THE PROMISE OF IMMERSIVE TECHNOLOGY IN PLANNING MILITARY OPERATIONS
Client Challenge: Modern Military Needs Are Outpacing Traditional Planning Methods

Traditional military planning — whether for small, single-unit missions or larger, joint military operations — can be hugely prodigious efforts. And, it is not getting any easier. The Joint Chiefs of Staff (JCS) aptly describe today's challenge this way: “The strategic environment is uncertain, complex, and changes rapidly. While the nature of war has not changed, the character of warfare has evolved. Military operations will increasingly operate in a transregional, multi-domain, and multi-functional environment. [Operations] will cut across multiple combatant commands and across land, maritime, air, space, and cyberspace.”

This means the stakes for today’s military planners could not be higher. While planning that is well executed and designed can translate into greater success on the battlefield, inadequate planning can cost not just mission objectives, but American lives and treasure. “Effective planning provides leadership with options that offer the highest probability for success at acceptable risk and enables the efficient use of limited resources, including time, to achieve objectives in this global environment.”

In its planning guidance, the JCS outlines operating precepts for military planners that underscore the extensive level of detail and input required to develop a successful military plan. These include the need to integrate joint military capabilities during an operation and the imperative of avoiding combining capabilities that will result in unnecessary complexity and little advantage.

But achieving these objectives is easier said than done for military planners. Current planning methodologies — which may involve the use of paper maps, sand tables, board games, computer modeling, electronic displays or some combination of those — are limited in a variety of ways.

- **Time-Consuming** — Planners often rely on traditional sand tables and physical models to denote key elements such as geography and position of forces to help plan operations. These can take hours to construct and then a similar amount of time to reset to assess multiple scenarios. The incorporation of the most recent intelligence and understanding of enemy capabilities adds even more time. Even with existing electronic modeling systems, planning can take from days to weeks in total to set up properly, depending on the breadth of the operation and the need to allow planners to run through various scenarios. This can be laborious, especially when the goal is to simulate realism.

- **Limited Realism** — Current planning tools are also a poor match with the complexity of the missions faced by U.S. forces. Sand tables lack sufficient fidelity in representing geographies, topographies and distances, and they cannot represent the battlefield under myriad conditions, such as all-weather operations. These tools also struggle to: effectively model complex operations such as joint operations with allied forces; rapidly run through countless scenarios to incorporate various capabilities and vulnerabilities of both allied and enemy forces; and assess the performance of each element in a scenario to glean insights. For example, they cannot effectively gauge the impact of enemy electronic warfare and psychological operations on U.S. and allied forces.

- **Centralized** — Current planning approaches limit the ability of planners at far-flung locations to participate in planning at the same time. The sand table, for example, is a physical construction that is shared only with those in the same room, which impedes inputs from those in the field or at higher headquarters. This is especially problematic when planning for larger operations that involve numerous forces and stages.
A New Perspective: Immersive Technologies Can Dramatically Improve How the Military Plans Operations

U.S. military organizations can dramatically advance the effectiveness of their planning activities using immersive technologies. Immersive technologies are uniquely valuable because of their ability to quickly present artificial environments that both accurately replicate and enhance the real world.

Broadly speaking, immersive planning environments primarily rely upon virtual reality (VR) systems, in which the experience resides entirely within a headset. Computing power and fidelity in head-mounted displays are now so sophisticated, there is an ever-narrowing gap between user perceptions of the real and virtual worlds. The result is an immersive experience that is highly realistic and when coupled with the proper data analytics, highly effective.

- Improved Visibility — It is hard to overstate the benefits to military planners of becoming immersed in a 3D representation of the location and conditions of a potential operation. They can zoom out and see a village from 10,000 feet or zoom in and be standing in an alley between two buildings. They can get a sense for where and how they might deploy forces, where unforeseen threats might emerge from and which paths and alternate paths exist into and out of a battle zone. Immersive technologies can transport users into the proposed military operation, allowing them to maximize the potential for success by playing “what if” scenarios to account for every challenge. Users can achieve a strategic overview of the operation or take a deep dive to the tactical level. For example, they can examine an operation from start to finish, walk the perimeter of a field hospital during an emergency or see the impact of a windstorm on U.S. forces — all without risking lives and at reduced expense.

Immersive Capabilities Are Already Making Inroads in Military Planning: Tabletop Commander

Within the military, most immersive technologies are still largely confined to training applications. But Defense Department leaders have recognized the need for advanced technologies in the planning arena and the calling for so-called “point of need” systems that incorporate artificial intelligence (AI)-driven tools to assist in exercise planning.

An example of such a system is called Tabletop Commander, a next-generation battlefield simulation that employs VR systems and algorithms to construct a virtual battlespace for military exercises based upon given parameters. Adversaries, weather systems, non-visual components like network connections and power supply and other data sets can be added to facilitate exercise planning, modeling and simulation. With Tabletop Commander, planners can “observe” military exercises in an immersive environment from multiple perspectives with complex, real-world, real-time data layers that create a rich view of the operation, providing planners with new insights so they can better mitigate risks and ensure success.

Tabletop Commander lets planners visually bring to life an Air Tasking Order (ATO) in a 3D format, an often intricate and detailed document that assigns forces to specific targets and missions at certain times during a military operation. Planners can run through the mission and “observe” as aircraft execute the ATO and enemy forces respond, and then assess whether aspects of the ATO will or will not work and adjust accordingly.
• **Enhanced Realism and Accuracy** — A key benefit of immersive technologies — and unlike any methods currently in use — is their ability to provide a highly accurate representation of the battle zone geography. For example, by overlaying intelligence, satellite and topography data onto a virtual battle zone, geographies can be created swiftly and precisely. This allows for rapid resetting so that potential actions can be assessed for various scenarios, environments, weather conditions and times of day. Working in immersive environments, planners are closer than ever to the battle zone, able to examine the terrain and other variables and adjust their plans accordingly. In planning an operation, for example, immersive capabilities allow planners to overlay important information such as the ranges, speeds and targeting capabilities of U.S. ships, aircraft and land vehicles. They can assess their vulnerabilities to enemy defenses and devise more responsive countermeasures. And they can even evaluate where communications links and electronic warfare capabilities are effective and ineffective.

• **Decentralized** — Planners and operational units located in dispersed locations — and even those located in the field — can collaborate within the same virtual environments to assess planning options and consider contingencies. Improving the ability for more participants to collaborate within a more accurate and detailed planning platform and contribute ideas and insights regardless of their location, helps to produce plans that are stronger and more resilient.

Immersive technologies have advantages beyond military planning. They can also inform the Defense Department’s long-range budget planning and spending priorities. At present, some military offices use labor-intensive modeling or simple, board-based war games to assess how well various combinations of force structures support defense strategies and priorities — and these exercises help guide outyear budget decisions on weapons spending. Immersive planning environments enable long-range planners to do this with greater accuracy, detail and speed.

The flexibility of immersive technologies allows users to visualize essential non-visual information, resulting in improved mission insights. For example, they can depict the changing strength of communications links between friendly forces as they maneuver and illustrate the impact of enemy

**Immersive Capabilities Are Already Making Inroads in Military Planning: OceanLens**

OceanLens, a software tool that fuses actual hypsometric (measurements of land elevation) and bathymetric (measurements of underwater depths) data in an interactive 3D environment, enables planners to “explore” the entire globe from any vantage point: air, land or sea. The tool can integrate 3D objects and data overlays to create almost any scenario encountered on the earth’s surface or underwater. 3D models can be imported and scaled, plotted statically or with projected tracks, and viewed from various perspectives in a 3D rendering. OceanLens can support the full spectrum of surface and subsurface training, planning and operations, including intelligence data fusion, common operating picture development, mission planning and sensor placement.

Although both OceanLens and Tabletop Commander are promising examples of immersive technology, they are just the beginning. Immersive technologies are the next frontier in military planning. Whatever the level of assessment, from the tactical unit level up to the combatant commander level, they provide the tools with which modern and future military planners will operate. The success of every mission starts with planning, and immersive technologies are poised to dramatically advance the capabilities and insights of U.S. military planners.
IMMERSIVE PLANNING ENVIRONMENTS CAN BETTER PROVIDE INSIGHTS INTO UNPREDICTABLE ADVERSARIES SO THAT U.S. FORCES ARE BETTER PREPARED FOR A WIDE RANGE OF CONTINGENCIES
jammers and geography on those communications, enabling planners to avoid potential communications gaps. Planners can also plot expected levels of communications among enemy units and better plan how to conduct their own electronic warfare operations. And with its abilities to rapidly simulate many scenarios, immersive planning environments can better provide insights into unpredictable adversaries so that U.S. forces are better prepared for a wide range of contingencies.

Immersive technology transports the user to the situation, allowing them to play “what if” and account for every challenge, while planning ahead to reduce risk and achieve success. With an immersive approach, planners can walk the perimeter of a field hospital during an emergency or see the impact of a windstorm on U.S. military troops, without building elaborate physical models, waiting for days to determine scenario outcomes, or even being in the same room.
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1. Joint Chiefs of Staff. "Joint Publication 5-0, Joint Planning," June 16, 2017:  

2. Ibid.
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