.2.3	both VEMD lanes inoperative CAD inoperative	see ref 3.3.1, 3.3.2 see ref 3.3.3	Malfunctions will cause: Both VEMD lanes to fail - no VEMD indications; CAD to fail - no cautions are displayed.	no
CPDS OVHT	FLM BK 117 C-2, 3.2.3	instrument panel overheat	CPDS OVHT caution	Malfunction will cause caution indications only	no
DOORS	FLM BK 117 C-2, 3.2.3	cockpit, cabin sliding or clamshell door open	DOORS caution	Malfunction will cause caution indications only	maybe
ENG CHIP (1)	FLM BK 117 C-2, 3.2.3	Metal particles detected in engine 1 oil	ENG CHIP (FB effective) 1	Malfunction will cause caution indications only	no
ENG CHIP (1)	FLM BK 117 C-2, 3.2.3	Metal particles detected in engine 1 oil	ENG CHIP (FB ineffective) 1	Malfunction will cause caution indications only	no

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General thoughts on training

Training

Helicopter Technology Improvements over the past few years

Then (ALII)

Now (H145)

Training on automation and flight path management is essential!

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(NOT) our Simulator / Training device, but…

Training

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Training possibilities

Training

Aeronautical , i.e.

- Wet and Dry Lease
- EC 135 / EC 145C2 Type Rating
- EC 135 / EC 145C2 Check-Flights (OPC/LPC)
- Instrument Rating (IR)
- NVG Training
- CAT A Training
- Missions specific Training (HEMS, OFF-Shore, etc.)
- MCC - Multi Crew Cockpit Training
- CRM Training
- Etc.

H145 (BK117D2) starting Q2/2017

Medical, i.e.

- MTRM – Medical Team Resource Management Training
- Intensive Care Transport Training
- DIVI Children Emergency Training
- MPG (Medical Product Law) Training
- Initial and Refresher
- Etc.

Not for third parties at the moment

Combined Training: Aeronautical + Medical

- ACRM (Aeronautical Crew Resource Management)
- ACRM Trainer Assessment
- TCM (Technical Crew Member) Initial
- TCM Refresher
- etc.

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Why flight simulation?

Training

- Training of critical scenarios, which cannot be demonstrated or are too dangerous to fly in a real aircraft
- Independent from weather and time
- "Real" simulation of meteorological conditions, as e.g. IMC
- Training „around the clock" possible
- No fuel consumption, no noise – environmental friendly

  Carbon dioxide reduction till now: > 10.0000.000 kg
- Reduction of Maintenance Costs
- No waste of flight time to practice sites: the simulator can easily be placed everywhere. There is a large number of operating scenarios, airfields confined areas, helidecks, etc.
- Checking and verification of new procedures in a safe environment
- Exact cockpit replicant – switches are where they should be
- Training in the SIM is highly recommended by the IHEST and NTSB

Due to the high degree of realism the check flights and all hours flown in a full flight simulator are accepted by the national aviation authorities as real flight hours for the extension of pilot licences.

Training under mission specific circumstances: Mountainous Terrain

Training

Training under mission specific circumstances : i.e. HEMS

Training

Training under mission specific circumstances : i.e. Offshore

Training

Training under mission specific circumstances : i.e. Day and Night

Training

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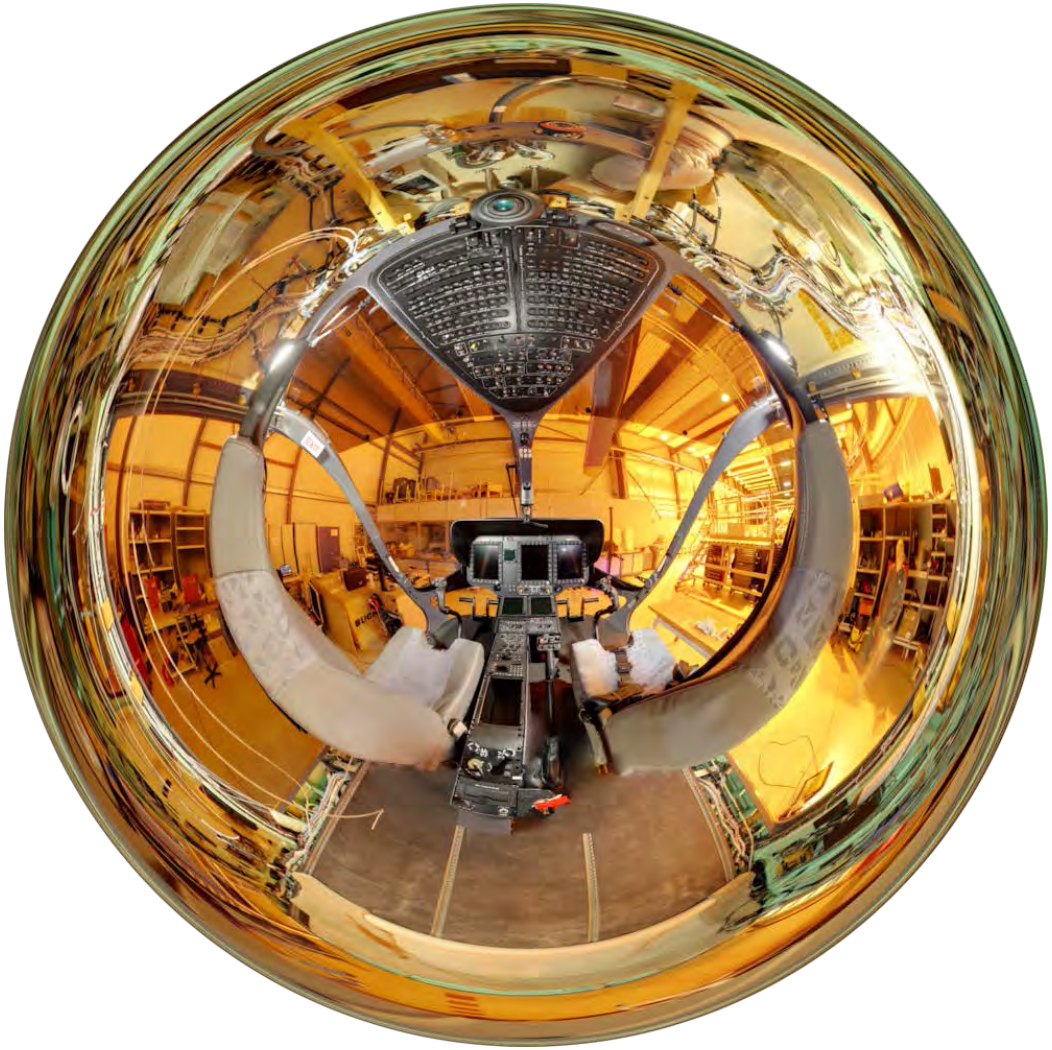
The future has just begun…

Training



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Full Flight Simulator Level D H145 - Roadmap

Training

Courtesy Reiser Simulation & Training

Medical Training

Training

Christoph „SIM“

- Two Full Scale Models 1:1: EC135 and BK117 for training scenarios inside the helicopter
- Including professional patient simulators with bluetooth connection
- “Christoph Sim" incorporates the medical equipment used in air rescue
- Video- and audioinstallation

Shock room

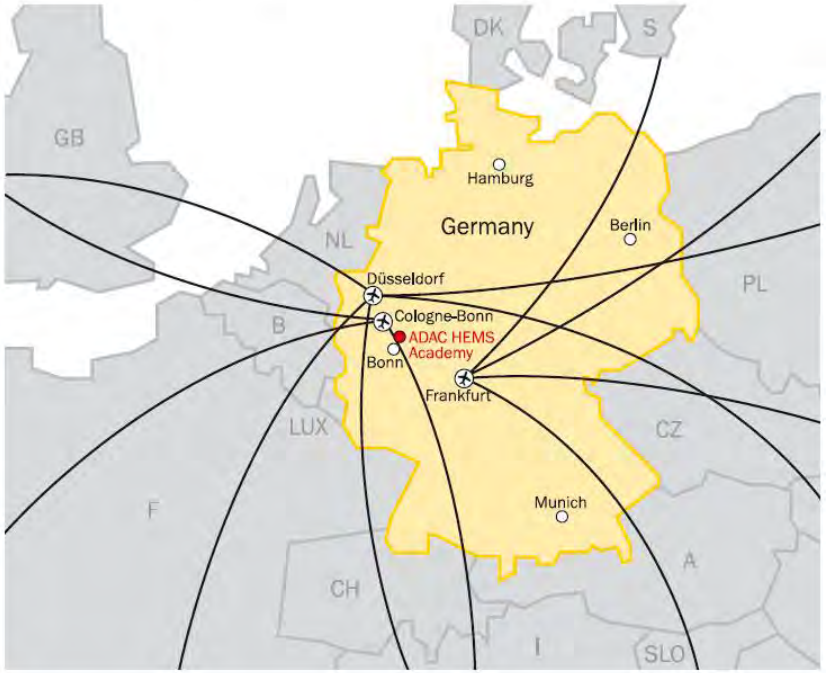
- To train the handover of the patient from the helicopter to the hospital
- Intensive care transport preparation

Anticipating the future

- 24/7 all-weather operations (new aircraft)
  - PBN, PIS approaches (vs ILS)
  - IFR rating – quo vadis?
- Aviation regulation (Bureaucracy, Age 60, drones)
- New medical strategies (faster intervention & stabilisation) to reduce therapy-free interval for patients and earlier definitive treatment
- New medical devices for HEMS (ECMO, CT, microwave)

We look forward to welcome you “On Board”!

3 International Airports within less than an hour driving distance:
Frankfurt ∞ Cologne-Bonn ∞ Düsseldorf



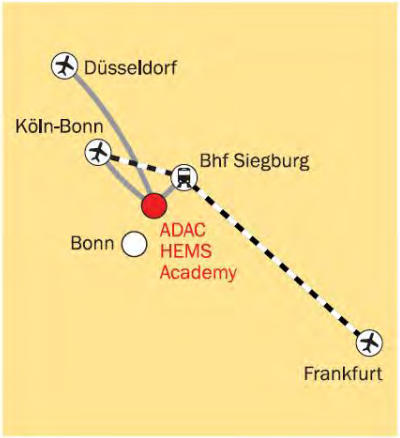
Where to find us?

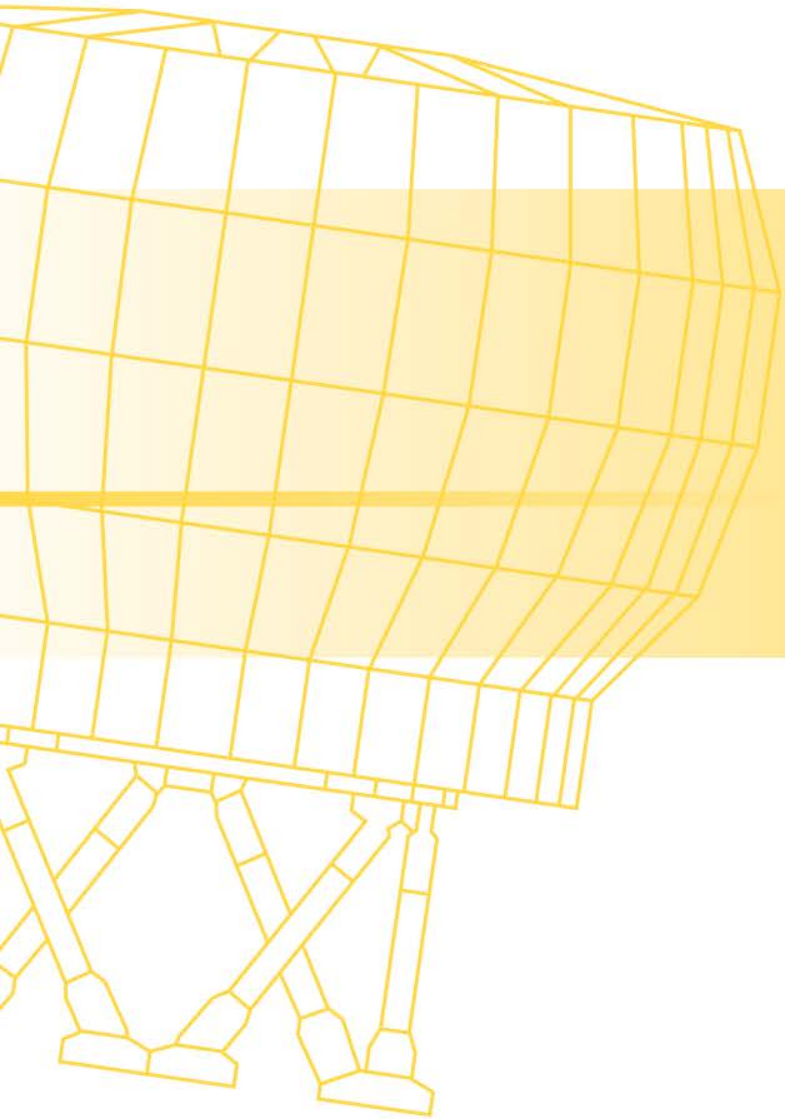
Arrival Frankfurt Airport
45 min by Bullit-Train to Siegburg trainstation
Transfer by taxi

Arrival Cologne-Bonn Airport
30 min car drive

Arrival Düsseldorf Airport
50 min car drive

Or land “on our doorstep”
Hangelar Airfield
with your small plane
or helicopter





ADAC HEMS Academy

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Thank you very much for your attention

HEMS Academy