

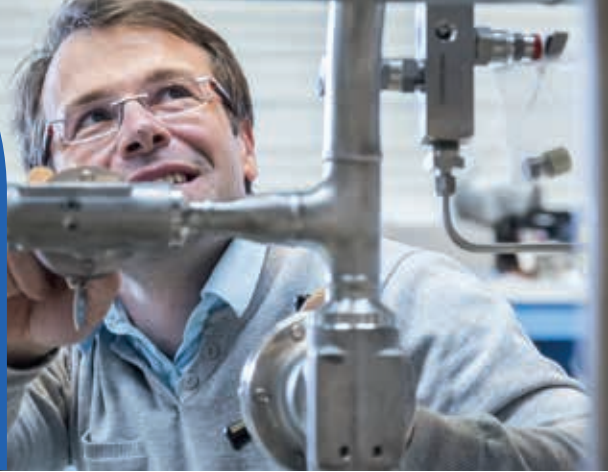
Marine

Gas generation and associated equipment
for naval applications



World leader in the field of air gas separation technologies with more than fifty years of experience, Air Liquide advanced Technologies is a benchmark in expertise.

Our teams design and develop systems for the production, storage, regeneration of gases and the reliquefaction of boil-off gases on board submarines and surface vessels (for civil and military marine).



Military field

Surface vessels

Air Liquide is developing units for the production of oxygen and nitrogen in a marine environment to answer your needs in:

Gaseous oxygen on-board

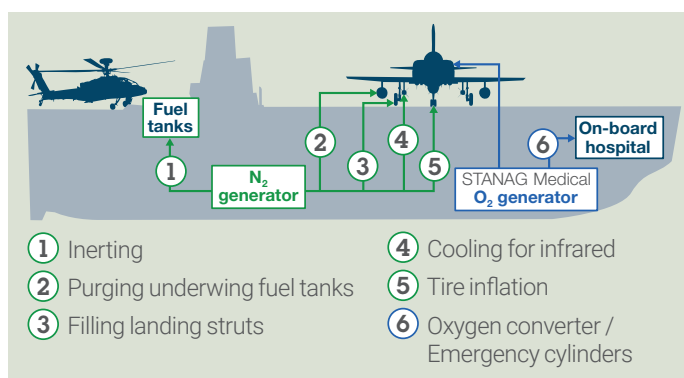
- To fill emergency egress devices and back-up cylinders for fighting aircraft
- For medical use, compliant with STANAG standards

Liquid oxygen on-board

- To fill oxygen converters for fighting aircraft

Gaseous nitrogen on-board

- To inert the jet fuel tank
- To purge hoses, pipe and external underwing fuel tanks
- To inflate tires, to fill landing struts and hydraulic system
- To cool infrared cameras and cells (optronics)



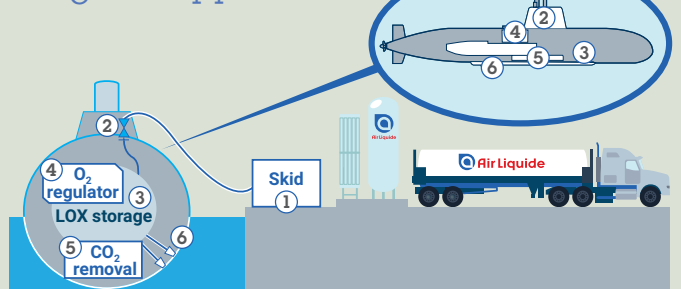
Submarines

Air Liquide has developed innovative solutions and equipment to:

- Regenerate confined atmospheres (using valves, valve boxes, hoses, oxygen regulator, oxygen removal, etc.)
- Store **cryogenic oxygen** for use in **powering submarines in a dive** and supplying their crews with **breathable air**
- Provide gas utilities and equipment at dockside: tank, skid, flexible hoses



Air gases applications



Hydrogen is at the heart of the clean transport revolution. As a precursor of hydrogen mobility, Air Liquide has been using its existing industrial facilities, technologies and expertise to develop applications for transportation.

Thanks to hydrogen, Air Liquide is supporting the transition of the transport sector towards environmentally friendly mobility, in particular through its expertise in liquid hydrogen, which is particularly well suited to intensive mobility.



Hydrogen expert for more than 50 years

Liquid hydrogen storage

Present across the entire hydrogen value chain, from production to the various applications, including transport and storage, Air Liquide is putting its technical and industrial expertise to contribute to the clean transport revolution.



Hydrogen fuel cell

Standard and tailor-made fuel cell stacks and system design to meet all your specific needs: PEM* metal & carbon /single stack up to 120 kw with possible scale-up to 500 kw.

- Best-in-class performance: > 2 kw/L & > 2.2 kw/kg
- Long lifetime: > 20,000 h
- Operates from atmospheric pressure
- Cost killing: < 250 €/kw for 1,000 stacks
- Manufacturing can be licensed
- Onsite fuel cell test facility

* PEM: Proton Exchange Membrane



Services

Air Liquide offers client support from projects start to finish, from pilot feasibility study to on-site equipment start-up.

Cryogenic fluid testing facilities that are unique in Europe are also made available for qualification testing in a naval environment.

Air Liquide's teams support their clients by offering services such as:

- Maintenance
- Maintain in operation ready condition
- Obsolescence management
- Training

At dockside and in operation.

Contacts

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A world leader in gases, technologies and services for Industry and Health, Air Liquide is present in 73 countries with approximately 67,100 employees and serves more than 3.9 million customers and patients.