CURTISS-WRIGHT

How to Lower the Cost and Risk of a New Tactical Data Link Solution

By using a proven, easy to use, comprehensive technology suite, ROI is increased, and greater capability is delivered with less downtime incurred.

The successful adoption of a new tactical data link (TDL) solution relies on effectively combining technology, software, integration, testing, certification, and training. Shortfalls in any area introduce schedule and program risks that drive costs higher. This white paper guides the reader through the critical decisions associated with adopting and sustaining a new TDL solution and how the right vendor can simplify the process and add greater capability while reducing risks to deliver a greater return on investment (ROI).

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Look beyond the initial purchase price

It is tempting to favor the lowest cost TDL solution that meets the immediate/minimum mandatory requirements and functionality. Unfortunately, this is a short-sighted approach. In fact, a purchasing strategy focused on minimum requirements and lowest price almost always costs far more than a strategy focused on the total cost of ownership (TCO) over the long term. The short-term strategy simply doesn't consider the factors that cause costs to skyrocket after purchase.

Choosing TDL solutions with the next one to two decades in mind rather than the next one to two years significantly reduces the risk of unforeseen and unexpected costs. With this approach, government and commercial defense organizations can break out of the endless cycle of updating incompatible software that adversely affects the entire TDL solution life cycle

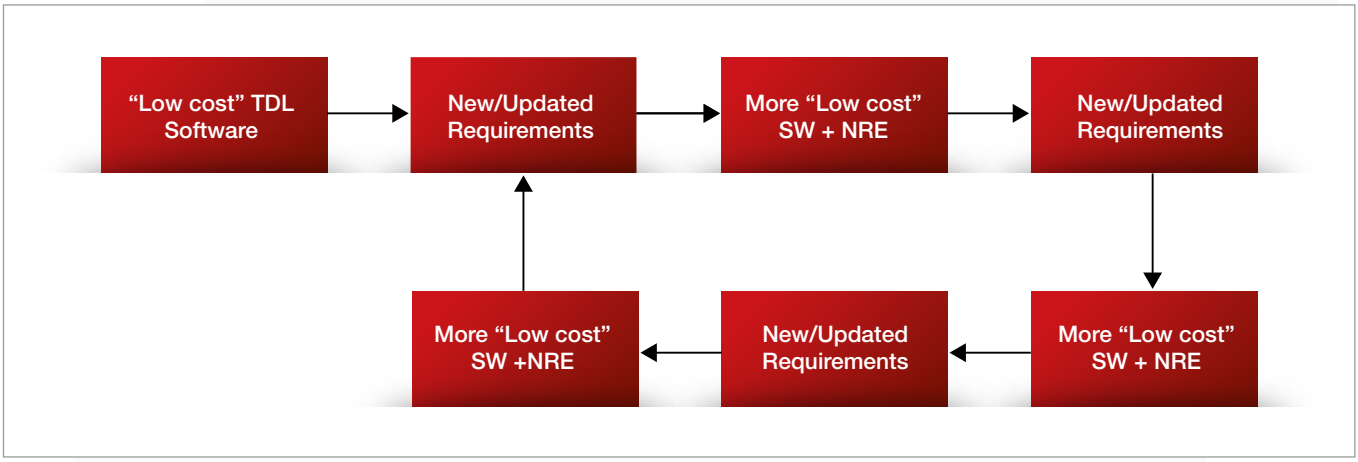

Fig 1.The never-ending life cycle of "low cost" TDL software

Invite TDL end-users and experts to evaluate solutions

In many ways, asking non-technical agents to evaluate complex TDL solutions with up to two decades of future requirements in mind is not a fair request. They're not TDL experts and may not have the depth of field knowledge and technology expertise required to differentiate and prioritize the features and functions offered in the proposed solutions.

This is where TDL end-users and technology experts have an essential role to play. They understand the capabilities required today, how implementations affect usability, and the level of interoperability needed for mission success. They also appreciate the full extent of integration, upgrade, and maintenance requirements and can provide visibility into the features and functions that will be most important for future mission success. With their broad, detailed, and technical perspective end-users and technical experts are crucial to choosing TDL solutions with the fewest risks and the lowest TCO.

Understand the factors that affect total cost of ownership

Choosing TDL solutions based only on the features highlighted in a brochure or product descriptions such as “TDL simulator for Link 16” leaves too many unknowns. Everyone who is evaluating TDL solutions should understand the many factors that affect the proposed solution’s TCO. They can then use this understanding to:

- Probe TDL solution vendors for more information about their offerings to ensure they meet/exceed long-term requirements.
- More objectively compare TDL solutions and assess return on investment over time.
- Reduce the risk of unexpected and unforeseen requirements that will strain schedules and budgets.

Integration and certification costs

When purchasing a low-cost TDL solution, it could be assumed that in-house teams can integrate the solution in the field or on existing platforms. Unfortunately, this is rarely the case. In reality, the time and costs associated with integrating a TDL solution in any environment are a significant component of the TCO.

Only highly experienced and skilled technical experts can integrate a TDL solution. The task requires a deep knowledge of TDLs and associated system components, from radios, terminals, computers, and antennas to complex mission operations software. The TDL solution must be integrated with all of these components and other platform systems, including navigation systems and instrumentation buses.

The time, cost, and complexity of the following integration tasks must be considered as part of the TDL solution’s TCO:

- Creating the proof of concept for the new TDL solution
- Establishing communications and integrating APIs across all hardware and software components associated with the TDL solution and the systems with which it communicates
- Updating mission operations software to support the new TDL solution
- Powering the new TDL solution without affecting power to other systems or considerably increasing platform or ground station power budgets
- Verifying and validating the features, functions, and interoperability of the new TDL solution
- Simulating the operation of the new TDL solution on a real-time network, potentially with the high costs of putting air, sea, or ground platforms into action
- Certifying the new TDL solution meets essential MIL-STD and STANAG standards
- Deploying the new TDL solution in the field or on a platform
- Training warfighters to use the new TDL solution which is a particularly time-intensive and costly requirement if the solution is not user-friendly.

The costs to certify a new TDL solution are extremely important to consider, as each attempt to pass certification tests costs hundreds of thousands of dollars. This is not a process any organization can afford to fail or repeat multiple times. It must be done right the first time.

Replacement and upgrade costs

Suppose TDL solutions are selected based only on their ability to provide the features, functions, and standards support needed today. In this case, there's a considerable risk they won't meet requirements down the road. This means the cost of replacing the TDL solution with a more comprehensive and advanced solution and upgrading its capabilities must also be considered when the purchase is made. Removing and replacing an existing solution reintroduces and repeats the time, cost, and complexity of the integration process described above.

Upgrading also adds a new set of costs and risks to the equation. When initially purchased and integrated, the in-house experts who understood the TDL solution may not be available. Even if in-house experts are available, working on the upgrade takes them away from other projects and priorities, likely for many months.

Asking the solution provider or a third-party engineering services company to step in and upgrade the TDL solution will not reduce time, costs, or complexity. These resources are costly, and there's no guarantee they'll have the expertise required to add the new capabilities and ensure seamless interoperability with other systems.

The full range of functionality provided

It's crucial to understand everything included in the initial purchase price of a TDL solution. A comprehensive and fully supported TDL suite may have a higher initial cost but is designed with the future in mind. Indeed, in many requests for proposals we receive detailed requirements that often omit critical functionality. By deeply understanding the missions our TDL solutions are used for, we can draw attention to these omissions saving our customers the complexity and additional investment of trying to add them later. Comprehensive TDL solutions:

- Are available with complete, expert integration services to minimize integration risks.
- Are pre-tested and verified to meet all major MIL-STD and STANAG standards to virtually eliminate the risk they will fail expensive certification tests.
- Provide the features and functions that exceed those that are required immediately, removing the need for solution replacements or upgrades when additional capabilities are needed.
- Already support a wide range of TDL types, terminals, and interfaces to maximize implementation flexibility and increase return on investment.
- Support new terminals, interfaces, and revised standards as they are released to dramatically simplify the adoption of the latest technologies and requirements.
- Are extremely fast to setup and easy to use to reduce training costs and the risk of operator confusion or error.
- Include a broad set of real-time simulation capabilities across many different types of assets that remove the cost of testing on actual platforms.

Take Link 16 support as an example. If only a small number of Link 16 messages must be supported today, look for a TDL solution that already supports all types of Link 16 messages. With Link 16's broad use and adoption by government and commercial/defense organizations globally, it's highly likely additional message support will be required within a few years. Even by the time the TDL solution is fully integrated, more message support is often needed.

Ease-of-use is also very important to consider. When TDL solutions are complex to setup and use, every aspect of deployment and operation takes longer and costs more. In many cases, it can take hours or days to setup a complete Link 16 network. However, the most user-friendly TDL solutions perform the same task in a few minutes. This significant saving may not have been identified as a criterion for purchase.

TDL solutions that support multiple aspects of TDL functionality go a long way towards reducing the TCO and maximizing ROI. For example, deploying a single TDL solution that can be used for training, simulation, and battlefield operations is far more cost-effective than deploying and maintaining a separate solution for each function type. Using a single interface, Warfighters only need to learn one system, whether they're running simulation scenarios, upgrading their TDL communications skills on-the-fly in the field, or executing mission tasks.

Look for hidden costs and risks

There are less obvious functionality aspects to look for when evaluating and comparing the actual costs of TDL solutions. They include:

- Overly simplistic TDL API implementations.
- Limited TDL network simulation and terminal emulation capabilities.
- Separate systems for TDL training and battlefield operations.

Overly simplistic TDL API implementations

Many TDL solutions claim to have an API that allows host systems to access the TDL equipment. However, in nearly all cases, the software behind the API is just a simple data format that performs transmit and receive functions on raw TDL data. While this type of API is typically available at a low price, its implementation generates other costs.

The problem is these simplistic API implementations shift data processing to the TDL host system. Upgrading to a more advanced TDL host system that can handle these heavy data processing requirements is extremely expensive, especially when the TDL solution is being integrated into an existing system.
To ensure data processing requirements are not transferred to the TDL host, the TDL solution must provide:

- A comprehensive, well-documented API that includes all messages and comprehensive support for the chosen terminal/radio. This is especially important, as the terminal/radio selected at the start of the procurement/integration cycle is often not the terminal used in the final system.
- An integrated, sophisticated data link processor that can handle TDL processing requirements.

In addition, the TDL solution's vendor must offer accessible technology experts, including TDL engineers and operators who can answer questions and provide guidance during all TDL system design, development, integration, testing, certification, training, and operations phases.

Limited TDL network simulation and terminal emulation capabilities

When evaluating TDL simulators and emulators, one should avoid choosing multiple, non-integrated solutions for different aspects of the end-to-end TDL execution and processing chain. This approach fragments simulation and emulation activities and means various solutions must be supported and maintained separately.

A single simulation system that supports the entire TDL mission set and provides the ability to add hardware-in-the-loop and host software as they become available enables end-to-end simulation at lower costs.

This is particularly important during the early stages of proof-of-concept and requirement definition when there's often no access to radios, terminals, or host systems. When it comes time for testing, the simulator can recreate an entire network of TDL-equipped assets to validate how the system-under-test performs in a real-world environment.

To minimize the risk of failing costly certification tests, look for a TDL network simulator that can verify and validate that the fully integrated system will pass stringent TDL certification processes. The best way to ensure successful certification is to use the same solution the certification agencies use.

TCG Battlefield Operation Support System (BOSS)

Curtiss-Wright's TCG BOSS® has been the standard TDL tool for multi-link certification testing and platform integration for twenty years. TCG BOSS enables military end-users and prime contractors to verify that the TDL implantation delivered on aircraft and other military platforms conforms to Link 22, Link 16, Link 11, JREAP, SIMPLE, SADL, DIS, and related TDL standards and interface definitions. BOSS is agnostic, making it a suitable investment across multiple platforms and programs.

Separate systems for TDL training and battlefield operations

Using different solutions for TDL training and battlefield operations further adds to cost and can result in mission failure. A two-in-one training and battlefield solution is essential to reduce these risks and simplify warfighters' lives.

TDL solutions are quite different from flight instrumentation or radio communications systems that provide precise, timely, and unambiguous information. With the complexity of TDL communications, warfighters require pre-deployment training in classroom environments and continuous training on the battlefield as they fight. Every day, cryptographic keys change, mission parameters are altered, and operational configurations change.

When warfighters can train on the same TDL solution they use in the field, there's a much lower risk of slow responses and errors. Warfighters never need to adjust their actions to accommodate different user interface layouts, controls, or steps to execute TDL communications. And there's only one solution to purchase and maintain.

A two-in-one TDL solution also delivers a better ROI because it can be used for activities ranging from pre-mission preparations to post-mission analysis. The solution can be used to:

- Improve combat readiness by quickly and easily creating and adapting highly realistic simulations that include red and blue forces at sea, in the air, and on the ground.
- Increase battlefield situational awareness by instantly switching from simulation mode to battlefield mode to support mission communications.
- Enable more effective debrief sessions by playing back all TDL-related actions taken during missions.
- Enrich mission rehearsals by walking warfighters through simulations of the mission profile step-by-step.
- Rapidly deploy a Link 16 or Link 22 network in the field.

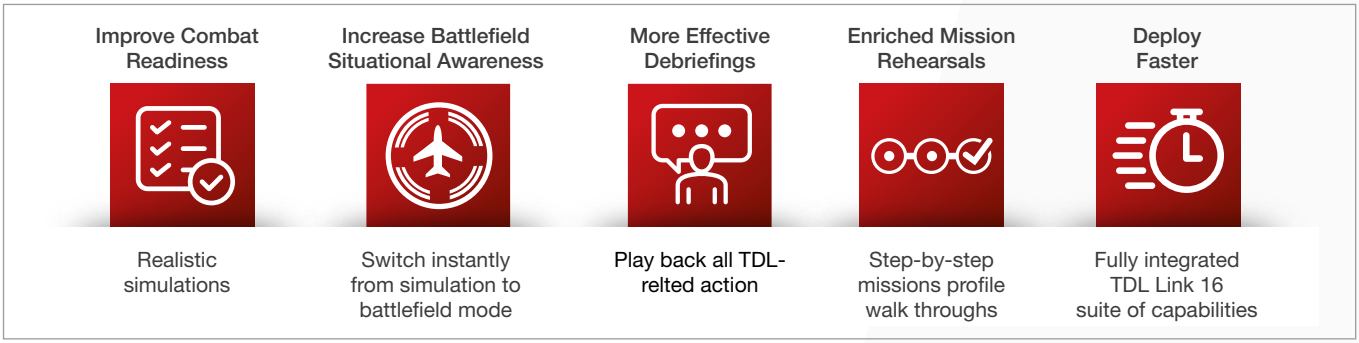

Fig 2. A comprehensive solution suite simplifies TDL implementation while adding greater functionality

Rely on proven TDL solutions designed with the future in mind

Curtiss-Wright has been developing TDL solutions for two decades. Over the years, we've been contacted many times to step in and help customers who chose TDL solutions based on price. We've seen firsthand the costs, risks, and challenges those choices brought to our customers' organizations.

To mitigate these issues, Curtis-Wright TCG TDL solutions are designed to deliver maximum ROI with greater functionality and flexibility and to evolve smoothly to the future. This comprehensive suite of TDL solutions includes Curtiss-Wright:

- **TCG GTS®** Ground Tactical Data Link System which is the only system that provides TDL training and simulation and battlefield situational awareness, and command-and-control capabilities in a single, moveable system. W ith the speed and simplicity of the TCG GTS, a Link 16 or Link 22 network can be setup with just six mouse clicks, and Warfighters can press a single button to switch between simulation mode and battlefield mode.
- **TCG BOSS®** Battlefield Operations Support System gives system integrators a single solution to test TDL systems in any environment, from the lab to a simulated TDL network, to the platform. The TCG BOSS can verify that TDL systems meet almost any certification requirements worldwide. When a new standard is released, the TCG BOSS is immediately updated to support it.
- **TCG Adaptable Tactical Data Link Router (ATR)** provides seamless, on-demand connectivity and routing for multiple Link 16 interfaces and other TDL protocols in a highly scalable design. This affordable alternative to the more powerful TCG BOSS and TCG GTS can simultaneously operate multiple network interfaces to various TDL types, including Link 16, SADL, SIMPLE, JREAP-A, and JREAP-C.
- **TCG Adjunct Simulation Engine (ASE)** provides high-fidelity, real-time, and configurable simulated TDL information to operational and training networks. TCG ASE is ideal for training programs requiring Link 16 messages and TDL simulation in a live-virtual-constructive (LVC) or distributed interactive simulation (DIS) network. This complete TDL simulation system operates with many hosts and hardware platforms.
- **TCG HUNTR™** tactical data multi-link gateway combines a single-button start-up, automated link connections, and a highly intuitive graphical interface to quickly access up-to-date and accurate contextual TDL data translations. The TCG HUNTR multi-link gateway leverages two decades of knowledge and expertise in Link 16 technology and messages and supports a wide variety of data link types. It is the only TDL gateway that requires minimal personnel, training, and almost no TDL expertise to operate.
- **TCG LinkPRO®** TDL processing software optimizes TDL processing, integration, and communications to alleviate interoperability issues and reduce time, risks, and costs. With its full-featured API and flexible, IP-based host connectivity, TCG LinkPRO can be used with any tactical host and has become a fundamental component in command-and-control systems around the globe.

Curtiss-Wright TCG TDL solutions are used by TDL testing, interoperability, and certification agencies globally, giving our customers the unique opportunity to use the same test environments these agencies rely on to significantly reduce the risk that our customer's TDL systems will fail crucial tests.

To learn more about how Curtiss-Wright TCG TDL solutions can de-risk your Link 16/22 solution while adding greater functionality and increasing your ROI, visit us at www.curtisswrightds.com

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