

# IMPROVED MISSION EFFECTIVENESS

Submarine life support and power generation systems



**Collins Aerospace**



## GO BENEATH THE SURFACE WITH A PROVEN LEADER

Nuclear-powered submarines can cruise underwater at full power for years – but their crews need air. Collins environmental control and life support systems detect and remove CO<sub>2</sub> from the air and produce oxygen, replenishing and supporting an inhabitable environment. Collins submarine life support systems make it possible for sailors to live and work comfortably.

Our environmental control and life support systems not only protect the crew, but also the submarine machinery. Prolonged exposure to seawater can cause biofouling, creating a build-up of organisms that can damage seawater piping and machinery, and propulsion systems. Our systems prevent marine organism buildup and reduce biofouling.



## ENVIRONMENTAL AND LIFE SUPPORT SYSTEMS

SYSTEM	BENEFITS
Central Atmosphere Monitoring System (CAMS)	<ul style="list-style-type: none"> <li>• Provides early detection, identification and warning of possible hazardous atmospheric conditions within the submarine</li> <li>• Designed to meet a wide range of environmental, operational and analytical requirements as specified by the U.S. Navy</li> </ul>
Low Pressure Electrolyzer (LPE) and Advanced Integrated Low Pressure Electrolyzer (AILPE)	<ul style="list-style-type: none"> <li>• Produces low-pressure oxygen via electrolysis of water</li> </ul>
Advanced CO2 Removal Unit (ACRU)	<ul style="list-style-type: none"> <li>• Necessary for long term submerged operations performed by nuclear powered submarines in order to remove CO2 from the atmosphere</li> </ul>
Electrolytic Chlorine Generator (ECG)	<ul style="list-style-type: none"> <li>• Converts seawater to chlorine for easier chlorination of seawater piping systems</li> <li>• Chlorination helps prevent buildup of marine organisms and reduce biofouling</li> </ul>

## POWER GENERATION SYSTEMS

Collins power generation systems enable non-nuclear submarines to stay beneath the sea longer, keeping them in stealth mode and maintaining a charge on the batteries. Submerged stealth is key to avoiding detection and completing the mission.

Our systems greatly improve submersion endurance. The S-80 Spanish Navy increased submerged time from days to three weeks with Collins maritime power generation systems.

SYSTEM	BENEFITS
S-80 Fuel Cell Power Module (FCPM)	<ul style="list-style-type: none"> <li>• Charges the submarine's batteries while submerged to extend the time required prior to returning to the surface to snorkel thus extending the submarine's stealth capabilities</li> </ul>
UUV Fuel Cell Power System	<ul style="list-style-type: none"> <li>• S-80 fuel cell, scaled to operate with cryogenic oxygen and hydrogen, or compressed hydrogen</li> <li>• Demonstrated TRL 6 system test completed</li> </ul>

# THE FUTURE OF SUBMARINES – INTERNATIONALLY

Since 1976, Collins has been providing systems for every submarine class in the U.S. With our experience and resources, we're expanding our reach to international markets.

Our modernized and highly reliable systems are making an impact on the future of submarines around the world.

## CAPABILITIES

- Full design, development and qualification capabilities:
- Mechanical and electrical systems and test capabilities
- Complex sea-based systems
- Grade A shock requirements
- Acoustics
- Fuel cell systems
- US and international design requirements

Full Navy specific manufacturing, assembly, test and integration capabilities:

- Life support systems
- Torpedoes
- Fuel cells
- UUV sub-systems

Aftermarket technical services:

- Technical support, spares and repairs



# DEFINING THE NEXT GENERATION OF SUBMARINES

In the air, on the ground or at sea – Collins Aerospace brings innovative and trusted solutions where they are needed the most. Leveraging our diverse experience, assets, capabilities and breadth of products, we deliver solutions that improve submarine safety and increase mission readiness.

Collins is the industry leader in submarine life support systems and power generation technology. We have been on board all U.S. submarines built since 1976. We're on British and Japanese submarines and are the prime supplier of fuel cells to Navantia's S-80 submarine for the Spanish Navy. Our products are proven in missions worldwide.

We make it easy for customers to stay mission-ready with full aftermarket support services – anywhere in the world. Collins covers the full lifecycle of products – from design, development, manufacturing and testing to aftermarket and support – we define the future of maritime technologies.



To learn more, go  
→ [collinsaerospace.com](https://collinsaerospace.com)

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