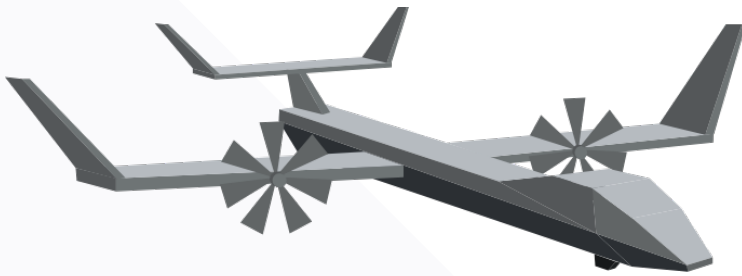


Delivering Excellence with CSIP

How a Prime Contractor Used Tangram Pro™ to Delight its Customer



When a DoD contractor to the US Air Force approached Tangram Flex for support in building adaptable, reconfigurable autonomous aircraft, the team provided a software toolkit specifically configured to improve the speed and safety of software component updates. As the DoD and defense industry organizations move forward to outpace adversaries, Component Software Integration Platforms (CSIPs) will pave the way for rapid integration with confidence.

We've moved from the Ford Pinto to a Tesla in less than a lifetime by doing what humans do best — taking the inventions of generations past and finding ways to reconfigure them. Software offers today's systems more potential than ever before. Yet, defense programs are lagging in the technology race, and growing gaps between system engineering and software development make it difficult to deliver new capabilities in pace with mission demands.

Mission-critical systems need new technologies quickly, and they need them to work correctly every time. While you can't reinvent system engineering overnight, there is a way to avoid the pitfalls of software integration. With the right tools, engineering organizations can cross the gaps between phases of the engineering lifecycle and work together with less work.



The Problem

A large government prime contractor for the US Department of Defense (DoD) was tasked with building autonomous aircraft that can be quickly, seamlessly configured to respond to new missions for the US Air Force. To work according to the USAF's vision, the system would need to allow components to be swapped and replaced between missions and across multiple systems to support the teaming of manned and unmanned aircraft.

The contractor approached Tangram Flex with a question: Was there a way to generate interfaces that could translate between a classified messaging standard used by the Air Force and an open standard? These interfaces would have to enable faster integration of off-the-shelf technologies and resolve issues of vendor lock. The contractor was already doing this, but generating the interfaces could take months or even a year of handwriting code, and it was difficult to prove the system's security and correctness.

The contractor needed a partner with expertise in component software integration. To be successful, they also needed a solution they could use in the future on their own, since the Air Force expects its contractors to deliver mission-critical updates quickly and persistently. With the right technology, the contractor intended to show its customer that they could meet — and exceed — that expectation.

Our Approach

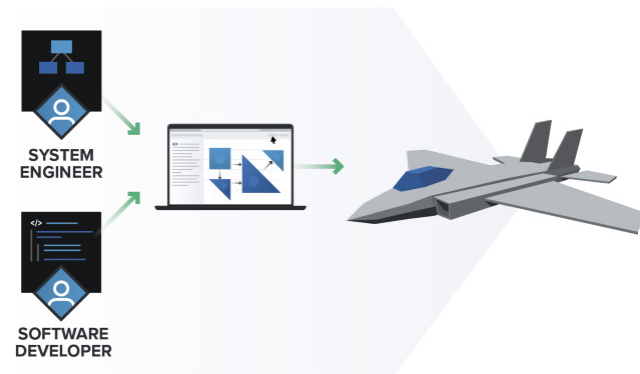
Our team began by understanding exactly what the contractor needed to solve. Software engineers at Tangram Flex worked closely with their engineering team to clarify the key challenge areas they faced,

- **Difficulty reconciling system models and software code**
- **Component reusability**
- **Manual work to write integration code and translate between messaging standards**
- **Specialized skills needed to apply assurance and analysis tools to interface code**
- **Barriers to DevSecOps**



Component Software Integration Platforms, or CSIPs, are sets of tools that make software integration easier. They bring components, processes, and people together in one place to help teams stay in sync — so engineering teams can deliver new capabilities faster — and provide integrated testing tools so that speed doesn't come at the expense of quality. CSIPs are becoming more widely recognized as the right approach to system adaptation and modernization in the commercial market, and their value extends ideally into DoD systems. It's become clear that the way to ensure mission advantage is through advanced software capabilities, and CSIPs make that more achievable.

In partnership with the contractor, the Tangram Flex engineering team identified ways that our CSIP, Tangram Pro™, could be adapted to solve their integration problems. The contractor needed a component library and interface where its system engineers and software developers could share design and code in one place, making it possible to reuse existing components. They also needed an efficient way to produce the code required for components to exchange information with one another, according to their end-user's requirements, and the ability to test and provide evidence of correctness and certification to US Air Force standards.



To help the contractor achieve those requirements, Tangram Flex engineers made three configurations to Tangram Pro™ for a solution that specifically addresses their challenges:

- **Added the contractor's message sets to Tangram Pro™ to enable the definition of each component's data inputs and outputs in the component library**
- **Integrated required transforms for translating between message types into the CSIP to allow the contractor to connect components using different standards together without writing transforms by hand**
- **Selected appropriate testing and analysis tools for the contractor's needs and included them as plugins available for inclusion in code generating workflows so the contractor can prove that code is correct and complies to their customer's specifications**

These configurations made it possible to automatically generate the software interface that allows the contractor's engineer team to connect components together without manual work and to receive readable, actionable evidence of cybersecurity and resilience in the code.



These configurations in Tangram Pro™ overcame several of the contractor's challenges. The final step was to integrate a CSIP directly with the contractor's existing engineering pipeline so that code generated in Tangram Pro™ can be immediately and automatically delivered to the next step of their process. Without connecting to the contractor's delivery processes, an extra mile of manual configuration would be required. This pressing need prompted Tangram Flex to move up CI/CD integration in its product roadmap and provide DevSecOps integration with GitLab, GitHub, and Bitbucket, the most commonly used platforms in the industry. These integrations allow users to connect Tangram Pro™ directly to their delivery pipelines so that generated code can be automatically delivered for deployment without any custom work. Connecting Tangram Pro™ to the contractor's existing lifecycle is critical for delivering updates at the point of need.

The Results

In this first-ever instance of CSIP use in a DoD program, the contractor was able to prove their ability to give the Air Force what it needs: confident delivery of rapidly reconfigurable autonomous systems. The best part? The work put into customizing the message sets and building a component library in Tangram Pro™ means that the contractor can continue to get the Air Force – and ultimately, the warfighter – the high-powered, cutting edge technology they need in a much shorter time frame. Using a CSIP also helps the contractor replace and procure software components more like hardware, which overcomes the vendor lock that has traditionally blocked them from rapidly integrating new technologies and connecting manned and unmanned systems. The contractor's customer is now invested in this solution and is engaging with both the contractor and Tangram Flex to continue work in the domain.

While a CSIP is not a prerequisite for software integration, it is an accelerator that gives DoD contractors the same sweet spot of rapid and reliable development that their commercial counterparts enjoy. Before Tangram Pro™, our customer was already a leader in defense system engineering, but they were focusing a huge amount of time and resources on integration tasks that did not result in persistent value. They were unable to cut time without cutting corners, and the reusability and flexibility the DoD demands seemed far out of reach. Working hand in hand with Tangram Flex, they can now demonstrate and show amazing capabilities:

- **Reusable components to share across programs**
- **Generation of secure software interfaces in hours rather than months**
- **Interoperability between standards and architectures**
- **Evidence that code is correct and secure**

All of this helps our customer succeed in providing rapid reconfiguration across multiple systems to support teaming of manned and unmanned aircraft.



Adaptability at Scale

Integrating new technology into DoD systems has been a time-consuming, tedious practice of manual custom development. Conventional engineering can't handle all of the unknowns introduced with each line of code, and it takes a lot of code to bring systems from different vendors and military branches together. Many engineering teams use model- and component-based engineering practices, but integration itself is a long game. Our customers at Tangram Flex are highly skilled and successful at system modernization, but they want repeatable, scalable, and faster ways to do what they're best at: building the most advanced mission-critical systems in the world.

Tangram Pro™ gives system designers, software developers, and maintainers of mission-critical systems the power to overcome lifecycle gaps and deliver new technology to the field on time with confidence. Keeping models, requirements, and code in sync — and unifying engineering tools — makes software integration simpler so engineering teams are free to focus on products and delivering the best possible capabilities with less cost.

By following the lead of the commercial industry, you can find better ways to access and implement new technology in defense systems. CSIPs are the best path towards reducing low-value engineering efforts, integrating analysis and testing to improve safety, and truly building adaptable and resilient systems.

Tangram Pro™ closes the gap between system design and implementation through a shared interface that shows you what you need to build each step of the way. It is the first CSIP that can be adapted to any environment and customized to meet your unique needs. Visit tangramflex.com/technology to learn more and register for a free trial of Tangram Pro™ to try it for yourself.

The engineering and business value of Tangram Pro™ are truly realized through:

1

Lower overall cost of component-based program execution

2

Efficiencies in testing, verification, and certification

3

Faster software delivery and release cadence

4

Eased transition to agile software development & DevSecOps adoption



At Tangram Flex, we understand the challenges of security, speed, and safety. That's why we are dedicated to simplifying software integration for mission-critical defense systems. Our team combines engineering expertise with our core product, Tangram Pro™ to arm customers with customized toolkits for meeting mission needs. Tangram Flex is headquartered in Dayton, Ohio, the home of Wilbur and Orville Wright and a hub of defense innovation. Get in touch: hello@tangramflex.com

