



Holographic Display for National Security

September 2024

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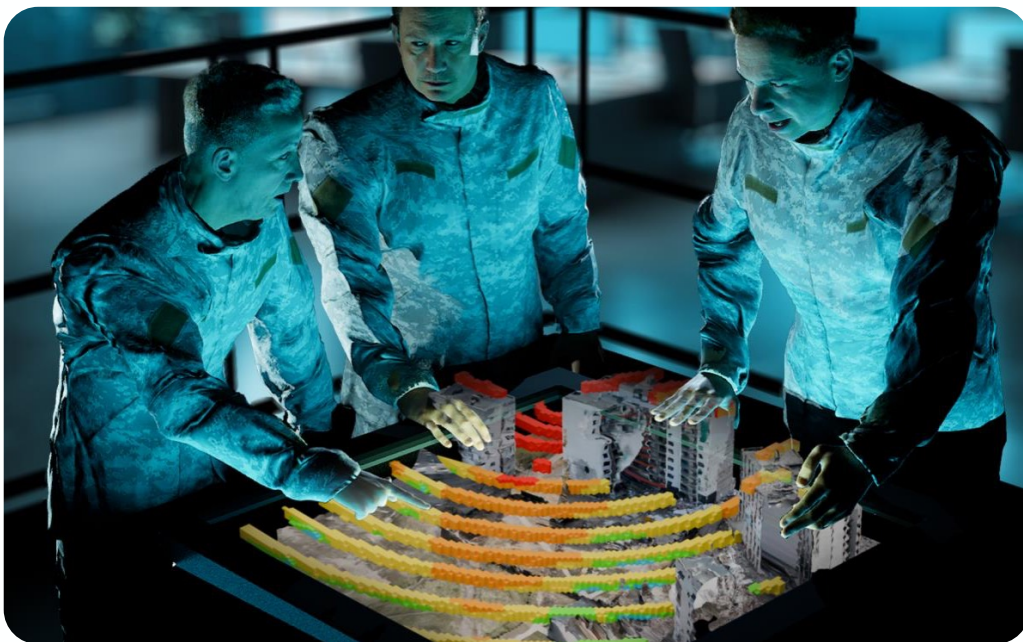
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Executive Summary

Avalon's NOVAC system is a next-generation holographic display tailored to meet the evolving needs of defense and security operations. It revolutionizes situational understanding by offering a true 3D visualization of complex battlespaces, essential for modern decision-making and strategic planning in multidomain operations. With seamless integration into existing defense platforms like Tactical Awareness Kit (TAK) and the SIMDIS 3-D Analysis and Display toolset, as well as publicly available data sources like Google Earth and Esri, NOVAC aggregates diverse data into a unified display, enabling precise and efficient visualization of multifaceted scenarios. Its immersive 40" display, coupled with a 74-degree viewing angle and over 5 billion rays, allows users to visualize operational environments with clarity, enhancing the accuracy of resource allocation and mission-critical decisions. Designed for interoperability and efficiency, NOVAC empowers defense agencies with tools to address contemporary challenges with unparalleled precision and insight.

NOVAC serves as a pivotal asset in modern defense operations for enhancing mission briefings through dynamic 3D visualizations of flight paths and natural and manmade terrain features, complex situations and items of primary concern aligned from the tactical to the strategic viewpoint. It facilitates virtual training by enabling adaptive learning experiences and rapid appreciation for complex topics such as Radio Frequency (RF) propagation. Its ability to ingest and integrate real-time data, ranging from sensor inputs and topographical data to dynamic threat assessments, enables key decision makers with the ability to make informed decisions and adapt strategies in real-time, enhancing operational effectiveness across diverse security sectors. The 3D view of the operational environment presented by NOVAC offers the National Security Council (NSC) the ability to see the granular and tactical details needed for operational context and to fully appreciate the variables of high risk and politically sensitive missions.



Avalon NOVAC™ Display

Introduction

Unlike traditional two-dimensional displays, this innovative holographic solution offers a three-dimensional, immersive visualization experience, enabling operators and commanders to interact with complex data and scenarios with unparalleled clarity and depth. The NOVAC holographic display, available today, addresses critical challenges faced by defense organizations, such as information overload, spatial limitations, and decision-making under pressure. By presenting data, terrain, and simulations in a holographic format, the resultant rendering enhances situational awareness, facilitates collaborative planning, and streamlines communication among military personnel. Furthermore, its ability to render dynamic, real-time visuals in a 3D space empowers defense organizations to simulate alternative scenarios, optimize resource allocation, and devise more effective strategies and responses.



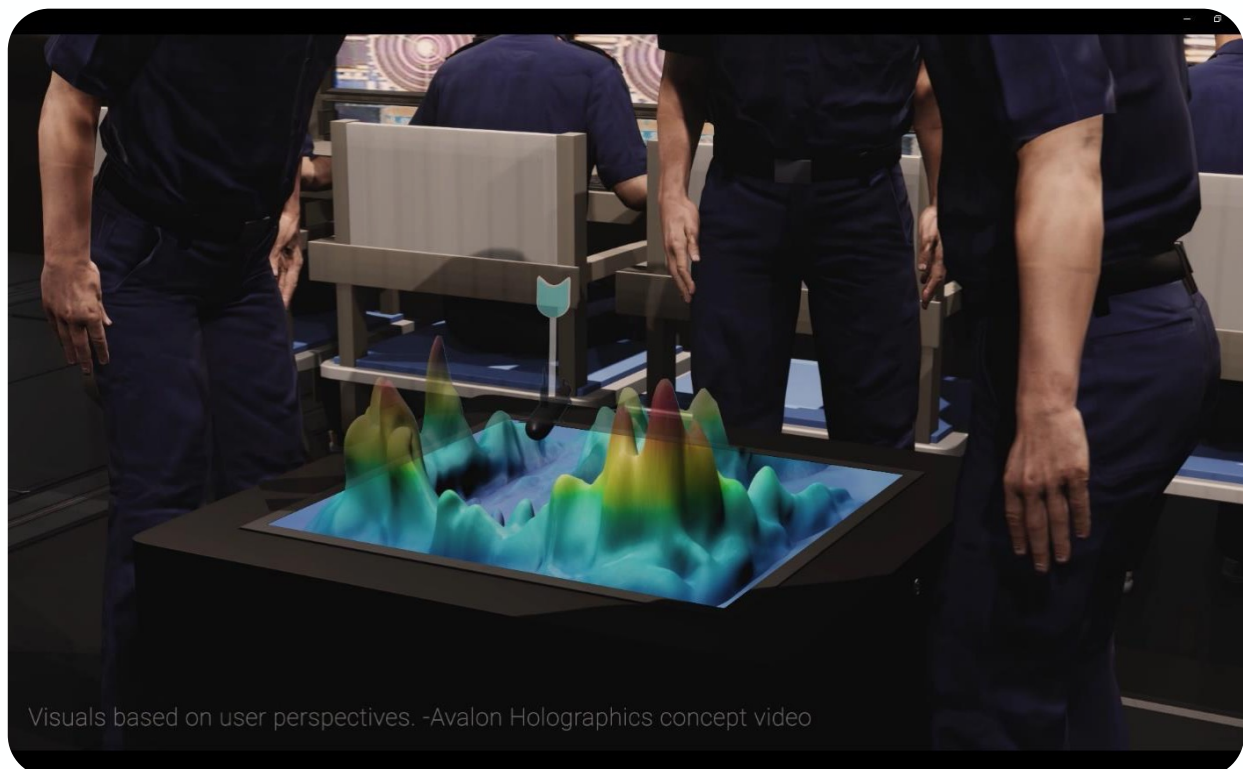
Holographic Display Technical Specifications and Capabilities

NOVAC solves long-standing data visualization problems with powerfully detailed holograms that provide a natural 3D Common Operating Picture (COP) and battlespace situational awareness. Designed to be interoperable with existing systems, NOVAC delivers a 3D view without the need for any headsets or awkward accessories. By reducing cognitive load and improving operational tempo, NOVAC empowers users to make better decisions, faster.

NOVAC stands as a pioneering platform that adeptly ingests critical battlespace data, encompassing intricate details like terrain and bathymetry, through universally recognized Open Geospatial Consortium (OGC) formats such as 3D Tiles, as well as common data sources like Google Maps and Esri. Future data sources like One World Terrain (OWT) can be easily integrated.

Going beyond mere topography, NOVAC seamlessly integrates platform and entity information into the dynamic 3D environment either via predefined scenarios or a robust application programming interface (API) framework. Furthermore, the platform can ingest a diverse array of inherently 3D sensor data types – including but not limited to sonar, radar, and most of the usable RF spectrum – into the unified 3D scene. The culmination of these capabilities manifests in a truly immersive holographic viewing experience, enabling stakeholders to engage with complex data sets in a natural, intuitive manner. This fosters enhanced situational awareness and informed decision-making within defense and strategic sectors.

NOVAC is 40" diagonal screen, has almost a foot of depth, more than 5 billion rays, and can be seen by multiple viewers.



Visuals based on user perspectives. -Avalon Holographics concept video

Technical Requirements

Display	
Screen Size	40"
Resolution	63,888 x69,696 5 Billion Rays of Light. Equivalent to 2,500 HD TVs
Active Pixels	4.5 Billion
Aspect Ratio	1:1 (Square)

Light Field	
Number of Viewers	6-8
Viewing Angle	74 degrees x 74 degree viewing angle (other optical configurations available)

Dimensions	
Size Dimensions (L x W x H)	3.5' L x 3.2' W x 2' H
Weight	929.5lbs, 422.5kg
Power Consumption	6700 watts

Software Details	
Battle Management System Integration	SIMDIS, TAK, AFSIM, Google Maps, One World Terrain, ESRI/ArcGIS, etc

Expected Use Cases

Mission Briefing and Common Operating Picture (COP)

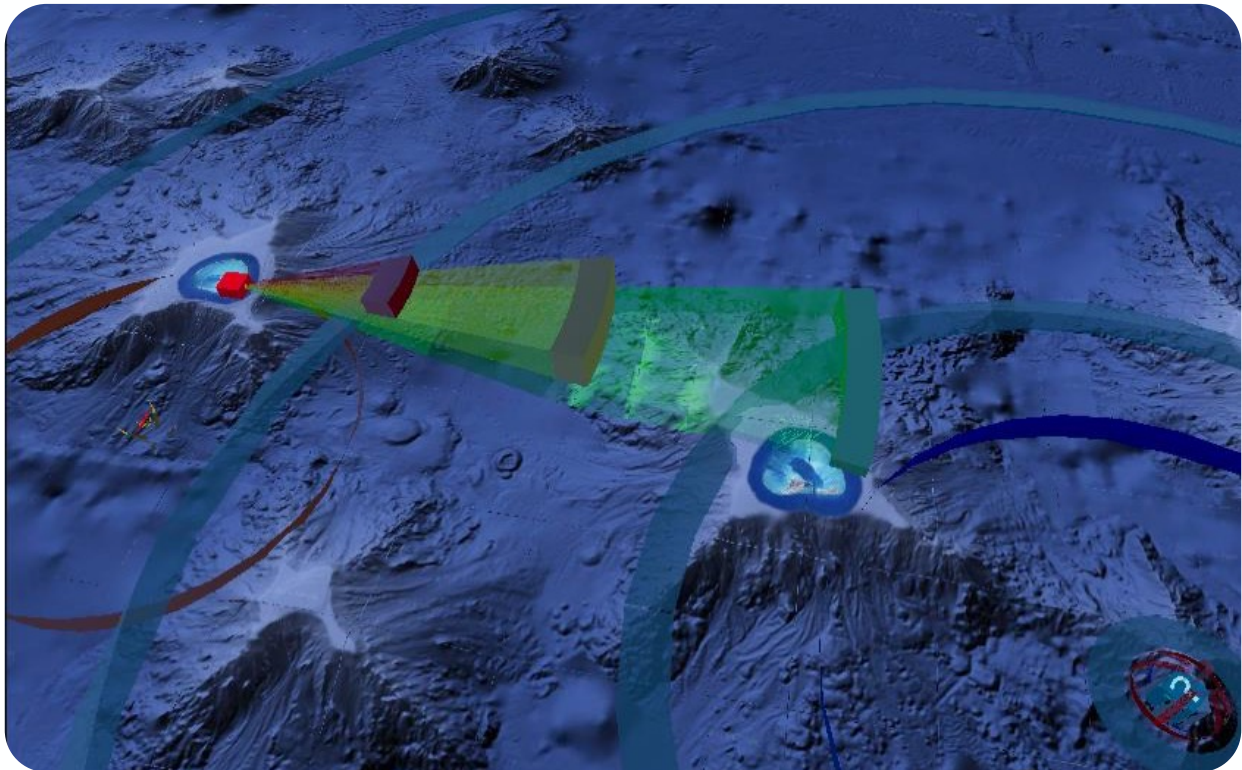
The NOVAC tabletop holographic display significantly accelerates inclusion of relevant operational data for mission briefings using a common and shared perspective by offering a highly detailed and immersive 3D visualization. The holographic display allows decision makers to zoom in on minute details from relative positional data for a vessel of interest to the highly granular interior of a ship for visualizing the tactical movements of an assault team and even the complex design of specific cargo that drives the NSC level of approval. This granular level of visual insight ensures that senior decision makers can more easily understand the nuances of the tactical situation while still considering regional implications by zooming out to view the area of operations. The system's ability to visually map out the availability and positioning of key military, intelligence, and logistical assets across domains (land, sea, air, cyber) and across multinational partners, provides decision makers with a comprehensive understanding of the situation through the eyes of the operational command and the individual operator. This multidomain awareness allows the NSC to factor in the effects of otherwise hard to visualize capabilities such as space and cyber, ensuring that all available resources are maximized while fostering collaborative efforts with partner nations. This real-time data fusion streamlines information dissemination across all stakeholders, promoting faster and more informed decisions, thus optimizing mission outcomes.



Visualizing Complex Systems for Approval to Deploy and Execute

The NOVAC tabletop holographic display offers a crucial capability for the NSC to assess political, strategic, and operational risk during mission planning. By visualizing sensor coverages in 3D such as radar, sonar, satellite, and electronic surveillance, the display provides a clear understanding of capabilities and limitations needed for fully informed decision-making. This is particularly valuable when considering how sensor gaps might leave operations vulnerable, increasing risk to force and to mission.

Additionally, the display helps decision makers better appreciate the operational constraints posed by geography, such as extremely rugged terrain or dense urban areas. By integrating real-time data and enabling intuitive understanding of these environments, the holographic display allows approval authorities insight to how planners have mitigated risks and optimized resource allocation. This holistic situational awareness supports more informed decision-making, helping to balance the tactical necessities of a mission with broader political and strategic objectives.



Traction/Testimonials

Avalon Holographics has been engaged with the defense community for over 7 of our 9 years. Battlespace visualization is the most consistently identified early application for holographic displays. The company has closed greater than \$14M in contracts, primarily with major defense contractors and the Canadian government. Support from both Canada's Department of National Defence (DND) and the US Department of Defense (DoD) has been strong and steady. A select set of testimonials appears below (where appropriate, Chatham House Rules apply):

End Users:

"This would be especially useful tracking targets in difficult environments like urban settings. If I could deploy this tomorrow, I would."

– Active Operator (CANSOFCOM)

"We lost people in an operation, and during AAR we realized we missed key sightline info during mission planning. I think this technology could have made the difference in saving them."

– Active Operator (SOCOM)

"I feel like I'm looking at the very first steps of a technology that will one day be as commonplace as LCD monitors or seatbelts."

– Lead assessing advanced battlespace visualization and interaction technologies (Army Research Lab, DoD)

"We've tried every 3D technology out there, and they all disappoint. This is the real deal; I've been waiting my whole career for this."

– Ed Chaulk, Naval Combat Systems Officer, Maritime Warfare Center (Canadian Navy)

"Avalon will sell a lot of tabletop light field displays; even with a multi-million dollar price."

– Operator, Joint Innovation & Technology Battlespace (JITB) (Canadian Navy)

Prime Contractors:

"I was skeptical, but after seeing the demo, I've had our CTO add this to [our] Technology Roadmap."

"Avalon's holographic display technology will revolutionize how underwater data is visualized."

"Avalon represents a new generation of pioneers, opening frontiers for the future use of effective, yet unobtrusive methods of visualization."

Government Contracts

Avalon has been awarded several contracts under Canada's Innovation for Defence Excellence and Security (IDEaS) and Innovative Solutions Canada (ISC) programs. These are structurally similar to the US SBIR program, with similar goals. Specifically:

1. Holographic Battlespace Visualization: Modified SIMDIS – Littoral sight lines & RF coverage
 - Completed Phase 1a & 1b (equiv. to SBIR 1 & 2), discussing Phase 2 (SBIR 3)
2. 3D Visualization for Complex Info. Systems (w. MDA) – Completed Phase 1a
3. Holographic Space Situational Awareness: Conjunction Assessment & Collision Avoidance, Suspicious (RSO)
 - Completed Phase 1a
4. It's Not Just Noise: Acoustic Tools (w. Kongsberg Geospatial): Visualization of sonar data – Completed Phase 1a
5. Making Data Make Sense: RT Rapid Decision Making (w. 3D Planeta/Terris): Visualization and analysis of GIS data
 - Completed Phase 1a & 1b, discussing Phase 2
6. ISC-Testing Stream 1, 2 & 3: 1st Sales
 - Sold preNOVAC to DRDC Halifax; testing completed recently
 - Sold kidNOVAC to Navy Innovation (Canada)
 - Negotiating contract to sell HighGround software to Navy Innovation (Canada)

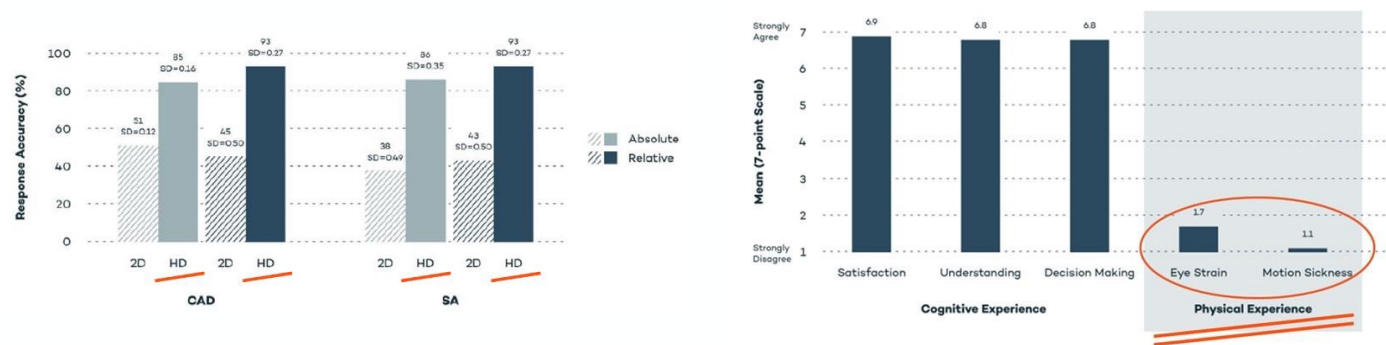


Holographic Benefits

Holographic prints are already used in several defense applications, and interest in displays has been prevalent for over 20 years. The constant drive for 3D graphics, taking off in the 1990s and evolving into today's VR and AR technologies, and the repeated issues and limitations encountered by these technologies, only reinforces this. The interest derives first from an intuitive sense that viewing information in natural 3D, the same way we observe the real world, must inherently be more efficient and effective. Human beings and our visual systems have evolved to react and respond to the natural light field very quickly, as a survival mechanism. Therefore, when we need Situational Awareness in a three-dimensional context, an obvious conclusion is that the best way to view this 3D information is as we view the real world. The use of constructed physical models (including 3D printing) in recent times, such as in the buildup to the Bin Laden raid, is a constant reminder of this desire. And as noted previously, space is always dealt with in a three-dimensional context.

Studies show that holographic visuals significantly reduce cognitive load by 20% to over 50%, allowing operators to make faster, more accurate decisions, and enabling faster learning and better retention in training. Most studies were limited to printed laser holograms, but full motion digital holograms are expected to offer better results. Avalon has also conducted early prototype studies that show significant cognitive advantage: decision making accuracy improvements of 67%-126% and no viewer discomfort.

Qualitative Study Results (Avalon Holographics)



Rough Order of Magnitude (ROM) Cost Estimate

The Rough Order of Magnitude cost for the NOVAC system is five million dollars. While very expensive now, this technology represents a multi-generational leap in information consumption and can be an integral part of force protection. The long-term benefits in terms of enhanced situational awareness, improved decision-making, and operational effectiveness position make NOVAC as a vital asset for defense organizations committed to safeguarding national security interests.