

TDL Technology

7 3CDSE Expo:
SyntheSys Defence
Event Preview

11 Model-Based Testing in
Defence: Requirements
Management

13 Hyper Connected Air
Traffic Management:
From EUROCONTROL

*Published by SyntheSys
for the Tactical Data
Links Community*

Autumn 2021



DATA LINK SERVICES



TESTING | TRAINING | INTEROPERABILITY

We provide advice and assistance on the implementation and operation of military Tactical Data Links (TDLs), including Link 11, Link 16, Link 22 and Variable Message Format (VMF), as well as Joint Range Extension Application Protocol (JREAP).

We provide world-class support to TDL and other defence projects; our customers come to us because we listen, assess, respond and deliver.

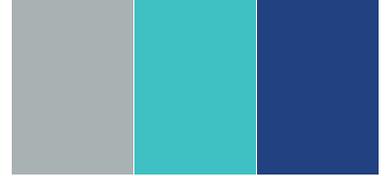
SyntheSys has extensive experience in the development and definition of TDL testing programmes together with a real depth of knowledge around the life cycle specification and management of complex data to achieve and maintain TDL Interoperability.

Our range of TDL Training courses is created from direct involvement in the specifications, development, procurement and maintenance of TDL systems.

For more information, visit: <https://bit.ly/3llgGA1>



SyntheSys
— DEFENCE —



Letter from the MD

Editorial

Editor: Sarah Thomas
Email: sarah_thomas@synthesys.co.uk

Copy Editor: Penny Morgan
Email: penny_morgan@synthesys.co.uk

Contributors:
John S Hartas, Mark Hudspeth,
Mark Williamson, Kate Chandler,
James Norful, Dan Quixote

With special thanks to:
Jorge Pereira,
EUROCONTROL

Printing:
Illustrated Stationery Ltd

©2021 SyntheSys Systems
Engineers Ltd

All rights reserved.
No part of this publication may be reproduced,
distributed, or transmitted
in any form or by any means, including
photocopying, recording, or other
electronic or mechanical methods,
without the prior written permission
of the editor, except in the case
of brief quotations embodied
in critical reviews and certain
other non-commercial uses
permitted by copyright law.

Contains public sector information
licensed under the Open
Government Licence v3.0

Unless otherwise accredited, all military
photographs in this issue are
© Crown copyright 2021
www.defenceimagery.mod.uk

Cover photo: UK Eurofighter

Autumn 2021

To subscribe:
www.tdl-technology.com

Enhancing our Defence Offering

New innovations across the global defence community focus on dealing with challenges around multi-domain information exchange, delivering agile command and control, simulating future battlespace complexity and upskilling defence staff. We are currently seeing national defence priorities rapidly shift to respond to a drastically changing domain.

With so much happening throughout the defence landscape, there has never been a better time to bring new products and services to this evolving marketplace and it is with that in mind that I introduce Issue 12 of TDL Technology magazine.

For programme teams and organisations navigating the challenges of integration and interoperability testing, and training, I am thrilled to introduce our latest innovation, Synapse, which improves delivered capability performance by ensuring standards conformance is built into your integration, interoperability and simulation test / training programmes. Pages 8 & 9 give a full overview of the tool and I very much encourage you to contact me directly if you have any feedback, questions, or would like a personalised demonstration of this powerful functionality.

The SyntheSys Defence team will be exhibiting at the upcoming Three Counties Defence and Security Expo (3CDSE) as part of the Make UK Pavilion and this magazine contains an event showcase for those attending, on Pages 7-10.

I'd like to extend my personal thanks to Jorge Pereira from EUROCONTROL for contributing an informative and enjoyable article on Page 13 exploring military avionics' access to hyper connected air traffic management.

At a time when collaboration and communication is now more important than ever, if you or your organisation would like to contribute an article to a future issue, please do not hesitate to contact us via the editor.

With very best regards,

John S Hartas

Managing Director
SyntheSys Defence



John S Hartas, SyntheSys MD

Contents

News & Industry Events

- 5 SyntheSys News
The latest news from us
- 16 **FREE** TDL Online Training
Details of SyntheSys' Free TDL Training

Features

- 6 Getting it Right Every Time
Using systems engineering in Defence engineering design to ensure quality
- 7 Three Counties Defence & Security Expo (3CDSE)
SyntheSys Defence Event Preview
- 11 Requirements Management & Model-Based Testing in Defence
Minimising issues early in the process

Guest Articles

- 13 Military Avionics
Hyper Connected Air Traffic Management



Read about our new test, training and simulation capability on Pages 8 and 9



**GOT SOMETHING
WORTH SHOUTING ABOUT?**

We want to hear from you!

Have you got a burning question to ask?

Or perhaps a topic you feel doesn't get enough scrutiny?

Our industry forum is for you!

We are asking members of the TDL and related communities to come forward with different ideas and topics for inclusion in an open industry forum which is dedicated to you.

If you are interested in contributing please contact
Sarah Thomas:
sarah_thomas@synthesys.co.uk

SyntheSys News

Online Training Success For Ultra Intelligence & Communications

It's been said that good communication among military on land, sea and air is even more important than the use of force itself. This is one of the overriding tenets of Tactical Data Links (TDLs) as they are critical for interoperability of North Atlantic Treaty Organisation (NATO) and coalition forces operating within a single battlespace.

MIDS Link 16 & Link 11 Online Training delivered to customers from Ultra Intelligence & Communications.

Over the course of five days, we delivered courses aimed at providing students with a comprehensive understanding of Joint Tactical Information Distribution System (JTIDS) / Multifunctional Information Distribution System (MIDS) Link 16 and



both the Link 11 System and its operational use. In preparation for a new project with their counterparts back in the United States (US), they were looking for a solid foundation of TDLs.

At the conclusion of the training, the attendees felt they were prepared for the upcoming work and that all of their training requirements were successfully met.

Looking for Tactical Data Link Training?

You may be interested in our TDL Tech -Teach Newsletter!

Without a doubt, the global pandemic has presented several difficulties for training organisations who rely on face-to-face student interaction.

The critical need for TDL training on modern platforms has certainly not been without its challenges over the past 12-months.

As we continue to expand our courseware into the online environment, we will refine our methodologies of delivering this type of training to provide a seamless instructional experience for our students, whether attending in-person or online.

Read more about our training offering and news from our training division in the first of our TDL Tech-Teach newsletters. To read the newsletter, visit: <http://resources.synthesys.co.uk/defence/newsletters/tdl-tech-teach-01.pdf>

ISSUE 1

TDL TECH-TEACH

ADAPTING TO A CHANGING LANDSCAPE

Welcome to the first of our TDL Tech-Teach newsletters, which is aimed at those interested in Tactical Data Link (TDL) and related training.

Without a doubt, the global pandemic has presented several difficulties for training organisations who rely on face-to-face student interaction. The critical need for TDL training on modern platforms has certainly not been without its challenges over the past 12-months.

As we continue to expand our courseware into the online environment, we will refine our methodologies of delivering this type of training to provide a seamless instructional experience for our students, whether attending in-person or online. We continue to consider classroom training to be the foundation of what we do and will continue to be the primary method of course delivery.

We are thrilled to be working with customers to deliver our face-to-face courses.

TDL TRAINING CALENDAR

DATE	COURSE
13-16 OCTOBER	MIDS LINK 16 & JREAP
17-18 OCTOBER	DLM/ICO
19-20 OCTOBER	DLM/ICO
21-22 OCTOBER	DLM/ICO
23-24 OCTOBER	DLM/ICO
25-26 OCTOBER	MIDS LINK 16 & JREAP
27-28 OCTOBER	MIDS LINK 16 & JREAP

ONLINE TRAINING SUCCESS FOR ULTRA INTELLIGENCE & COMMUNICATIONS

We've been told that good communication among military on land, sea and air is even more important than the use of force itself. This is one of the overriding tenets of TDLs as they are critical for interoperability of NATO and coalition forces operating within a single battlespace.

MIDS Link 16 & Link 11 Online Training delivered to customers from Ultra Intelligence & Communications.

Over the course of five days, we delivered courses aimed at providing students with a comprehensive understanding of Joint Tactical Information Distribution System (JTIDS) / Multifunctional Information Distribution System (MIDS) Link 16 and Link 11 and its operational use.

In preparation for a new project with their counterparts back in the United States (US), they were looking for a solid foundation of TDLs. At the conclusion of the training, the attendees felt they were prepared for the upcoming work and that all of their training requirements were successfully met.

FEATURED COURSE

DATA LINK MANAGER / INTERFACE CONTROL OFFICER (DLM/ICO) COURSE

The DLM/ICO course is designed to provide students with the knowledge to perform various roles in Data Link Manager, Interface Control and engage in Multi-Tactical Data Link Architectures and Operations.

The course provides students with a fundamental understanding of various TDLs, their uses, state of the art simulation tools, generally applied knowledge to real world scenarios. The DLM/ICO course is based on NATO's Link 16 and Link 11 documentation fused with instructor experience. The course relies on practical exercises and assignments which gives a working understanding of course concepts.

Training delegates receive unlimited access to the Synthesys Defence Community Portal, which is designed to enhance and support the training experience. Delegates can access course information, download copies of course material, and also benefit from the other tools within the portal.

WHAT YOU WILL LEARN

- FUNDAMENTALS OF A DATA LINK ENVIRONMENT
- DETAILS OF VARIOUS DATA LINKS AND HOW THEY WORK IN ISOLATION
- REAL-LINE ARCHITECTURE TO IMPROVE MESSAGE

For more information, visit: resources.synthesys.co.uk/defence/newsletters/tdl-tech-teach-01.pdf

5

Synthesys DEFENCE

Getting it Right Every Time

Quality isn't an afterthought; it has to be a constant focus through every stage of the development process. How many times have we heard that? Six Sigma and Lean methodologies have brought a ubiquitous 'Kaizen' philosophy of continuous improvement to development and manufacturing, and Agile project management emphasises iterative testing and incremental development.

Systems engineering has learned a lot from these methodologies and is continually adapting its processes to add value alongside these disciplines. Using these techniques can only get you so far, and most of these ideas originated in specialised development disciplines. Lean and Six Sigma methodologies add the most value in bulk manufacturing processes; Agile works best with adaptable products like software, with new versions rolling out after weeks rather than years. Often, complex systems are produced in smaller quantities and can't be changed so easily.

Lean, Six Sigma and Agile methodologies can add a lot of value when you're building the engine or coding a module; not so much when you're building the engine factory or setting long-term strategy for a huge software platform. And then there's all the space in between.

What systems engineering brings to the table is a view of the system as a whole and how its structure generates its behaviour, and this extends to its approach to quality. The outputs of the whole system, in terms of user satisfaction, its operating environment and its interaction with other systems – in short, the value derived from the whole system throughout its life cycle – are at the front-and-centre of quality.

Thinking about quality like a systems engineer is about thinking in terms of a hierarchy of complexity. When designing the system, we start with the broad needs of the client, turn that into specific requirements for the system as a whole, create an architecture at the system and then the subsystem level, and only then produce a detailed design for the individual elements. Ensuring quality of a whole system is about going through that hierarchy in reverse: testing the reliability of individual components or modules against specifications; verifying the performance of subsystems against requirements; then validating the outputs of the system in terms of customer need. This is coupled with a clear recursive process for when standards

are not met, to ensure definitions are revisited at the most specific level possible.

Systems engineers work to ensure processes that touch any aspect of the life cycle are capable of meeting the requirements of the project. Because systems engineering success involves establishing scientific and falsifiable requirements, it is also involved with setting the measurement and quality assurance processes. Its focus, therefore, is on ensuring an unbiased and repeatable process, with independence in assurance, and straightforward, repeatable measurement that can be performed frequently.

Verification and validation are the processes of performing these assessments on the project. Rather than see the difference as being the point in the life cycle when these actions are performed – before and after product integration – systems engineering sees them as respectively ensuring that the product has been built right and that the right product has been built. Verification is about checking the system against requirements, architecture and design; validation is about checking it meets client needs. Depending on the system, both of these tasks might need to be performed at any or all of the element, subsystem or system level.

The point of using systems engineering processes in quality is about looking at the system-as-a-whole in the right way. We believe this approach is complementary to a wide range of development methodologies. A huge part of that is in its scientific approach to requirements engineering, which generates specific, unambiguous and testable requirements using the same method as a scientist uses to generate the hypothesis of an experiment. Black box models of how the elements of a system interact with one another also significantly reduce the risk of an emergent defect not being detected until the system has been integrated.

To discuss how your organisation may use Systems Engineering to accelerate projects, improve quality and reduce costs, contact us via: cet@synthesys.co.uk or call us on: +44(0)1947 821464.

The logo for the Three Counties Defence & Security Expo (3CDSE), featuring the letters '3C' stacked above 'DSE' in a bold, sans-serif font.A yellow paraglider is shown in flight against a blue sky with scattered white clouds. The paraglider's canopy is fully inflated and curved, with its suspension lines visible.

THREE COUNTIES
**DEFENCE &
SECURITY EXPO**

LANDING AT THE MAKE UK DEFENCE PAVILION

We firmly believe that forming strong relationships across the defence community is a cornerstone of how we operate, which is why we are thrilled to announce that we will be exhibiting at the upcoming Three Counties Defence and Security Expo (3CDSE) event.

This flagship event takes place at the Three Counties Showground in Malvern on 3rd & 4th November 2021. We will be participating in the MAKE UK Defence pavilion on day two of the event – 4th November.

Initiated by the Three Counties Defence & Security Group (3CDSG), 3CDSE is a unique showcase of innovative defence and security SMEs. The show brings together senior military leaders, senior police engaged in the fight against cyber-crime, the intelligence and security agencies, and the industry innovators who supply them, to identify future strategies and needs.

The SyntheSys Defence team will be exhibiting as part of the MAKE UK Defence pavilion where we will be demonstrating our new military communications test, training and simulation capability, Synapse.

The logo for Synapse, featuring a network of blue dots connected by thin lines, positioned above the word 'SYNAPSE' in a bold, blue, sans-serif font.

SyntheSys
DEFENCE

SYNAPSE TEST & TRAINING: A SOLUTION TOUR



CHALLENGES

TESTING IS KEY 

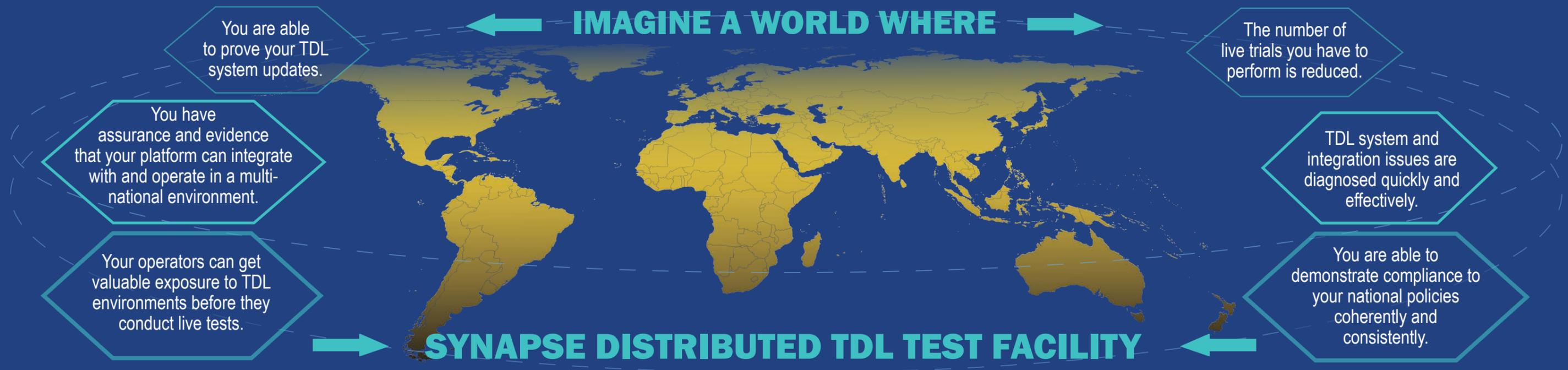
OPERATIONAL ASSURANCE 

LONG TERM EFFICIENCY 

REAL CONSEQUENCES 

It is increasingly necessary to perform interoperability and integration testing with coalition partners focusing on force level function, not just against other national platforms. Tactical Data Link Interoperability (TDL IO) testing is crucial to overall operational and strategic effectiveness but is something which is often viewed as a necessary evil as opposed to a way of creating long term efficiencies and cost savings.

The consequences of not testing interoperability are explored further here: <https://bit.ly/37BB5vm>



If costly live trials are proving unaffordable, or perhaps those trials have not yet yielded the results that you wanted and you need to carry out further tests, SyntheSys can provide cost-saving data link, sensor and integration test opportunities that are cost effective, repeatable and scaleable. Our testing solutions operate as both a fixed location service and a deployable solution. By combining state-of-the-art test equipment with our own specialist testing consultancy service, we have helped many platforms to be involved in test initiatives.

REAL WORLD APPLICATION:

- Ground Based Air Defence (GBAD)
- Coalition Distributed Engineering Plant (CDEP)
- Select Precision Effects At Range (SPEAR) Capability 3
- Interoperability Trials

TECHNICAL FUNCTIONS:

- Deployable
- Supports DIS & SIMPLE
- Supports SISO Standard J and M (J=Link 16, M=Link 22)
- Supports Various Data Link Types

TDL TESTING RESOURCES:

- Dynamically Tests TDL Integration
- Maximising the Potential of Rig-to-Rig Trial Involvement: <https://bit.ly/2JRiDa1>
- Increasing the Value of Testing: <https://bit.ly/39OLDtZ>

FREE TDL INTEROPERABILITY HEALTH CHECK SERVICE: For a limited time, we are offering a completely free TDL IO health check for your current programmes. If you are currently facing IO challenges, contact us to book your free consultation.

MEET THE EVENT TEAM

If you are visiting the show expo, we would be thrilled to welcome you to our booth. If you would like to schedule a meeting during the show to discuss how our defence systems engineering, testing, interoperability, and sustainment services can improve your current defence programmes, contact us via: info@synthesys.co.uk



MARK HUDSPETH
Operations Director



SAM SOUTHWELL
Principal Consultant



STEVE ARLISS
Senior Consultant



KATE CHANDLER
Senior Consultant



Requirements Management & Model-Based Testing in Defence

From the Archives

This article which first appeared in Issue 2, 2016, still holds true relevance, so we thought it worthwhile re-sharing it.

It's well known that testing of Tactical Data Link (TDL) implementations of military platforms is high cost, particularly when testing interoperability between multiple platforms of different nations in a live environment with aircraft flying and ships at sea.

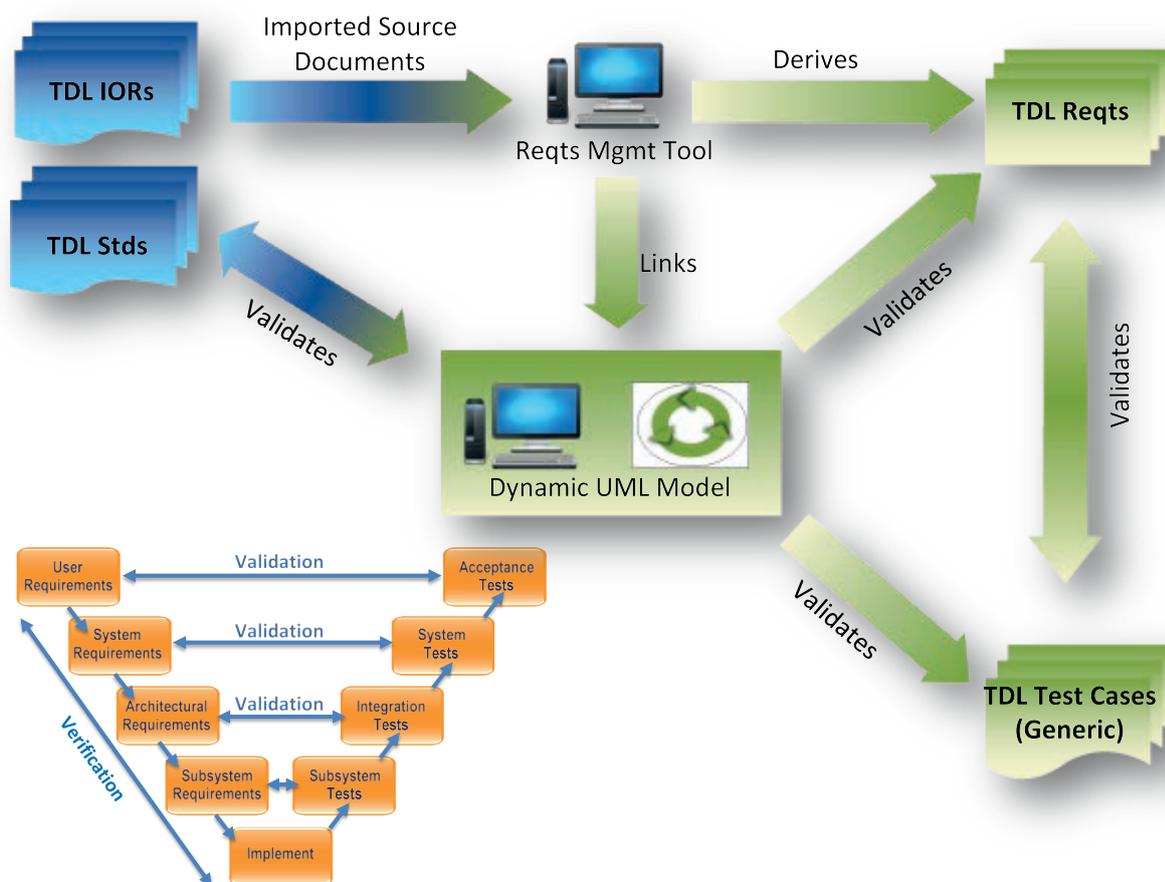
The application of requirements-based testing, underpinned by a model-based approach during requirements definition, helps to identify issues early in the development life cycle. This serves to minimise costs and risks in the development and maintenance of the system, as well as providing a direct correlation between clarified requirements and test cases for validation and verification purposes.

In this technical article, we aim to show how TDL model-based testing helps to make the most of all available benefits. Let's look at TDLs as being the vascular networks that enable the operational military System-of-Systems (SoS).

If they do not operate correctly, the platforms that they support will be starved of information, the vital nutrient in today's military enterprise without which it will cease to function cohesively or may even die. It's fair to say that it is critical that TDLs are implemented in a consistent and coordinated manner across the enterprise to ensure the flow of that vital nutrient.

Analogies aside, interoperability can be considered to be concerned with the timely, consistent, and coordinated flow of information across the TDL network. This can be achieved through an approach called standards-based interoperability, which ensures the consistent implementation of platforms by building them in accordance with underlying standards and specifications.

This is also referred to as a 'network-centric' approach and contrasts with traditional approaches in which platform TDL implementations have been focused on the needs of individual platforms, the so-called 'platform-centric' approach.



The standards-based interoperability approach can only be successful if the underlying baseline of standards and specifications is complete, consistent, and correct.

Unfortunately, in the TDL case, the governing standards (some United States (US) originated and managed, others originated and managed by the North Atlantic Treaty Organisation (NATO)) are large and complex documents that are evolving under an intricate change management system, with (in the NATO case) all participating nations contributing and agreeing on changes to the standard.

A further issue is that the structure of the requirements within the standard do not follow best practice in requirements writing techniques. These issues compound to the extent that the interpretation and misinterpretation of the complex requirements for a particular platform is an ongoing problem, leading to non-standard implementations and the creation of interoperability issues.

So, let's consider a scenario whereby a dynamic model of the requirements in the TDL standards and specifications is constructed in Unified Modelling Language (UML) to help ensure their integrity. Furthermore, as well as being able to provide feedback to the authors of the documents, this visual, functional model enables users to manage complexity and minimise ambiguity.

Here at SyntheSys, we have achieved just that.

The adoption of a model to represent the requirements gives the capability to dynamically simulate transactions with the appropriate stimuli, exercising the constraints and processing all possible paths through the model. The modelling software tracks the live progress through the model, creating a sequence diagram identifying inputs, outputs and actions. It also provides a model coverage statistic and history of the stimulation and decisions taken in execution.

The standards are constantly evolving with new functionality and modifications to existing capability under change control. The model and dynamic execution provide a means to carry out what-if analysis for changes to the standard that can identify knock-on effects and issues not readily apparent from the basic text. Any changes to the requirements are therefore easily identified within the model.

We advocate a requirements-based testing approach in which the testing of platforms is carried out against the governing standards and specifications. The models have enabled us to develop a comprehensive set of meaningful interoperability test cases since they clearly identify all decision points and, therefore, where a test case should be produced to address a specific route through the transaction.

These test cases are traceable to both the source requirements, as captured within the requirements management database, and the specific UML diagram that describes that functionality. Impact analysis of a test failure is therefore readily identified against the source requirement.

Mark Williamson
Managing Director, SyntheSys Technologies

Mark believes that....

“ ...the modelling approach reduces interoperability issues. Together with requirements-based testing, it readily identifies differences between a platform implementation and the standard, enabling those differences to be subject to systematic management. ”



Military Avionics Access to Hyper Connected Air Traffic Management

Note from the editor: The following guest article is an abridged abstract of a EUROCONTROL paper written by Jorge Pereira, Head of the Communications, Navigation and Surveillance (CNS) Coordination Unit within the Civil Military Air Traffic Management (ATM) Coordination Division at EUROCONTROL. I have focused upon the data link elements of the paper but, for those seeking wider information, please do get in touch and we can forward the full paper.

The modernisation of civil aviation CNS infrastructure is underway. Future aviation concepts will rely upon highly automated and hyper connected ATM systems. Enhanced data sharing will include the downlink of trajectories computed by aircraft's avionics enabling its use by ground Air Traffic Control (ATC) systems.

The future system will be more aircraft-centric with the transfer of certain ATM functions from the ground into the cockpit.

With the introduction of Trajectory-Based Operations (TBO), air traffic control will no longer be based on where the aircraft is, but on where the aircraft will be. One of the main enablers of TBO is the synchronisation of the airborne-based and ground-based predictions of the aircraft trajectory.

Such evolution raises significant challenges for military aircraft operating in a mixed civil-military environment. Global interoperability becomes a decisive factor for military operations that need seamless support from a common ATM/CNS infrastructure. However, military aircraft are often weapons systems, evidencing significant ATM/CNS capability mismatches and presenting serious technical and procurement constraints when meeting civil requirements.

A dual CNS approach^[1], where the capabilities available on board military aircraft can offer compliance/conformance and sustain equivalent levels of ATM/CNS performance, may be a viable option to reduce retrofits and costs. Trajectory management, together with Performance-Based Navigation (PBN) and advanced surveillance, will be a fundamental feature of future concepts.

A key enabler of trajectory management will be high-capacity air-ground data link communications and the ability of military avionics to rely on flight guidance to

process trajectory parameters at the level of the Flight Management Systems/Military Mission Systems (FMS/MMS). The compliance approach will clearly vary with aircraft types and mission.

In Europe, the Single European Sky ATM Research (SESAR) programme progressed the work to define solutions for 4D trajectory management and Airborne SPacing Sequencing & Merging (ASPS S&M)^[ii] to be enabled by existing military avionics. The results of the SESAR 1 project 9.3^[iii], together with the conclusions of several studies commissioned by EUROCONTROL, identified firm technical options to reutilise military avionics capable of sustaining key 4D functions and new separation modes.

The identified adaptations include the need to meet specific performance targets in terms of quality, service, availability and integrity. Other aspects analysed included the need to support certain functional requirements at the level of the Communication Management Unit (CMU), FMS/MMS and controllers regulating communications functions. Layers of defined protocol stacks and the support of Controller-Pilot Data Link Communications (CPDLC) and Automatic Dependant Surveillance- Contract (ADS-C) applications were also analysed.

To enable 4D Trajectory, inputs coming from aircraft sensors must produce, as output, a flight profile that the Flight Control Computer follows to satisfy the constraints imposed by 4D. This function requires the creation of a speed profile to be associated to the existing 3D Trajectory to create the 4D Trajectory.

Software modifications could ensure new control laws able to associate a set of flight controls to an assigned 4D Trajectory. In addition, there would be a requirement to adapt displays and aircraft Human-Machine Interfaces (HMI).

Availability of adequate air-ground data link enablers compliant with the underlying International Civil Aviation Organisation (ICAO) Aeronautical Telecommunications Network (ATN) concept is also fundamental.

The mitigating options to deal with the mismatch of data link technologies require the introduction of multilink solutions and applied consideration of software-defined radio technologies.

Military aircraft will adapt more effectively to equipment integration challenges, resulting from higher levels of automation and ATM modernisation, when interoperability and technology convergence approaches take advantage of the performance-based nature of civil ATM/CNS requirements. A UK study, executed in 2010, quantified the potential impact of the SESAR programme upon the UK military in the range of £2.7-£3.2bn if retrofit based on civil equipment was the sole approach for military aircraft compliance with civil requirements.

The ‘dual use CNS approach’ may, in certain cases, represent an affordable option; adapting military avionics to sustain emerging concepts such as trajectory management, PBN and advanced surveillance is crucial for sustained interoperability. Between 2009 and 2015, a SESAR 1 research project^[iv] identified a ‘generic architecture’ for military transport aircraft and fighters as the basis to define and validate the integration of 4D Functions in military aircraft, enabling trajectory management and new separation modes using existing military avionics.

Military aircraft data link equipage was required to support 4DTRAD (4D Trajectory Data Link) to enable CPDLC and ADS-C applications as defined by EUROCAE/RTCA^[v]. The ATN/OSI^[vi] protocol stack is a basic enabler. Modern military transport aircraft carry ATN-compliant VHF data link radios (e.g. Future Air Navigation System (FANS) 1/A or VHF Data Link (VDL) Mode 2) or, at least, offer provisions for future integration. Fighter aircraft are typically only equipped with military data link transceivers (e.g. Multifunctional Information Distribution System (MIDS) that are not useable for ATM.

Future equipment manufacturers would be well placed to address the use of civil data link systems on military aircraft by developing solutions that integrate the civil hardware and software onto circuit boards for installation into military V/UHF multimode radios. These could then sustain ATN/VDL2 or FANS protocols. Alternatively, interfaces to a commercial off-the-shelf CMU could also be considered for military radios to be seamlessly integrated with the military-specific FMS/MMS and avionics. A fundamental military concern for the use of ATN is security. Military aircraft will require the ability to inhibit transmission of data using Air Traffic Services (ATS) data links and ATN. It is also highly likely that the military use of ATN for data transmission would require encryption. The issue of authentication between controller and pilot digital data messages is an important area for consideration by the military. Authentication standards promoted by ICAO^[vii] must be applied before widespread implementation of ATN occurs by the military. Validation, assurance and standards are paramount to ensure that this application is fully achievable.

Finally, it is vitally important that civil-military interoperability initiatives must emerge from a balanced

consideration and adequate trade-offs, between civil aviation context and legitimate national defence and security objectives, interests and related military context and priorities.

- ^[i] See paper ‘Dual Use CNS Boosts Civil-Military Interoperability’ submitted to 2018 Integrated Communications Navigation and Surveillance (ICNS) Conference, dated April 10-12, 2018.
- ^[ii] Now referred to as Interval Management.
- ^[iii] Interoperability between Business and Mission Trajectory.
- ^[iv] Project 9.3 – Interoperability Business/Mission Trajectory. Partners: ALENIA, AERMACCHI, SELEX ES (now LEONARDO) and EUROCONTROL).
- ^[v] European Organisation for Civil Aviation Equipment/Radio Technical Commission for Aeronautics.
- ^[vi] Aeronautical Telecommunications Network/Open System Interconnection.
- ^[vii] International Civil Aviation Organisation



DATA LINK TRAINING

BECAUSE KNOWLEDGE RIPPLES

The successful development and operation of TDL systems involves a broad range of personnel: procurement officials, project managers, engineers and end-users.

Our training courses are balanced to meet those requirements by providing stimulating and thought-provoking lessons that challenge each attendee to aspire to learn more.

Whether you are new to TDLs, or an established user, SyntheSys Training Services will cover what you need to know to effectively understand, manage and maximise TDL usage and implementation in your organisation.

- Link 11, Link 16 & Link 22
- Data Link Manager/Interface Control Officer (DLM/ICO)
- Variable Message Format (VMF) & Combat Net Radio (CNR)
- Joint Range Extension Application Protocol (JREAP)
- Multifunctional Information Distribution System (MIDS)
Link 16 Network Design & Management

For more information on our specific courses, please visit:
<http://www.synthesys-defence.co.uk/data-link-training.html>



SyntheSys
— DEFENCE —

FREE TACTICAL DATA LINK (TDL) TRAINING

Access your completely free, introductory level Tactical Data Link Training now via the SyntheSys Defence Community Portal:

<http://www.synthesys-defence.co.uk/free-tdl-training.html>

AN INTRODUCTION TO
VARIABLE MESSAGE FORMAT (VMF)

AN INTRODUCTION TO
TACTICAL DATA LINKS

AN INTRODUCTION TO
LINK 22

AN INTRODUCTION TO
MIDS LINK 16

