



Holographic Display for Joint Mission Planning

αἰσθητικὴ ἐκδήλωση

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Executive Summary

Avalon's NOVAC is a cutting-edge holographic display system poised to redefine defense and security visualization. Tailored to address the evolving challenges of modern defense landscapes, NOVAC enhances situational awareness and facilitates collaborative planning by providing a true 3D visualization experience. Designed for seamless interoperability with established systems like TAK and SIMDIS, NOVAC integrates diverse battlespace data into a unified 3D display, enabling defense agencies to navigate complex scenarios with unprecedented precision and efficiency. With a 40" diagonal screen, 74-degree viewing angle, and over 5 billion rays, NOVAC offers an immersive visual interface that transcends traditional display capabilities, empowering users to make informed decisions and optimize resource allocation.

NOVAC's versatility extends beyond its technical specifications, offering tangible benefits across a spectrum of defense applications. Whether enhancing mission planning through dynamic 3D visualizations of flight paths and terrain features, optimizing radio planning by visualizing Radio Frequency (RF) propagation in varying scenarios, or facilitating virtual training by enabling adaptive learning experiences, NOVAC serves as a pivotal asset in modern defense operations. Its ability to ingest and integrate real-time data, ranging from sensor inputs and topographical data to dynamic threat assessments, enables defense personnel to make informed decisions and adapt strategies in real-time. This enhances operational effectiveness across diverse defense sectors. Supported by robust endorsements from defense communities and successful engagements with major contractors, NOVAC stands as a testament to Avalon's dedication to advancing defense capabilities through cutting-edge technology.



Avalon NOVAC™ Display

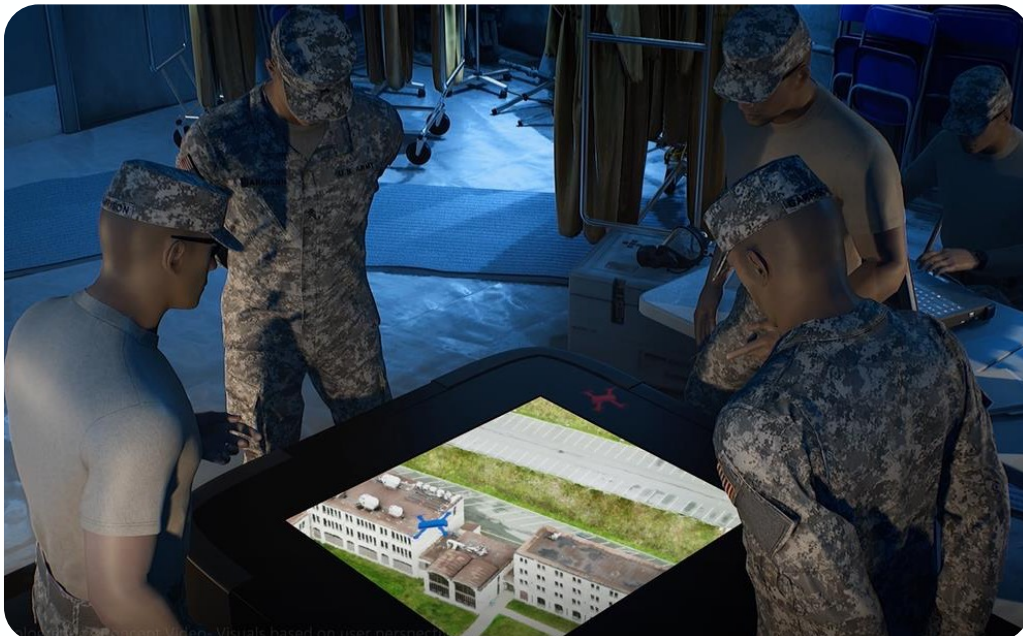
Holographic Display Technical Specifications and Capabilities:

NOVAC solves these 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 like TAK and SIMDIS, 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, faster decisions.

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

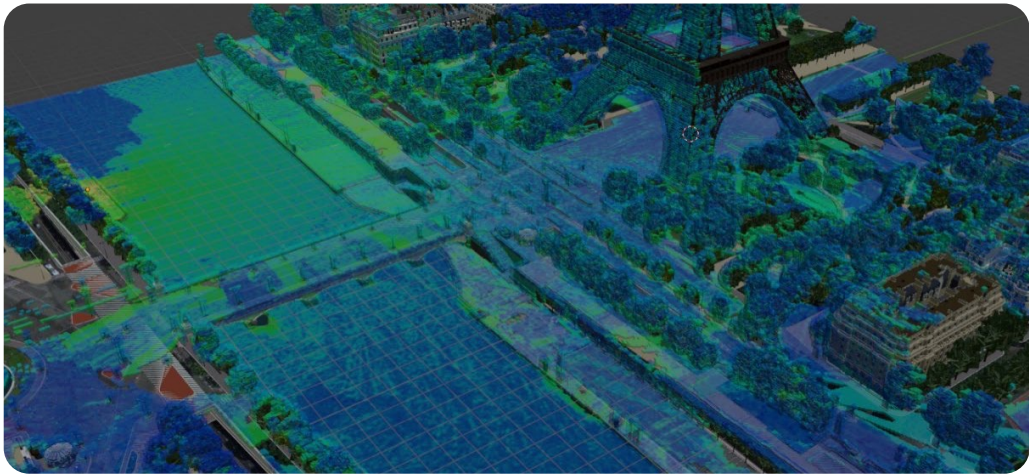
Going beyond mere topography, NOVAC seamlessly integrates platform and entity information into the dynamic 3D environment either via predefined scenarios or a robust application program interface (API) framework. Also, the platform can ingest a diverse array of inherently 3D sensor data types – including but not limited to sonar, radar, and RF, into the unified 3D scene. The culmination of these capabilities manifests in an 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 has a 40" diagonal screen with almost a foot of depth, and more than 5 billion rays; allowing for multiple viewers at the same time.



NOVAC™ Display in Operation Center

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

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Operational Problems

Intelligence Surveillance and Reconnaissance (ISR): Advanced Situational Awareness:

In dynamic Command Control/ Command, Control, Computers, Cyber, Intelligence Surveillance and Reconnaissance (C2/C4ISR) environments where comprehensive fusion of battlefield information is paramount, the management of cognitive load becomes pivotal, given its direct impact on decision-making and situational awareness. The NOVAC holographic display elevates advanced situational awareness across all environments by seamlessly integrating and correlating diverse data sources, including government-owned data and publicly/commercially available information (PAI/CAI). This fusion is visually portrayed in near real-time, offering a shared COP that is accurate and actionable. By presenting this multifaceted data in a 3D format, the holographic display empowers warfighters to intuitively navigate and interpret the COP, enhancing opportunities for knowledge management and discovery during operations. This approach not only reduces cognitive burden but also optimizes operational effectiveness by facilitating informed and efficient decision-making in complex, data-rich scenarios.

Joint Mission Planning

Virtual map tables present measurable benefit from the fidelity of holographics, as a natural 3D representation allows planning teams a faster, more easily digestible means of assessing the operational environment (OE). An intuitive 3D representation optimized for 3D human perception greatly simplifies the team's ability to rapidly, accurately, and collaboratively consider all contributing factors in Multi-Domain operations. Holographic displays accelerate situational understanding in the JADC2 (Joint All Domain C2), bringing together air, land, sea, space, and cyber effects into a more rapidly discernable picture.

Specific joint mission planning objectives and capabilities include:

- Target selection and evaluation to see structures and points on the globe in sufficiently high-fidelity 3D to plan optimal attack angles, determine structural make-up, establish proximity to protected sites, etc.
- Effects analysis for collateral damage estimates (CDE) to include population traffic patterns
- Simulating arc of the sun to show shadow effects on targets
- Obstacle analysis for extremely low altitude missions near the target and at relatively low altitude along the flight path
- Detailed views of potential field landing strips (FLS), helicopter landing zones (HLZ) and drop zones (DZ), emphasizing low altitude obstacles such as power lines
- Air space deconfliction to include simulation of known friendly, expected civilian traffic
- Threat rings of air defense, showing kinetic range and detection rings for associated targeting radar

All of these applications provide a means for planners at command-and-control hubs such as Combined Air Operations Centers and Joint Operations Centers to more rapidly assess decisions, allocate resources, rehearse operational concepts, and review post-mission effectiveness.

Expected Use Cases

Mission Planning/COA Development

A holographic display enhances mission planning and course of action (COA) development by visualizing critical elements like line of sight, radio propagation, RF signature reduction, route planning, change detection, and terrain analysis in a unified 3D environment. This comprehensive spatial visualization enables defense personnel to assess optimal communication paths, identify strategic positions, minimize RF exposure, plan efficient routes, and understand terrain complexities such as intervisibility. By integrating these key factors into a single, intuitive interface, holographic displays facilitate informed decision-making, ensuring precise and effective mission execution in diverse operational landscapes.

Mission Briefing

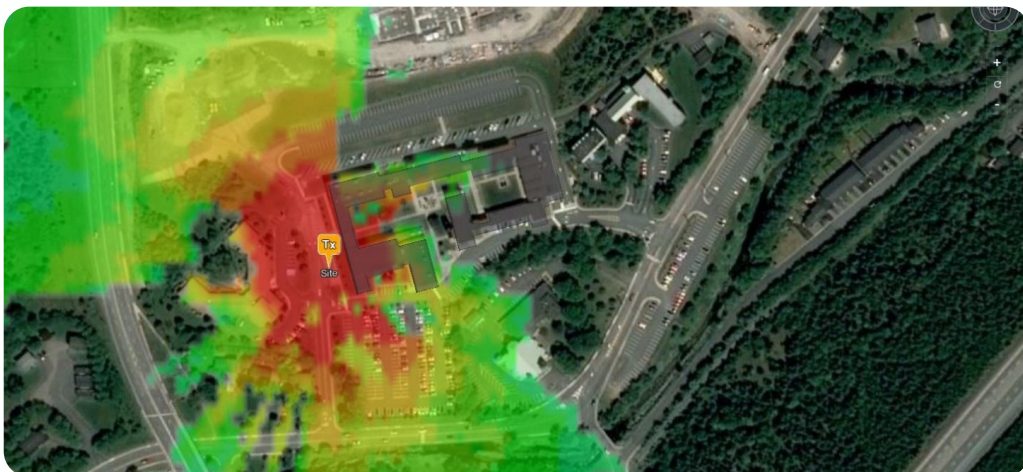
A holographic display enhances mission briefings by fostering real-time situational awareness and facilitating multi-domain operations through collaborative visualization. By presenting a unified COP, holographic displays promote a shared understanding among stakeholders, ensuring consistent and comprehensive information dissemination. This immersive visual context streamlines collaboration and enables faster, more informed decision-making processes, ultimately enhancing operational efficiency and mission success.

Airborne Operations

A holographic display optimizes airborne mission planning by providing a dynamic 3D visualization of flight paths, offsets, terrain features, obstructions, and wind patterns. This immersive spatial awareness enables jumpmasters to select safe drop zones, adjust flight trajectories, navigate around obstacles, and account for wind conditions effectively. By integrating these critical variables into a cohesive visual interface, holographic displays empower air planners to make informed decisions, ensuring accurate and secure airborne insertions in complex operational environments.

Radio Planning and Signature Mapping

A holographic display streamlines radio planning and signature mapping for tactical missions by visualizing RF propagation across varying scenarios, including weather conditions, interference levels, and transmitter and receiver configurations. This 3D visualization enables precise optimization of equipment heights, power settings, and frequencies, ensuring robust communication while minimizing RF signature to safeguard warfighters. Further, threat detection and analysis of the spatial relationship(s) between the signature(s) emitted by the airborne platform(s) can greatly improve situational awareness and help mission planners develop route plans and risk mitigation strategies.



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Traction/Testimonials

Avalon 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. We've 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) have 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."



Độc quyền kinh doanh và phân phối độc quyền tại Việt Nam

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)

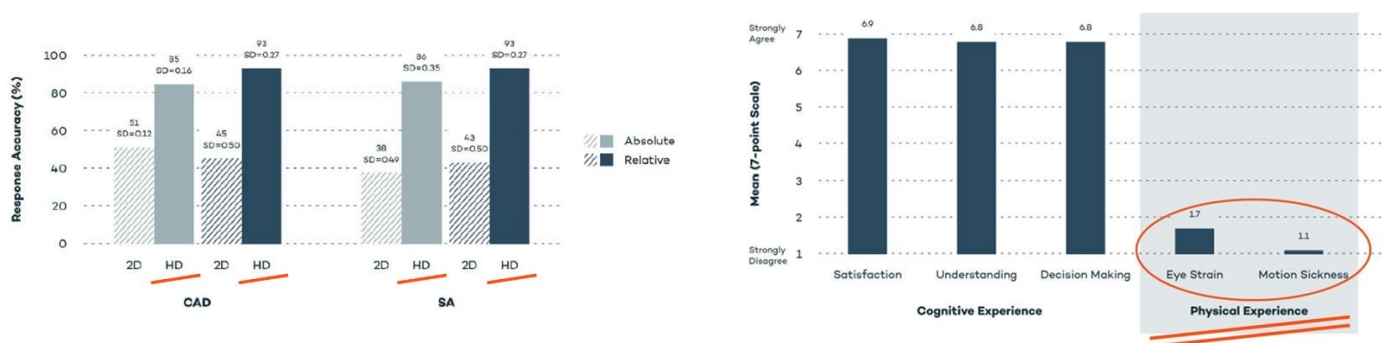


Holographic Benefits

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.