T1.4-P7

Risk Management and Program Execution of the Design, Build, and Installation of HA04 Crozet Islands

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MariPro

ABSTRACT

L3 MariPro manages program risk using a structured and formalized process. The purpose of this poster is to describe the risk management highlights used throughout the design, build, and install of HA04 at the Crozet Islands.

This poster summarizes the defined roles and responsibilities, required activities, unique processes and review requirements. The Risk management process described was applied to all program risks including those associated with subcontractors. The Program Risk items are updated monthly and reviewed with the Commission. It is noted that the Commission is involved during the course of the project in helping to identify and mitigate risks. The contributions of the team assist in maximizing the likelihood of delivering a system that satisfies all specification, cost and schedule requirements.

L3 MariPro's Risk Management Team is comprised of the Program Manager, Project or Systems Engineer and Task Managers. The primary responsibility for risk assessment and management rests with the Program Manager, with the assistance of the Project or Systems Engineer. Task Managers provide key expertise in the assessment and mitigation definition efforts for identified issues.

The risk management process highlights during the following phases of the HA04 program will be presented:

- **Land Survey**
- **Route Working Group (RWG)**
- **System Design**
- **System Integration Testing**
- **Installation Readiness Review (IRR)**
- **System Installation**

L3 MariPro was under contract to the CTBTO to design, build, and install the onshore and offshore system required to re-establish Hydroacoustic Station HA04 at the Crozet Islands, France. The system is composed of two new hydrophone triplets, underwater cables and associated equipment (collectively called the Underwater Segment (UWS)) and Shore Terminus (ST). The two individual UWSs are labeled North and South. The Shore Terminus and Outside Plant were installed in February 2016.

The UWS installation took place during the austral summer of 2016/2017, between the dates of 21 October 2016 and 03 February 2017. A telecommunications vessel based out of the USA was used as the installation platform. The two UWS systems were mobilized and loaded in the USA. The vessel transited to Cape Town, South Africa, collected the balance the installation team and installed the system.

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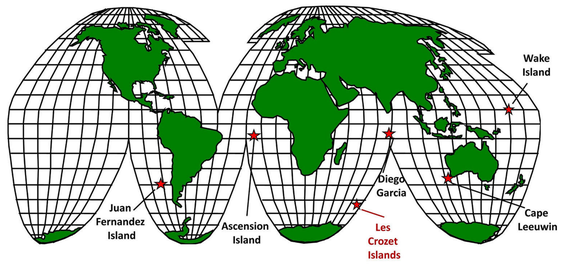
GLOBAL ALARM SYSTEM HYDROACOUSTIC MONITORING NETWORK



Under CTBTO, a global system of nuclear monitoring stations has been established to record data necessary to verify compliance with the Nuclear Test Ban Treaty. This network of monitoring stations is capable of registering shock waves emanating from a nuclear explosion underground, in the seas, and in the air.

Hydroacoustic stations detect sound waves produced by natural and man-made phenomena in the oceans, allowing monitoring of explosions and seismic events. The CTBTO International Monitoring Network contains eleven hydroacoustic stations and five T-phase stations that monitor the world's oceans. The stations have been distributed to cover all the oceans of the world, or approximately 70% of the surface of the earth.

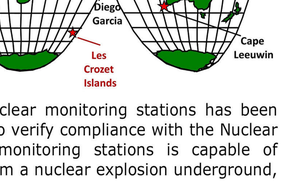
A hydrophone node consists of a buoy, riser cable, hydrophone, and mooring. The steel base of the node serves as an anchor while the moorings are kept taut by the orange subsurface buoys. The hydrophone, after installation is located between the float and the anchor in a green protective covering approximately 750 m below the surface.

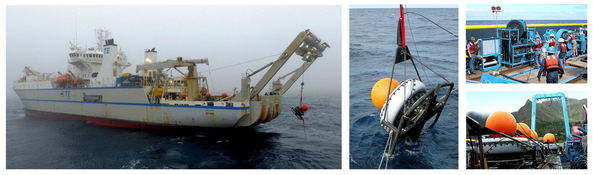
The underwater acoustic signals are detected by the systems, north and south, by means of a triplet of hydrophones located at the end of each cable. Explosions cause pressure waves in the water that are received by the hydrophones and converted to an electrical signal, which is instantly sent to the Shore Station via the fiber optic cable.

Each system, north and south, is comprised of three nodes. The sensors are positioned in an equilateral triangle measuring approximately two km per side. The signals from each node are instantly transmitted to the Shore Station by means of a fiber optic cable.

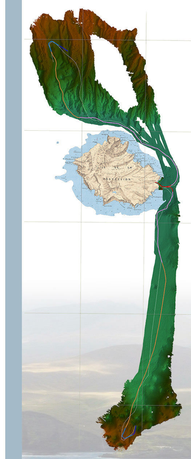
On shore, the cables terminate at the Shore Station which contains equipment that transmits the raw data received from the hydrophones to the CTBTO's International Data Center in Vienna.

There, signal processing is used to identify the differential results between explosions and seismic events. CTBTO then makes the data and analysis results available to the State Signatories.





HA04 CROZET ISLANDS PROGRAM
DESIGN | MANUFACTURING | TEST | INSTALLATION



CTBTO commissioned L3 MariPro to begin HA04 re-establishment efforts in December 2014. L3 MariPro was tasked with replacing the Underwater Segment (UWS) and installing the Shore Terminus (ST) equipment. HA04 was the sixth hydroacoustic station installation completed by L3 MariPro for CTBTO.

L3 MariPro developed a system design to meet the harsh environmental conditions found at Crozet Islands. The installation started from the shore, laying the near shore cable and continuing with the trunk cable and nodes in a continuous operation. The system was fully assembled prior to beginning the lay, so that significant interruptions such as recovering components, temporarily installing hardware, completing joints or deploying an ROV were not required. With this approach, although incremental weather was encountered, the installation was completed in a minimal amount of time. The project scope included: land/site survey and familiarization, design tailoring, manufacturing and testing, installation and acceptance testing.



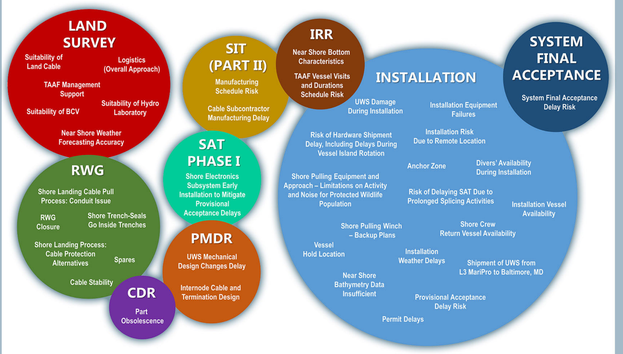


L3 MARIPRO CORE COMPETENCIES

L3 MariPro, backed by L3 Technologies Corporation, the sixth largest defense company in the United States, has been an active participant in commercial, academic and military undersea programs for over five decades. We have a strategic commitment to the current and long-term success of all of our customers and in particular a 15-year relationship with the Commission; including the successful provision of all of the currently operational hydroacoustic systems. We are continuing to make long-term investments in experienced key personnel, independent research and development, and capital and facility upgrades to offset risk and minimize cost to our customers. We will continue to listen to our customers, working in partnership to provide products and services that meet cost and schedule requirements.

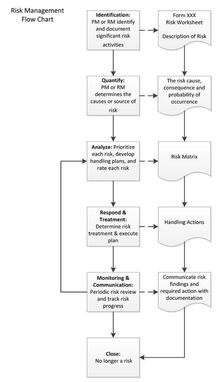
L3 MariPro's key market areas include Acoustic Ranges, Surveillance, Ocean Observing, Port Security, Commercial, Through Water Communications, and Technology.

PROGRAM RISKS
Timely identification of program risks is the key to successful Risk Management

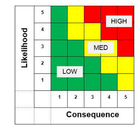


Risk is defined as the probability of failing to attain a particular outcome and consequences of that failure. Risk management is a key element in successful program completion. L3 MariPro's Risk Management Plan (RMP) was tailored for the Crozet Islands HA04 Hydroacoustic Station Re-establishment program. The Risk Management Team, working in close cooperation with CTBTO, provided key expertise in the assessment and mitigation efforts for risks.

The risk identification process started with the development of a list of items that are a mix of concerns, uncertainties, and issues. The identified risks were assessed based on their likelihood and consequence of occurrence. The consequence of occurrence is assessed for technical, schedule, and cost categories. This process resulted in assigning risk ratings for each risk event. The items resulting in the highest risk assessment were chosen for risk analysis and mitigation.



Risks were recorded in a Risk Management Register (RMR) and the RMR was reviewed at all program meetings.



For the HA04 Crozet Islands installation, 38 total risks were identified, analyzed, and successfully mitigated.

Technical Risk: Risk associated with the evolution of design and production of system and/or components affecting performance necessary to meet operational requirements.

Schedule Risk: Risks associated with adequacy of the time estimated and allocated for the technical development, production, and fielding of the system.

Cost Risk: Associated with the ability of the program to achieve its program/delivery order cost objectives.

SUMMARY

After years of planning, commitment and persistence, the re-establishment of hydroacoustic station HA04 in the Crozet Islands (France) was successfully completed in December 2016 through the combined efforts of L3 MariPro, CTBTO, the Administration of the French Southern and Antartic Territories (TAAF), the Crozet Natural Reserve, and the Station's Executive Agent, Commissariat à l'Energie Atomique et aux Énergies Alternatives (CEA). The successful installation of HA04 completes the global hydroacoustic network.