

**23. World Gas Conference,  
5th. - 9th. June 2006, Amsterdam**

**Verbundnetz  
Gas AG**

## **The “Helicopter based Pipeline Control System” HELPCOS of VNG Verbundnetz Gas AG**



**Referent: Olaf Meyer, Operation / Technology**

# HELPCOS

## - VNG in the European gas transmission grid -

gas transmission pipelines

existing



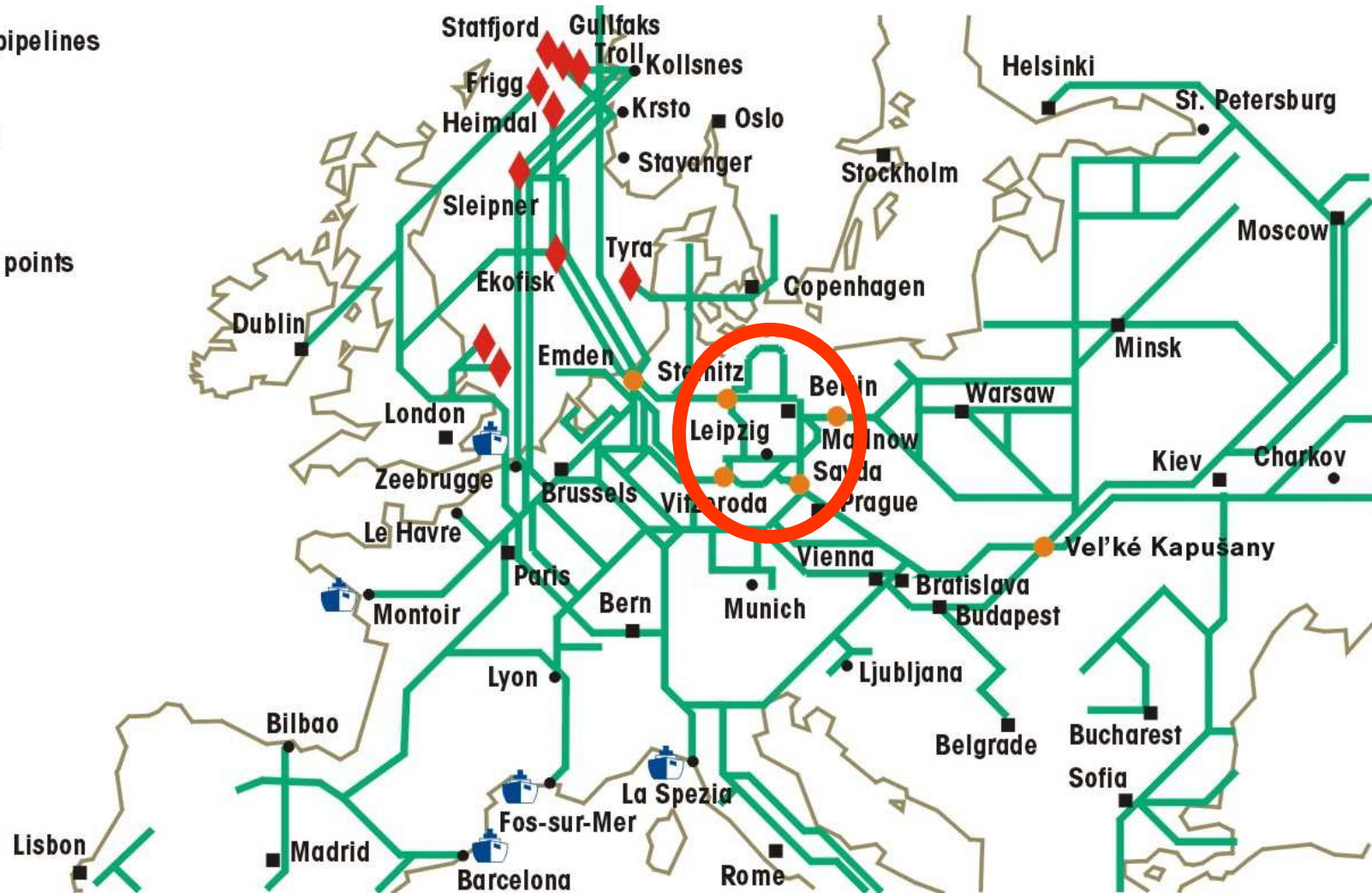
LNG terminal



gas fields

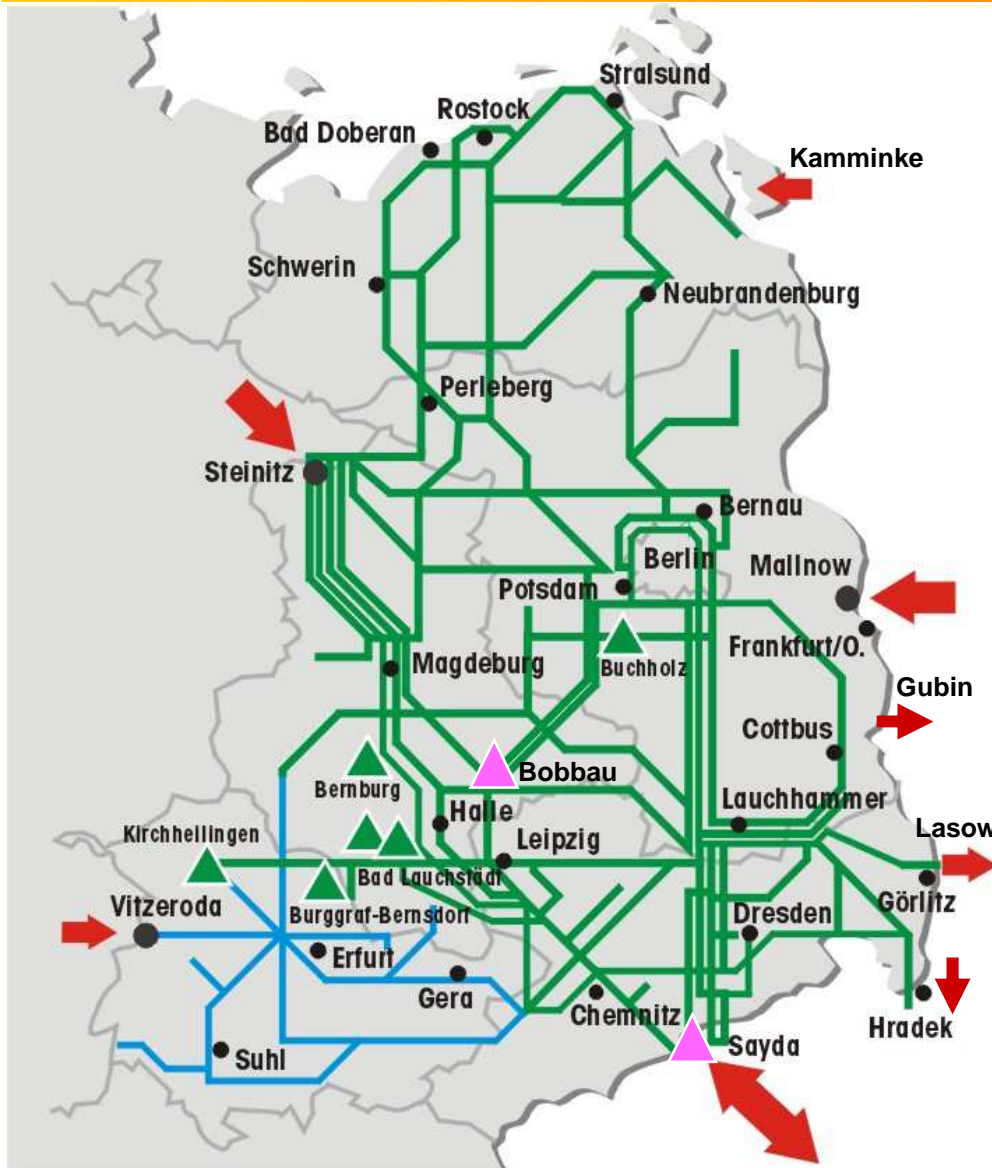


VNG delivery points



# HELPCOS

## - Technical infrastructure at VNG -



- Length of pipelines: **7,279 km**
- Underground gas storages: **6** (at overall **5** sites) ▲
- Total work gas capacity: **2.3 billion m<sup>3</sup>**
- Compressor stations: **2** (+ 4 compressor units UGS) ▲
- Total compression capacity: **77.8 MW** (8 piston compressors  
7 turbo compressors)
- Delivery stations / links: **8** →
- Metering and pressure regulating stations: **36**
- Cathodic corrosion protection installations: **727**

- **Law on the fuel and electricity Industries: § 16 - requirements:**

„...Operation of energy facilities to ensure the technical safety...”

- **Legislation for high-pressure gas pipelines: § 8 - Monitoring:**

„...Operators of high-pressure gas pipelines are responsible for their proper condition and regularly monitoring...”

„...continuously inspection of pipeline routes by walk or flight...”

- **DVGW legislation: G 466 - Maintenance of h-p. gas pipelines > 5 bar:**

„...Inspection of every operated pipeline in required time intervals...”

- **near buildings:** inspection by walk / drive → **every 2 months**

inspection by flight → **monthly**

- **out of buildings:** inspection by walk / drive → **every 4 months**

inspection by flight → **monthly**

# HELPCOS

## - Pipeline Monitoring at VNG -



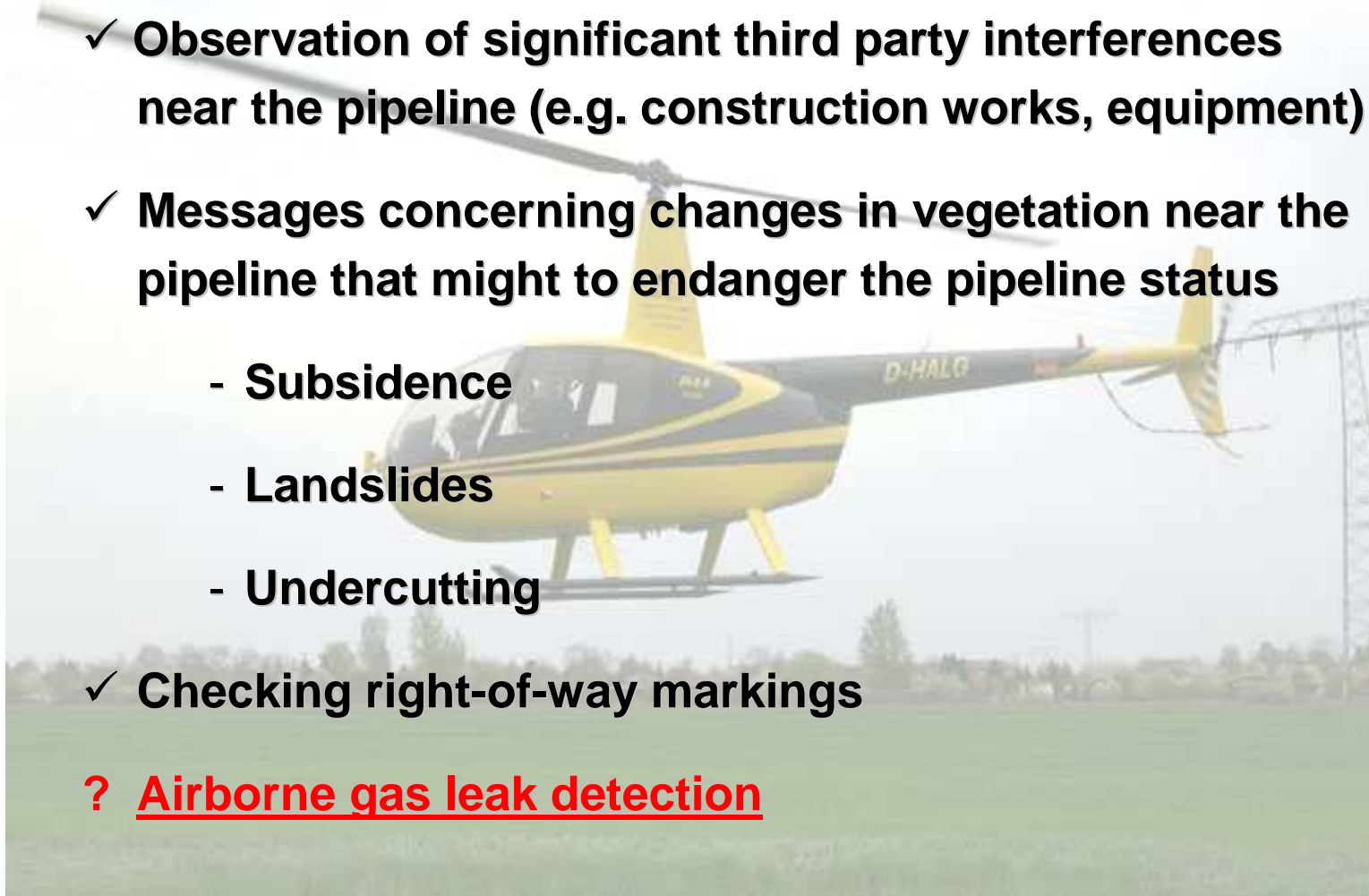
# HELPCOS

## - Pipeline Monitoring at VNG -



### Digital recording of the following facts in the helicopter:

- ✓ Observation of significant third party interferences near the pipeline (e.g. construction works, equipment)
- ✓ Messages concerning changes in vegetation near the pipeline that might to endanger the pipeline status
  - Subsidence
  - Landslides
  - Undercutting
- ✓ Checking right-of-way markings
- ? Airborne gas leak detection



### Objectives:

- Complete and innovative pipeline monitoring solution
- Development and installation of an automatic system for detection of gas leakages in pipelines in the helicopter
- Compensation / optimization of time and cost intensive gas detection work at the ground along long-distance pipelines



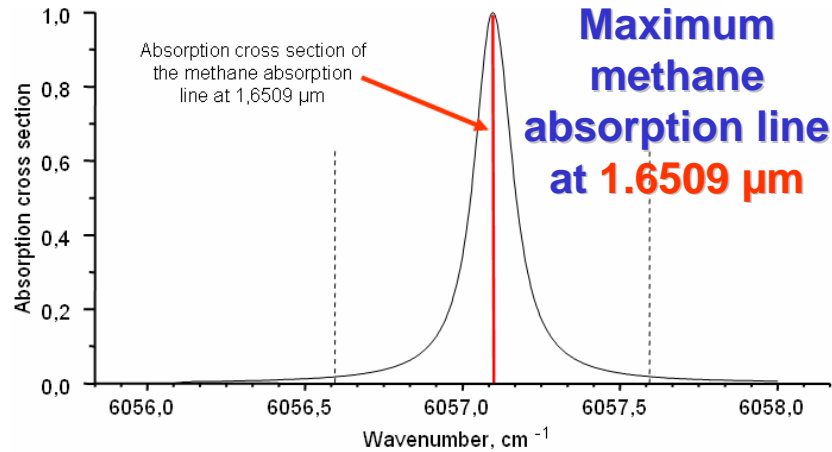
### Requirements:

- Integrated gas leak detection in line with routine monitoring flights
- Quick and efficient responding in case of emergencies by combination to VNG's Digital Messaging system Pipeline monitoring DMP (data recording)
- Application also on small-sized helicopters

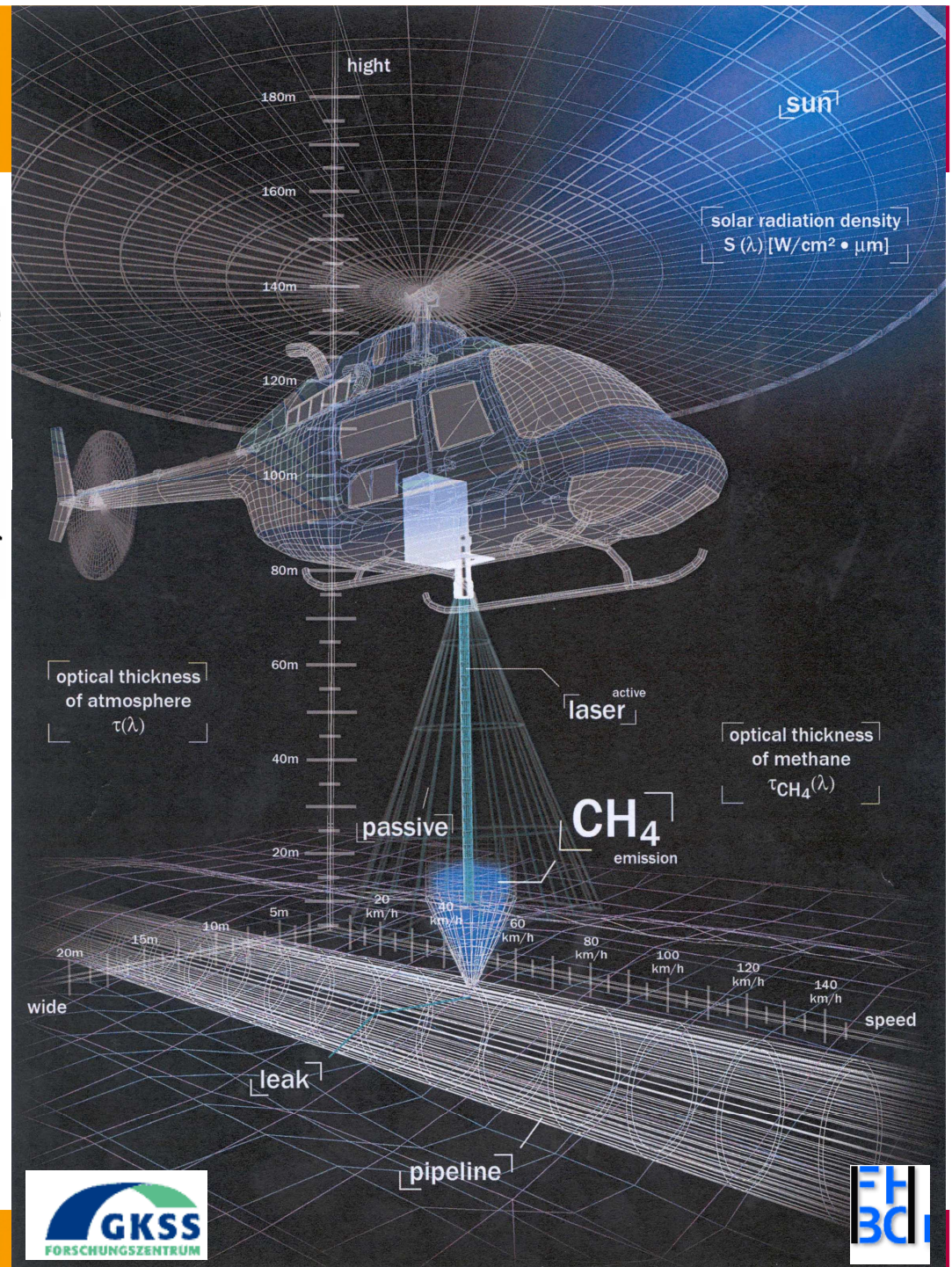


# HELPCOS

## - Measuring principle -



- Localisation of gas leakages in pipelines by measuring of methane absorption in near infra-red wave length range
- Use of a passive system (radiation source: sunlight) as well as an active system (radiation source: laser) for methane detection

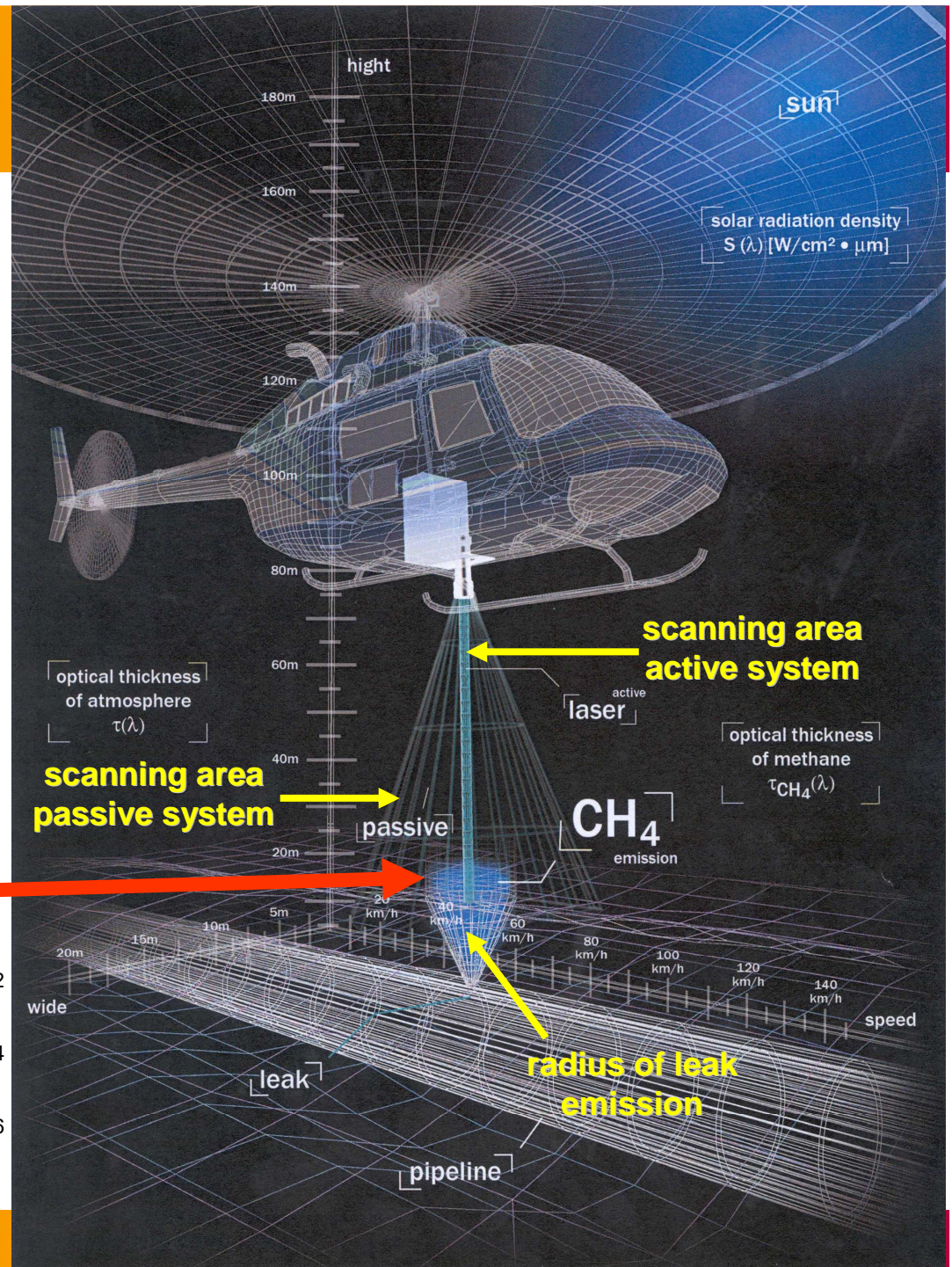
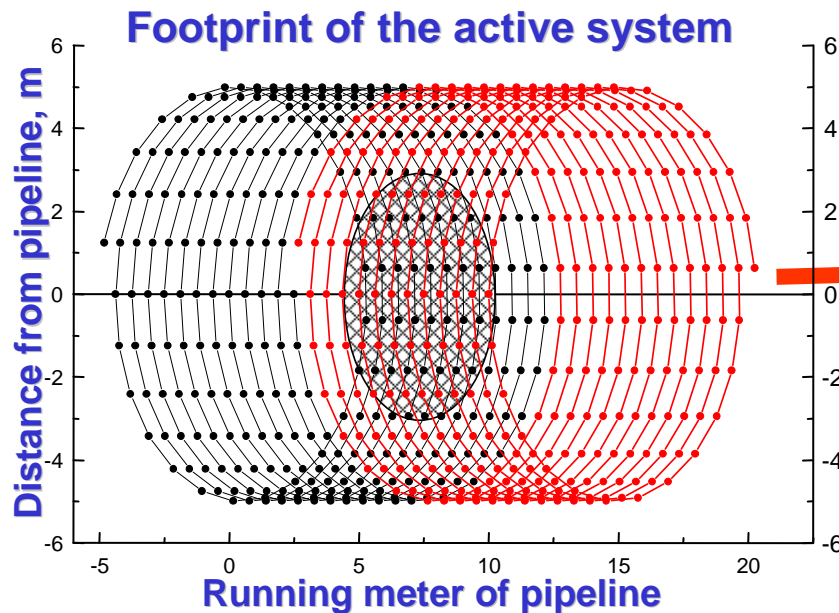


# HELPCOS

## - Detection principle -

### Scanning parameters:

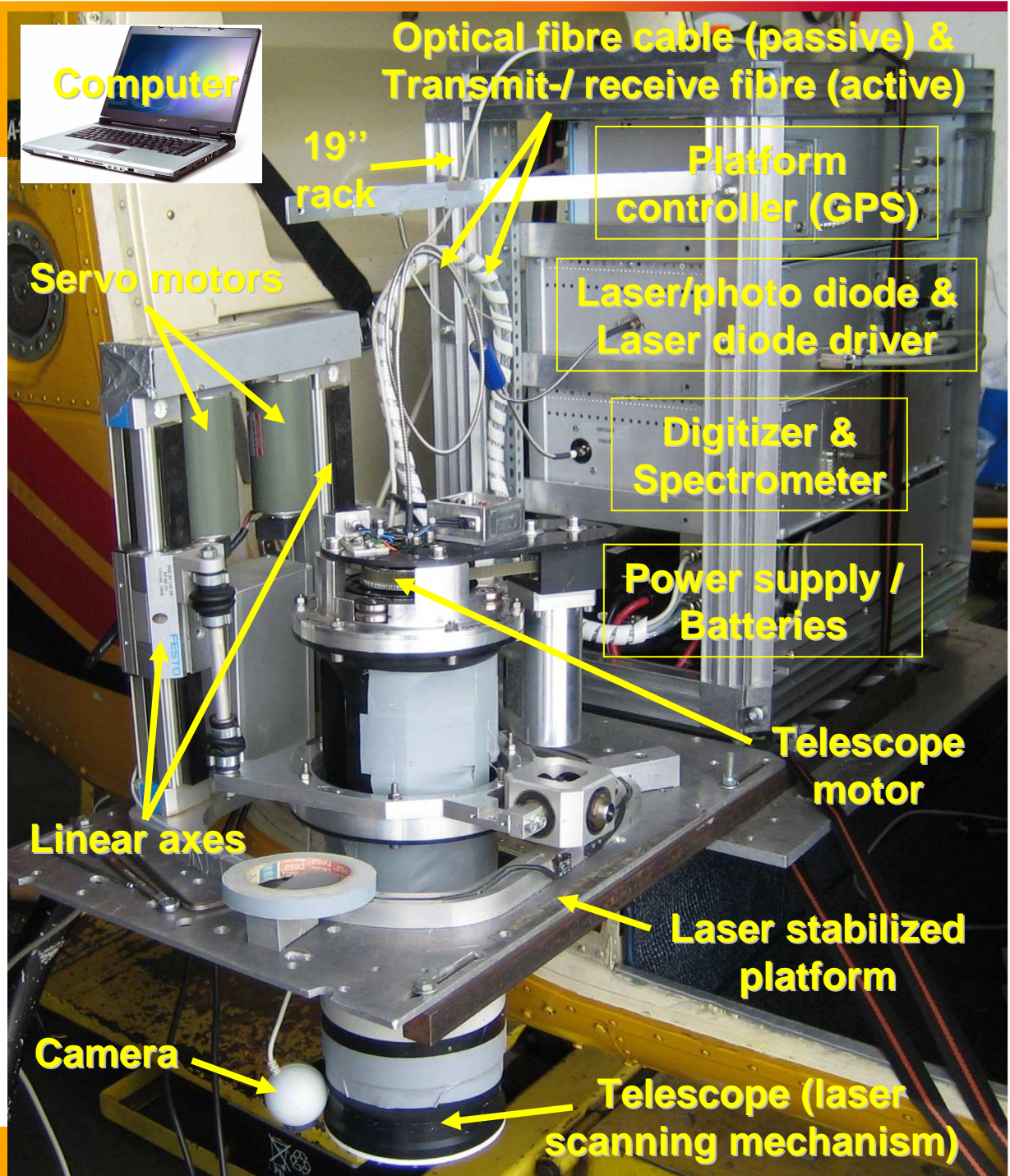
- **passive system:**
  - scanning area **20 m ( $\pm 10$  m)**
- **active system (laser):**
  - scanning area **10 m ( $\pm 5$  m)**
  - time interval measuring points: **1 msec**
  - distance measuring points: **10 cm**



# HELPCOS

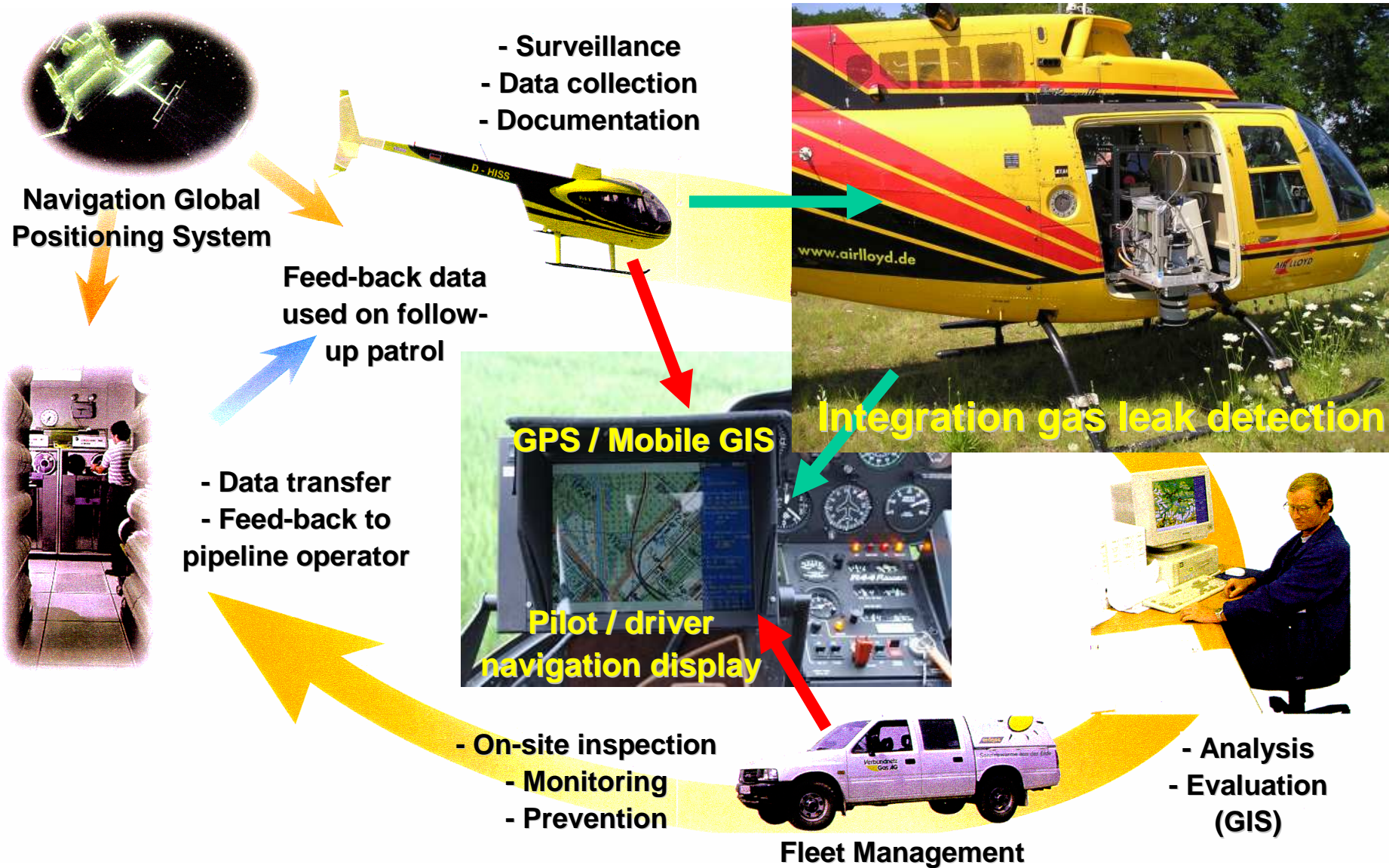
- Elements -

- Local acquisition of the recording measuring data on the base of the helicopter position (**DGPS** data) and the known coordinates of the pipeline (**GIS** data)
- Stabilization platform for exactly laser positioning of the pipeline
  - Steering accuracy  $\pm 1$  m
  - Maximum deflection  $18^\circ$



# HELPCOS

- Integration in VNG's pipeline monitoring -



# HELPCOS

## - Results and Parameters -

Basic Experience: - By measuring of methane in the near-infrared wavelength range it's possible to detect gas leaks

Passive System: - Source of radiation = sunlight  
- Detection limits: ca. 800 ppm x m (unclouded sky)

Active System: - Source of radiation = laser  
- Detection limits: ca. 80 ppm x m (laboratory)



**HELPCOS installed in the helicopter**

### Flight parameters for using measuring system:

- Flying speed:  
approx.: 80 km/h  
(50 mph)
- Flying height:  
approx.: 100 m
- Total weight:  
approx.: 70 kg

### Challenges:

- **Optimise the laser measuring hardware and software**
- **Compensate currently difficulties and influencing variables:**
- **Further test flights to increase the accuracy of the measures and to get more practical experience**
- **Automatic system on board of the helicopter every time so that all pipelines can be checked for leaks during a flight**
- **Further development activities**
- **Possibly new partners for further development processes**

### Outlook:

- **Finish of development activity with a running prototype for gas leak detection to entering series production**
- **Gas leak detection of pipelines during surveillance flights in line with the legal requirements of pipeline monitoring**
- **Finish development to a complete system solution with all significant monitoring activities on gas pipelines via helicopter**
  - **DMP**
  - **Gas leak detection system**
  - **Fleet management system**

A silhouette of a helicopter is shown in flight against a dramatic sunset sky. The sun is a bright yellow-orange orb near the horizon, casting a glow across the clouds. The helicopter is positioned in the center-left of the frame, with its main rotor blades blurred from motion. The text "Many thanks for your attention!" is overlaid in a bold, yellow, italicized font, split across two lines. The entire image is framed by a thick black border.

*Many thanks for  
your attention!*