

# Lighthouses and Navigational Aids in Antarctica: The Silent Service that Has Enabled Safety

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## 01 INTRODUCTION

Every Antarctic operation begins and ends at sea. Before a scientist deploys an instrument or a station receives its annual resupply, a ship must safely navigate some of the most hostile and least surveyed waters on Earth. That precondition rests on an infrastructure that rarely appears in Antarctic narratives: the lighthouses, beacons, buoys and electronic signals that together constitute aids to navigation. It is a silent service in the most literal sense — unnoticed when it works, potentially catastrophic when it fails. From the rudimentary cairns and marks left by 19th-century sealers to the formal state-installed signals of the 20th century, this infrastructure has quietly enabled science, logistics and tourism on the white continent.



A lighthouse specialist of the Chilean Navy services a beacon on the shores of the Chilean Antarctic Territory.

## 02 SOURCES & APPROACH

Historical–documentary analysis combining primary sources of the 1947 Chilean expedition (*Terra Australis*, 1948; *Valientes muchachos*, 2007), institutional records of the Chilean Navy and Directemar, and the international technical corpus: IMO (SOLAS, Polar Code), IHO hydrographic reporting and IALA standards for marine aids to navigation.

1947

1957

1959

1967–69

1974

1991

2017

2024

2025

2032–33

First Chilean Antarctic lighthouse lit at Punta Prat

IALA founded

Antarctic Treaty signed

Deception Island rescues: 46 lives saved

SOLAS Convention adopted

Madrid Protocol: Antarctica a natural reserve

IMO Polar Code enters into force

IALA becomes an intergovernmental organization

Piloto Pardo lighthouse lit at Deception Island

International Polar Year

## 03 FINDINGS



A lighthouse task force of the Chilean Navy with helicopter support.



Solar-powered beacon with daymark boards beside a Chilean Antarctic base.



Specialists servicing an isolated beacon in Antarctic waters.

### The silent service

Behind every signal there are people. Chile's Antarctic network of 78 aids to navigation is operated by the Navy's lighthouse specialists, deployed each austral summer by ship, boat and helicopter under strict environmental protocols, coordinating with INACH in protected areas. The zonal centre at Punta Arenas alone manages 50.3% of Chile's 1,801 national signals. Their work is measured, paradoxically, by its invisibility: the signal that works makes no news.

### Technology and the dual mission

From the acetylene lantern of 1947 to LED optics, solar power, modular low-impact towers and satellite positioning, Antarctic signals now operate in physical, synthetic and virtual AIS modalities. Under IALA standards the modern lighthouse is a platform, hosting radar transponders, AIS stations and sensors able to transmit meteorological and hydrological data: a node of environmental observation on a continent where such points are scarce.

### Case study: Piloto Pardo lighthouse (2025)

The most modern lighthouse in the Chilean Antarctic Territory was built at Deception Island — among the most visited sites on the continent — by a nine-person naval task force, and lit on 21 March 2025: exactly 78 years after the first Chilean Antarctic light at Punta Prat. Powered by renewables, it operates both as a physical signal and as data for electronic charts, and honours the 1967–69 rescues that saved 46 lives.



1947 → 2025: a historic Chilean Antarctic lighthouse tower (left, archival) and the Piloto Pardo lighthouse at Deception Island, with OPV Marinero Fuentealba offshore (right).

78

Chilean aids to navigation in Antarctica

< 5%

of Antarctic waters surveyed to modern standards (IHO)

118,491

visitors in the 2024–25 season (IAATO)

46

lives saved in the Deception Island rescues, 1967–69

## 04 SAFETY, TOURISM AND THE NETWORK

The coming decades pose a demanding equation: more traffic over insufficiently surveyed waters. Antarctic tourism reached 122,072 visitors in 2023–24 and ~118,500 in 2024–25, with over 95% of landed activity concentrated in the Peninsula (IAATO), while the IMO Polar Code itself warns that chart coverage may be inadequate for coastal navigation. The response is threefold: accelerating hydrographic surveys of the busiest routes; transitioning to S-100 digital chart services; and consolidating the network of physical and AIS aids at the most-frequented passages and landing sites, built to IALA standards under the Madrid Protocol. As climate change reshapes navigable waters, the network must be dynamic — expanding into newly open areas, with virtual aids responding where physical infrastructure has not yet arrived.

## 05 CONCLUSION: A KEY TO THE FUTURE

Antarctic aids to navigation are a concrete, verifiable form of international cooperation: installed by individual states yet serving every flag. Conceived as an integrated network of safety and observation, they can guide the navigator while measuring the ocean where no one else does — directly benefiting the safe operation of scientific expeditions, protecting the aquatic environment and safeguarding human life at sea. Recognising the specialists who sustain this silent service is a condition of its future. In Antarctica, a lighthouse is never just a lighthouse.

**Key references:** Orrego Vicuña, E. (1948). *Terra Australis*. Zig-Zag · León Wöppke, C. & Jara Fernández, M. (eds.) (2007). *Valientes muchachos* · IALA (2017). Recommendation R1001; (2024) IGO transition · IMO (2017). Polar Code · IHO (2025). Report to ATCM 47 · IAATO (2025). Overview of Antarctic Vessel Tourism · Armada de Chile & Directemar institutional records (2017–2025).

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