



Groupe Intra

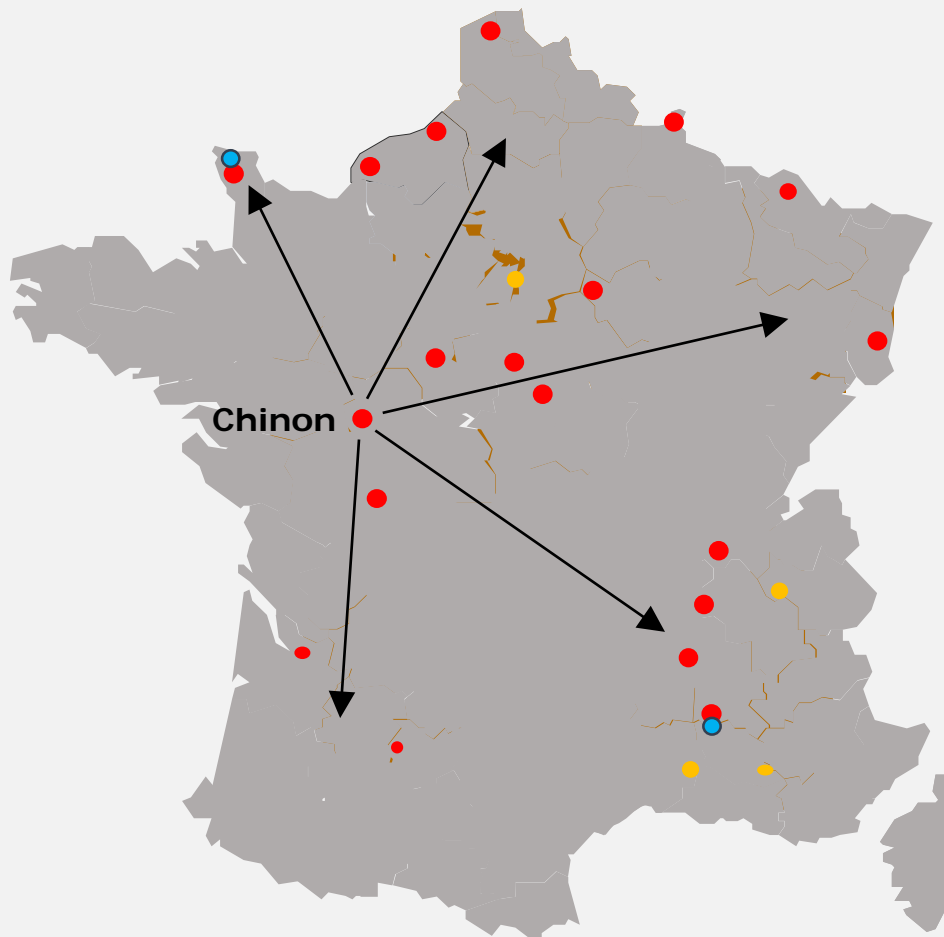
Gilles BLYWEERT – CEO

Groupe INTRA was created in 1988, two years after the Chernobyl accident by the three main French nuclear companies:

- **Electricité de France (EDF)**
- **Atomic Energy and Alternative Energies Commission (CEA)**
- **COGEMA (now AREVA)**

MISSIONS

- 1. DESIGN, MANUFACTURE, OPERATE and MAINTAIN a fleet of remotely operated machines capable of replacing humans in case of a major nuclear accident in and/or around its members installations**
- 2. READY for intervention within 24 hours on any French site**
(Mobilisation < 1 hour, Situation analysis and resources definition < 3 hours, Departure from Chinon < 5 hours , Max travel time = 11 hours, Equipment requalified < 3 hours)



Location:

- Fontenay Aux Roses
(Paris suburb from 1988 to 1995)
- Chinon NPP since July 1995

Scope:

- EDF Nuclear Power Plants (19)
- CEA Civil Research Centres (4)
- AREVA sites (La Hague and Pierrelatte)

Key Data



➤ Full time employees (seconded from parent companies)	: 20	} 4 Intervention Leaders
➤ Full time contractor	: 1	
➤ Pilots from parent companies	: 25 (outdoor and indoor robots)	} 8 pilots (civil works, drones and outdoor and indoor robots)
➤ Pilots from contractor	: 4 (civil works equipment)	
➤ Annual Budget	: 4M€	
➤ Total Investment since creation	: 40M€	
➤ Shares	: EDF	50 %
	: CEA	37,5 %
	: AREVA	12,5 %

Operational missions



Inspection and reconnaissance

- Inventories
 - Contamination and dose rate measurement
 - Sampling
-

Equipment monitoring

- Equipment (pumps, valves, etc)
 - Indicators, gauges, Instrumentation
-

Operations

- Valves
 - Actuators
 - Sources handling
-

Civil works

- Access reconnaissance
- Pathways
- Trenches excavation
- Dikes erection
- Soil stripping

Indoor equipment

EOLE



- Wire-guided
- Range: 350m (cable on integrated drum)
- 4 simultaneous video streams
- Radiation hardened electronics (maximum integrated dose: 10^4 Gy)
- Battery life of approximately 8 hours (lithium-ion batteries)

EROS



- Radiological instrumentation (gamma camera...)
- Gripper working load: from 5 to 16daN
- Crossing capabilities:
 - Obstacles: up to 40cm
 - Stairs: up to 45°
- Weight: 300 to 400kg

Outdoor equipment

ERASE



- Autonomy 10 hours (diesel engine)
- Max speed 4.2m/s
- Vision 5 video cameras
- Max integrated dose 10^3 Gy
- Remote control range 5km
- Arm working load 300daN
- Weight 5 to 6 tons



Civil Works equipment



EPPB

(Shielded control station)



EPELL

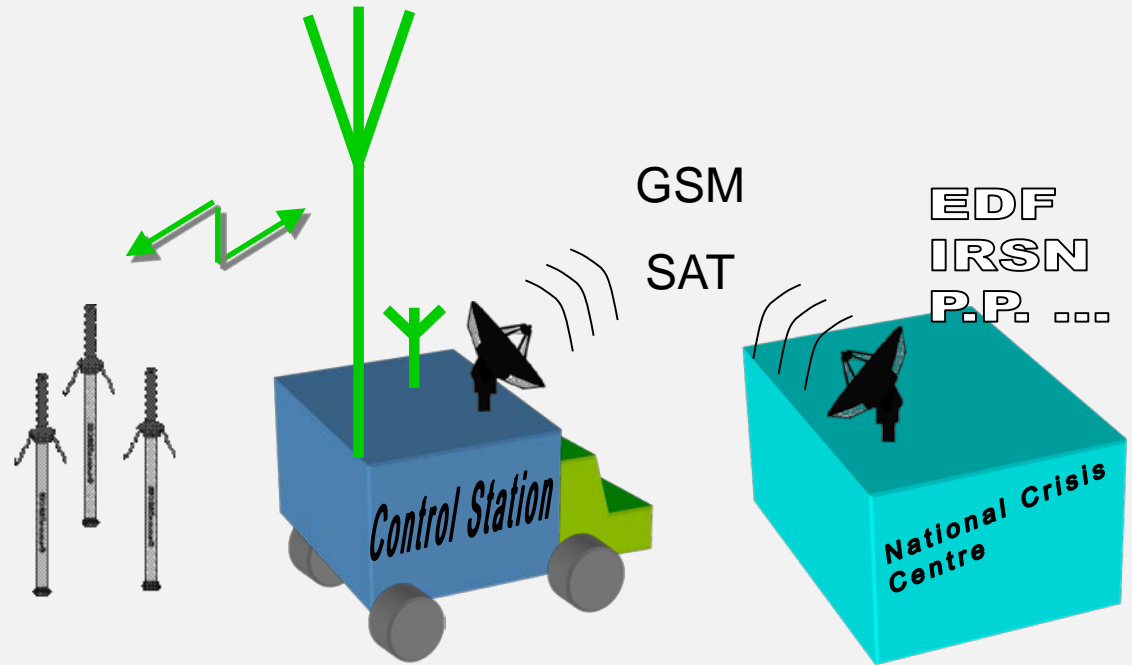


EBULL

300 m

- Autonomy > 30 hours
- Max speed: 5 to 85km/h
- Vision: 5 video cameras
- Remote control range: from eyesight to 300m
- Weight 20 to 54tons

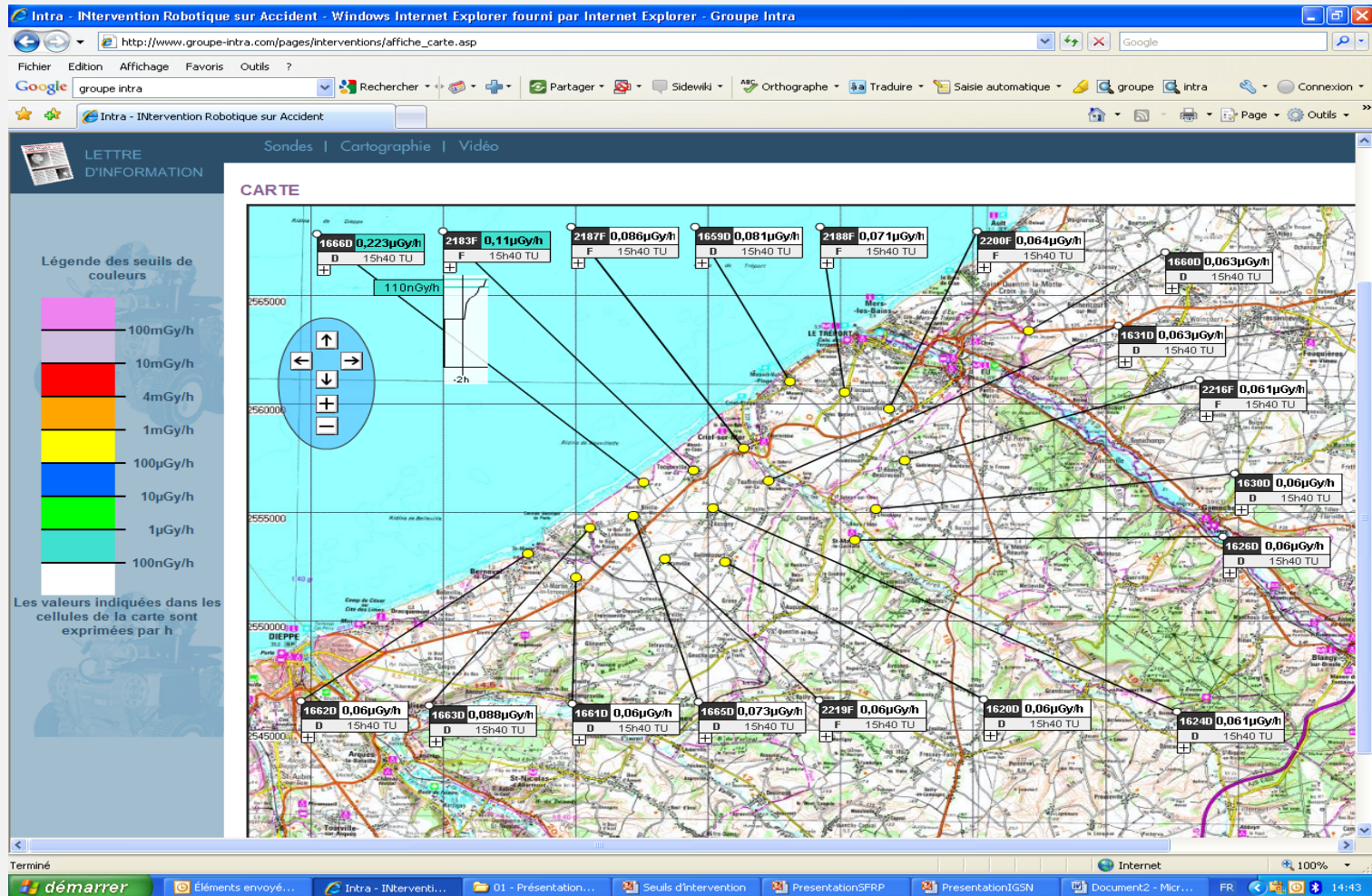
Radiological probes (SKYLINK)



Performance

- Detection Limit: 100nGy/h
- Maximum Range: 20km
- Sampling Frequency: 2 to 120mn

Radiological probes (SKYLINK)



Airborne Gamma Spectrometry survey

- Response in the event of incident or accident with potential or real radiological consequences (post-release)
- Environmental monitoring of nuclear and industrial facilities (mines, factories and dummy radiological survey runs)

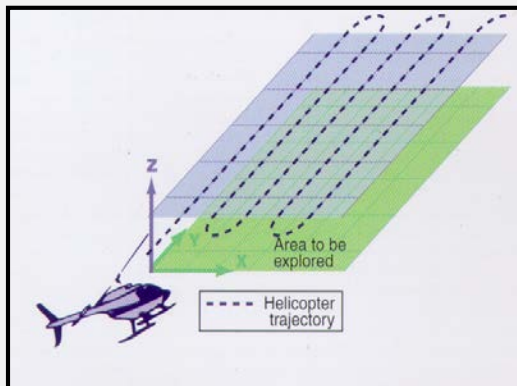


HELINUC

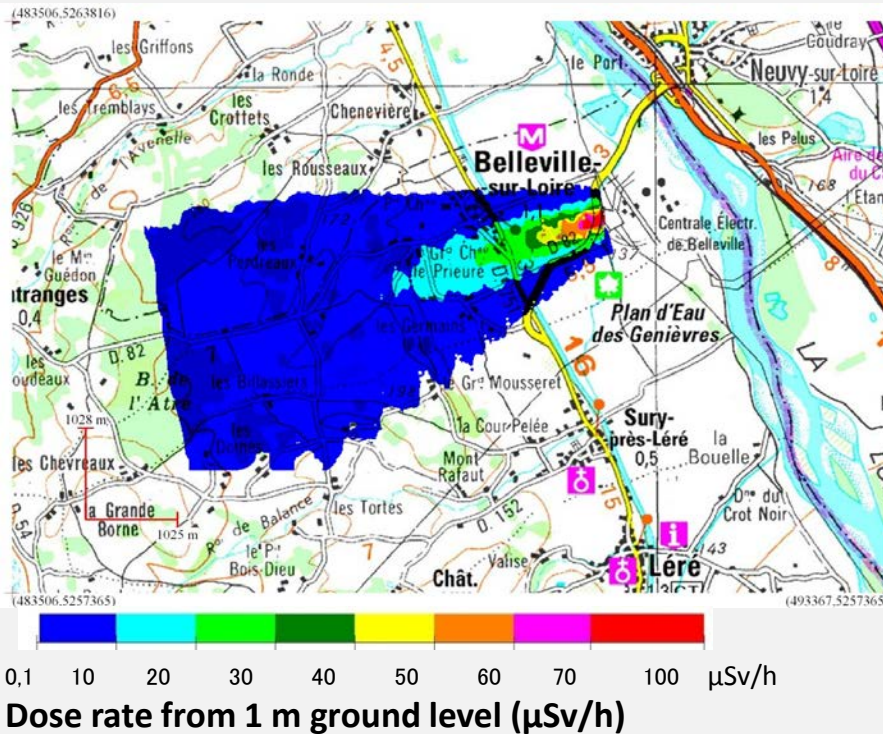
(developed by CEA)

Performance

- Sensors installation: < 2 hours
- Speed: 70km/h
- Altitude: 40m
- Grid spacing: 80m
- Measurement rate: minimum 50km²/day
- Data availability: < 30mn



Airborne Gamma Spectrometry survey



Sensors

- 1 NaI detector (16 litres)
- 2 high performance Ge detectors

Performance (40m altitude)

	<i>Contaminated Zone (2000m³)</i>	<i>Source</i>
E < 200keV	≈ 15kBq/m ²	≈ 250MBq
Cs 137	≈ 2kBq/m ²	≈ 40MBq
Co 60	≈ 1kBq/m ²	≈ 20MBq

Simulated map (Belleville NPP drill in 2005)

Fleet

Drones



- 1 thermal and 1 electric
- Autonomy: 20 to 120mn
- Payload: 3 to 5kg
(camera OTUS, detectors Canberra SG1R and SG2R)
- Remote control range: 10km
- Altitude: 3000m
- Speed: 90km/h
- Deployment: 30mn
- Usage: Reconnaissance and Measurement

Drones



High resolution camera OTUS

- 360°
- Self stabilised
- Zoom x 10
- Tracking enabled

Radiological detector SG1 and 2R

- NaI detectors (1 x 1 or 2 x 2 inch)
- Detection Limit : 100nGy/h at \approx 20m
- Sampling Frequency: 1s



Latest developments

Drones (gamma measurement - CARTODRONE)



Latest developments

Trailer EMOI

- Carry 2 indoor equipment (EOLE and/or EROS) to extend range up to 3km
- Additional channel between control station and outdoor equipment (ERASE)



Latest developments

Trailer EMOI

CTRL STATION 1



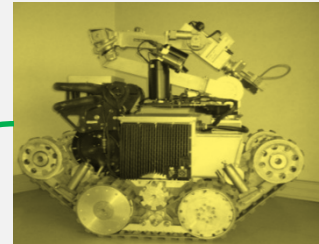
Coaxial Link

CTRL STATION 2



Optic Fiber (3 km)

EOLE/EROS

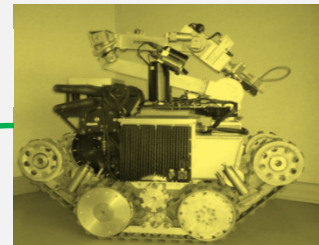


ERASE



EMOI

Wire (350 m)

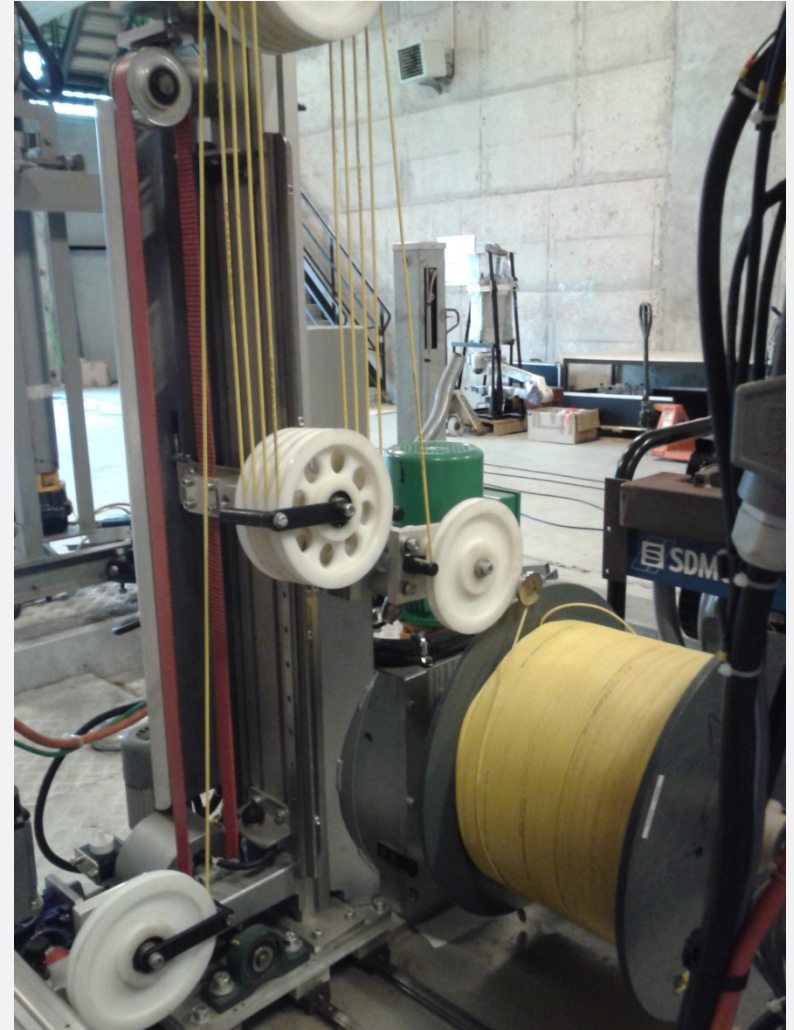


350 m

Latest developments

Trailer EMOI

- Development of a specific system to ensure that optic fiber is laid on the ground without tension



Latest developments

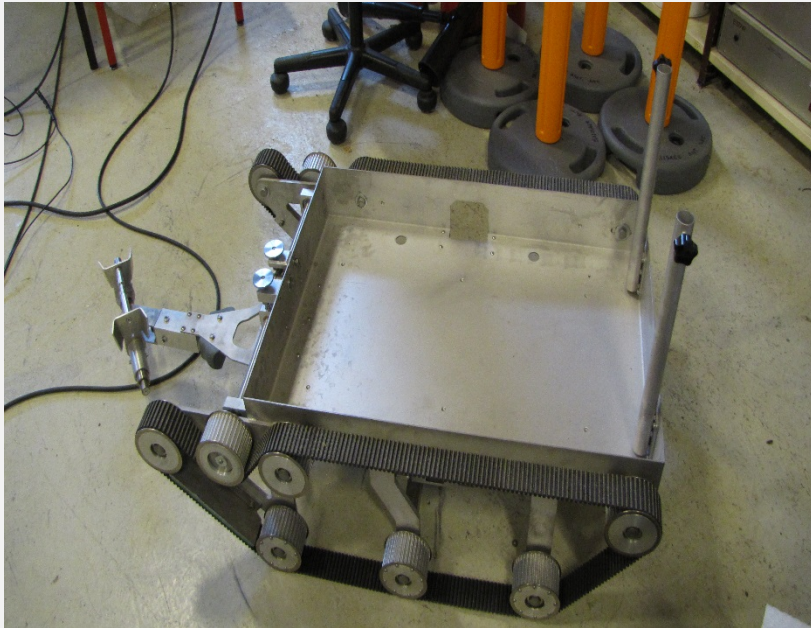
Trailer EMOI



Latest developments

Trailer SAS BR

Designed to enable indoor equipment missions inside a French 900 MW class reactor building with closed air lock

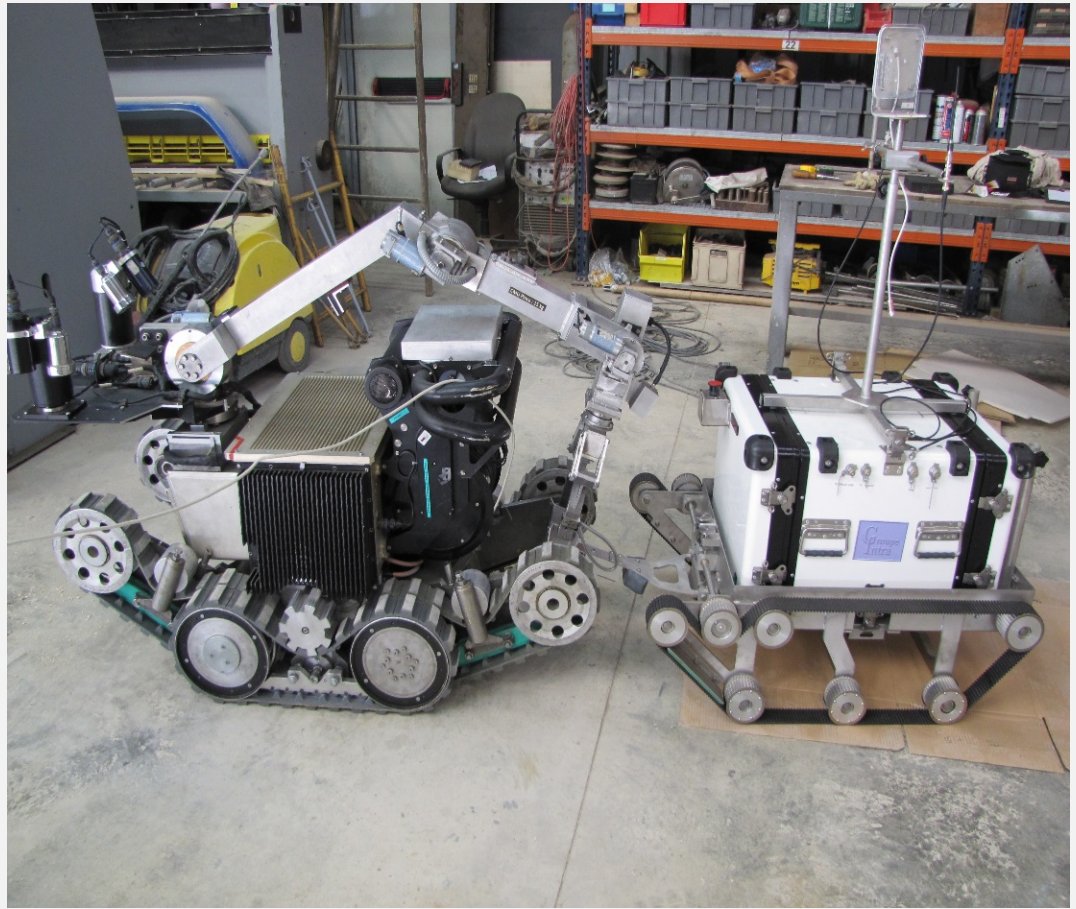
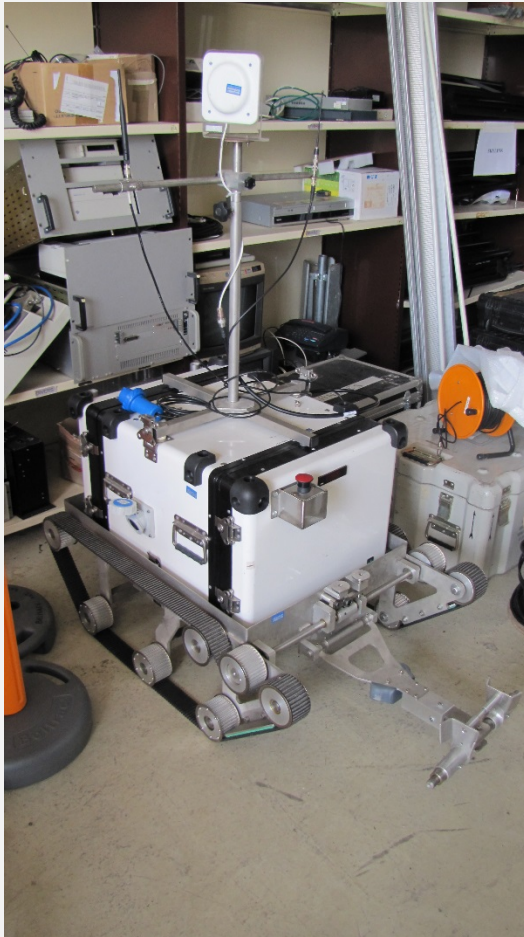


Performance

- Convoy (robot + trailer) max length: 2.45m
- Stair height capacity: 115mm
- Payload (box + mast + antennas): 60kg
- Remote control range: up to kms (optic fiber)
- Air lock tightness guaranteed (only one door open at a time during crossing)
- Easy coupling and uncoupling to EOLE
- Forward and backward travel
- Provide strong anchor for EOLE guiding wire

Latest developments

Trailer SAS BR

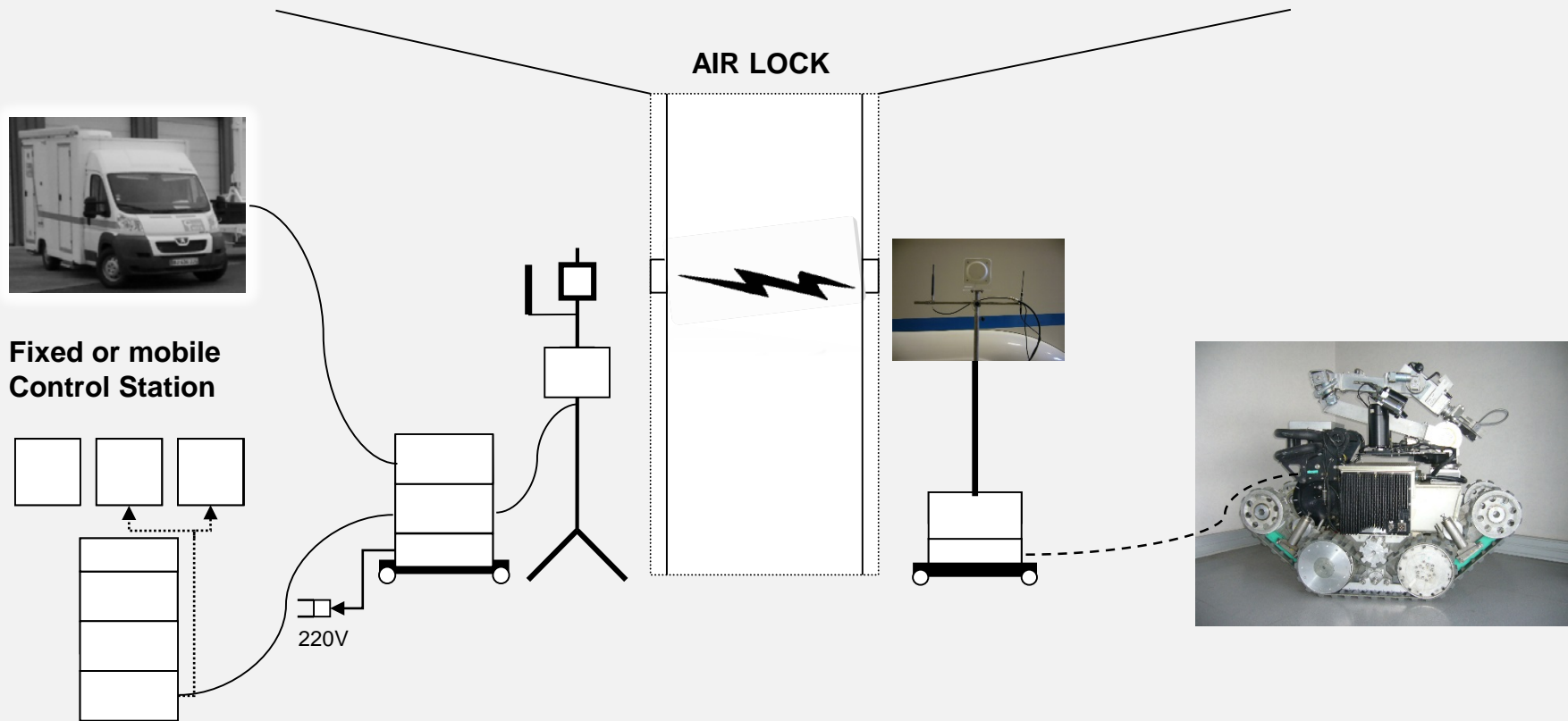


Latest developments

Trailer SAS BR

NUCLEAR AUXILIARY BUILDING

REACTOR BUILDING



Thank you for your attention



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