# Technology

A Tribute to Her Majesty: 70 Years of Tactical Data Links 8 Interoperability Musings from the Running Man 0 TDL News from Across the Globe

Published by SyntheSys for the Tactical Data Links Community

# In memory o<mark>f Queen</mark> Elizabeth II

# 1926



2022

Your steadfast service will always be remembered Ma'am

www.synthesys-defence.co.uk

# DATA LINK MANAGER INTERFACE CONTROL OFFICER TRAINING COURSE





Our flagship training course provides a comprehensive understanding of TDL systems, operations and the role and responsibilities of a DLM/ICO

For more information, visit: https://www.synthesys-defence.co.uk/dlm-ico-training.html



# 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: Mark Hudspeth, Sam Southwell, Kate Chandler

> Printing: Illustrated Stationery Ltd

©2022 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.

The contributing organisations are solely responsible for the content within the associate article.

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

Unless otherwise accredited, all military photographs in this issue are © Crown copyright 2022 www.defenceimagery.mod.uk

Autumn 2022 : Issue 14

To subscribe: www.tdl-technology.com



# Reflecting on the Past, Embracing the Present and Anticipating the Future

As the seasons change here in the UK, so do Tactical Data Link requirements, and it is with this in mind that I welcome you to this latest issue of TDL Technology Magazine. As this vital technology warps to support ever-more demanding operational, tactical, and strategic goals, we are seeing shifts towards simulation, sustainability and security. And so, as the industry upgrades, integrates and reinvents, the interoperability issues become greater.

I would like to join the nation in paying my respects to the late HM Queen Elizabeth II. We offer this latest issue of TDL Technology as a tribute to Her Majesty and all the service men and women who directly served under her reign. Issue 14 has therefore been designed to focus on three things. First, on Page 6, we pay tribute to Her Majesty Queen Elizabeth II by reflecting on the history of TDL usage with a timeline of key events and technologies throughout her 70 years on the throne. Next, we explore current and future UK TDL Interoperability test programmes on Page 8 with musings from our very own Sam Southwell. Finally, we bring together the best of the industry on Page 10 by compiling a list of interesting news features.

In my last letter, I commented on how the strong appetite for TDL Training is guiding some of what we do here at SyntheSys Defence and I was thrilled to see so many delegates at the free 'Introduction to Tactical Data Links' training we delivered over the summer. If you were unable to attend, you may be pleased to know that the session recording can be accessed on the Defence Community Portal along with other useful resources. To learn more and register for an account, please visit: http://tdl-tech.synthesys.co.uk/community-portal.html. Perhaps now is a good time to extend an invitation to join our next free TDL training session on the 29th November 2022, which will focus on JREAP. Further details can be found on Page 5.

With that in mind, our training calendar for 2023 is now open and we are actively taking bookings for our range of Tactical Data Link training courses. We offer a range of best-in-class training solutions which offer introductory style training, through to our extended Data Link Manager / Interface Control Officer 15-day course. Further information can be found on Page 11.

If you are reading this at the International Data Link Symposium (IDLS) in Halifax, Nova Scotia, Canada (7-10 November) then I hope you have a productive, insightful and successful trip. Please do look out for myself and my colleagues, Kate Chandler and Roland Kemp who will also be attending. Kate will be delivering a presentation on the Impact of Next Generation Multi-Domain Technologies on TDLs and how to achieve enduring economical and Net Zero Benefits.

Very best regards

Mark Hudspeth Managing Director SyntheSys Defence Limited

# Contents

# News & Industry Events

- 5 SyntheSys News The latest news from us
- 10 In the News Interesting defence and TDL news pieces from around the globe
- 11 2023 Training Schedule Including more FREE online TDL training

# Features

- 6 70 Years of Tactical Data Links A history of TDL technologies
- 8 Interoperability Musings from the Running Man A marathon or a sprint?

😑 🚫 SyntheSys

SyntheSys Defence Community Portal

# THE SYNTHESYS DEFENCE COMMUNITY PORTAL

Open to members of the TDL and wider Defence community, the Community Portal provides easy access to useful tools, technical insight and resources. What's even better, is that basic membership is completely free!

# **REGISTER NOW**

To register for access to the Defence Community Portal please visit: www.tdl-technology.com/community-portal



Free access to downloadable technical articles, white papers and other useful resources

Capabilities and Limitations (Caps & Lims) database

Unlimited subscription to TDL Technologies magazine

Access to pre-recorded TDL training courses and details of online training schedule

# SyntheSys News

# Students from Caedmon College, Whitby Complete their STEAM projects for this year's 'S Challenge'

The 'S Challenge' was created to influence students to research a subject of their choice and create a project considering aspects of STEAM (Science, Technology, Engineering, Art and Maths). When the students of Key Stage 3 finished their projects, they were asked to present in front of two judges, Kirsty Brown representing Caedmon College Whitby and a representative from SyntheSys.

This year's competition brought many creative and insightful projects. We would firstly like to congratulate all partakers of KS3 for making a step in their life to pursue their passion, as well as having the courage to present their findings in front of judges. This is not an easy task, and we can congratulate them for showing such passion and initiative at such a young age.

Secondly, we would like to congratulate the joint winners of this year's prize; Emily with her 'Fast Fashion' Project and Tristan's Coding project. Emily's 'Fast Fashion' established many issues we face with the world today and how the fashion industry, specifically fast fashion, is contributing to the global climate. We were blown away by her artistic representation of this matter which is why we gave her 1st place. Tristan's coding project was inspired from an Information and Communication Technology (ICT)





lesson but the way he took his knowledge to the next level stunned the judges. Tristan created a report that looked at the evolution of coding and his predictions on the future of technology. On top of this report, Tristan created his own computer game that demonstrated his hard work and understanding of coding. As both subjects showed great initiative and included multiple aspects of STEAM, we felt it was only fair to award 1st place to both Emily and Tristan.

John Hartas, Managing Director of SyntheSys, had this to say about this year's STEAM challenge:

"This year's projects, yet again, never failed to amaze the judges with the brilliant young minds of Caedmon College, Whitby. It is always a pleasure to be able to work with the pupils to expand their knowledge on subjects they are passionate about. All participants should be proud of their final products and I would like to congratulate them on being creative and having the courage to think outside the box."

# SyntheSys Secures a Place on G-Cloud Once Again

We are pleased to share that our cloud services continue to feature as part of the Crown Commercial Service, G-Cloud Framework.

The latest framework iteration, G-Cloud 13, provides a mechanism for clients to access leading IBM® software and systems engineering solutions through our cloudbaSE product, with associated technical support and training from our team. Our services can be found under the 'Cloud Hosting' lot.

The initiative aims to improve public sector procurement by pre-qualifying suppliers who meet a set minimum standard. We are pleased to feature our cloudbaSE toolset via the framework. cloudbaSE utilises the flexibility and versatility of Cloud computing to provide IBM® Engineering Lifecycle Management software in a more economical, adaptable way. The mix of powerful IBM® software, flexible licensing options and extensive experience, offers powerful solutions to everyday challenges faced by many Systems & Software Engineers, Developers and Testing professionals.

To find out more about our G-Cloud involvement, or to speak to us about your cloud hosting, software or support requirements contact: info@synthesys.co.uk.

# FREE ONLINE TRAINING – Introduction to JREAP 29th November 2022 – Register here: https://bit.ly/3yfYzUY

# 70 YEARS OF TACTICAL DATA LINKS - A TRIBUTE

2022 has been a tumultuous year, witnessing initially the extended celebration of HM Queen Elizabeth II's Platinum Jubilee, marking an historical seven decades of unwavering, selfless, and dedicated service as Monarch to the United Kingdom and Head of State to the wider Commonwealth. The recent passing of Her Majesty has resulted in an extensive overview of the past 70 years, focused mostly upon the cultural and socio-economic changes that have taken place during this period, but what of the technological developments in network-centric warfare?

1950s

The concept of Tactical Data Information Links, evolving with the increased research programmes post World War II, were made a reality by Ralph Benjamin and his team as part of the UK Admiralty Surface Weapons establishment in the 1950s. Shaped through the development of WWII technologies and the exponential advance of standardised data communications systems, the process was adopted by North Atlantic Treaty Organisation allies, coalition and US Forces to transmit and exchange real time tactical data through allied military network participant links. The importance of the connected battlespace was expedited further by the deepening of The Cold War with the Soviet Union.

# 1960s

The provision of a battlespace common picture evolved with the development and introduction of various Tactical Data Links (TDLs), initially 1 & 4. However, with the introduction of Link 11, a relatively slow link operating on a polling system with a Net Control Station, TDLs were capable of additional operations in broadcast modes, allowing individual participants to make single data transmissions and to transmit numerous messages. During the Vietnam conflict TDL technology was used extensively through US Navy Tactical Data Systems, the application of Positive Identification Radar Advisory Zones allowed pre-submitted flight plans to operate safely under protective umbrellas of surface support. Airborne Tactical Data Systems were also widely used with the introduction of carrier-based air operations in support of the conflict, providing direct airborne data feeds into the combat picture.

The Atox

The

# 1970s

The conceptual development of second generation TDLs began with Link 16, using 16-bit computers and operating at faster data rates than the original 8-bit TDLs originally devised. An encrypted high-capacity datalink, Link 16 introduced frequency hopping features and jam resistant capabilities, using the Joint Tactical Information Distribution System (JTIDS) and the Multi-Functional Information Distribution System (MIDS). The system provided support for real-time tactical information exchange. TDL utilisation expanded further following the introduction of the F16 Fighting Falcon - Belgium, Netherlands, Denmark, and Norway wanted the airframe and the components; consortium activities surged for access to the all-weather fighter.



 $\cap$ 

The application of Link 16's key features, Surveillance, Electronic Warfare, Mission Management, Weapons Coordination, Secure Voice Channels, Navigation and Air Control, were invaluable during the day-to-day activities of the Cold War and the Falkland Islands conflict. The integrated air picture facilitated the uninterrupted awareness of the combat picture to commanders and operators alike positioned upon the edges of the Eastern Bloc. 1981 saw the commencement of the full development of JTIDS. The extensive programme was supported by an exceptional team of individuals, including SyntheSys MD, Dr John Hartas, all of whom contributed unique expertise to various disciplines to facilitate the revolutionary concept.

Tactical data links provide network-centric situational awareness across multi-domains, including land, sea, air and, more recently, space. By incorporating the systems into various platforms including rotary, fixed-wing, maritime, unmanned systems and land-based platforms, the evolution over the past 70 years has been fascinating. Here follows a brief review of some of the key transformations and operations which occurred during the decades encompassing the period of celebrations and reflection during Queen Elizabeth II's reign.

# 1990s

In Gulf War One Operation DESERT STORM necessitated the immediate provision of reliable Situational Awareness for fast-moving forces across Air, Land and Sea. Link 16 capabilities, providing the fundamental base of integration and situational awareness activities, were enhanced through the introduction and utilisation of MIDS Terminals. In the early 1990s SyntheSys supported the Ministry of Defence as a trusted advisor with various aspects of the JTIDS Air Platform Network Management System (JAPNMS). The development of Link 22 also began as part of the NATO Improved Link Eleven (NILE) project in 1992.

# 2000s

The period immediately following 9/11 in 2001 witnessed some of the most fundamental application and developmental transitions during the previous five decades. In preparation for Operations ENDURING FREEDOM and IRAQI FREEDOM rapid expansion of the TDL capability was undertaken. JAPNMS development continued in the turn of the millennium and SyntheSys further supported Defence Science and Technology Laboratories through technical data support to the US Common Data Link (CDL) programme, which was in contention to support the Maritime Unmanned Airborne Vehicle (MUAV) programme. Support to the Joint UAV Experimental Programme (JUEP) culminated in the Royal Navy operating the ScanEagle.





# 2010s

UAV activities support continued in the TDL arena through the NATO Industrial Advisory Group, focused upon interoperable command and control data links, multi-environment control stations, payload data processing and counter threat analysis. As technologies have evolved then TDLs have adapted to continue to deliver fundamental underpinnings of the connected battlespace. The growth of airborne target pictures into the cockpit enhanced the situational awareness in multi-domain activities, with the wider incorporation of data links capable of integrating with the F-35 and F-22 allowing the smooth transition into 5th-generation platforms.

# 2020s

So far during this decade we have witnessed the retirement of the UK E-3D Sentry, following a long-standing presence and unrivalled capability. The introduction of new platforms, the focus upon the environment and increased innovation, but what does the future hold for TDLs? Adversarial developments and technological advances have resulted in the unprecedented sprint evolution of unmanned combat systems and swarm technologies. TDLs will play a vital role in ensuring that concurrent operations on multiple data links, validation, interoperability, multi-domain integration and simulated training of the collective battlefield, both nationally and with allies are imperative. The TDL influence endures...

# INTEROPER ABILITY MUSINGS OF THE RUNNING MAN

Note from the Editor: In this latest feature, Principal Consultant, Sam Southwell, entertains us with his reflections during a recent run after years of working on UK test and acceptance programmes. Sam also poses some frank questions about the future of interoperability assurance. For Sam's full professional bio, visit: https://bit.ly/3QtOACo

# A MARATHON OR A SPRINT?

**A word of caution** ..... the following article is about Tactical Data Link Interoperability Testing, if read out loud then you may experience the rest of the room stopping work and moving closer to catch every word, you have been warned!

Tactical Data Link Interoperability testing - hmmm, I thought, nearing the 6th mile of a trail run somewhere in the Lake District.

The E-3D rig disposal went pretty quick, removal being far easier than installation. But, this was the last airborne platform capable, with it now gone how will we perform wide area network Interoperability testing? Perhaps the simple answer is we won't. We do still have the Portsdown rig though, that still works.

No, wait, the A400M has a test rig, well it will have, and it will be taking part in NATO Interoperability tests, hurrah, flying the flag, albeit from a different country. Until then we can rely on the Navy platforms in their Portsdown rig to be the lone star, or stars, in support for our "interoperability is important" message to the world.

Perhaps I am thinking about this from a SyntheSys point of view? Perhaps the message is tired?

After all, as long as we conform to the standards we can assure interoperability, right? The Tactical Data Link standards are recognised as unambiguous even if you're not native to the English language, right, ....right?. Everyone updates to the latest and greatest version, but so what if they don't, the versions are entirely interoperable anyway, well, we spend a lot of good effort trying to make it so at least.

So why did initiatives like the NATO Interoperability test start? Is it cheaper? Is it more productive? Is it fun?

It's certainly not fun, it is certainly a lot cheaper than a live test but is it more productive? That of course depends on a whole host of other factors. So why are we in the situation we have found ourselves? Is it just simply because it is less sexy than live events and the results of a successful live test are conclusive? But is it a choice, surely it's not one or the other, surely as part of Interoperability Assurance it should be both? ...approaching the quarter point of the race now, what else would I be thinking about..... absolutely anything!

.....rocky bit, slow down or fall down.

...being passed by a lady, I'm being "chicked!" That can't be allowed to happen, what am I talking about, she is stronger and faster, get over it.

.....perhaps I'm tired!

.....smile for the camera, pretend you're still fresh and not breathing through other parts of your body.

.....stop smiling!... The rest of the runners will think you're an idiot!



So how do platforms assure interoperability, even with other UK platforms, if they don't have the capability at least to connect up over a wide area network? Is there not a Joint Services Publication or something that details this?

I have absolutely no idea how they do it, but then perhaps interoperability assurance is just too expensive. Or perhaps we could just buy the assurance from the integrator, that will be cheaper. Maybe my definition of assurance is different to others; I am perhaps too close to interoperability and the testing for it. Do I perhaps put too much store in it and it doesn't really need that kind of priority? We integrate to the standard so we get assurance from that, surely?

Buuut, tests rigs are not the only way to test, we can pour over the platform documentation versus other platform documents and assure that way. Is that good enough? It's certainly a very good start, that's for sure. All we have to do is ensure all platforms have produced good documents following the mandated process and that they are verified against the actual platform - how do we do that? Do we do all that or just produce all the documents? Do we even do that?

If we did do that, then it would be just a simple jump past a test rig, hang on don't we need a test rig set-up to verify the documents? Going round in circles here. Rewind, perhaps the idea of a fixed test rig is outdated? After all, not all assurance testing is about wide area. But what about mobile support rigs with the ability to connect to the wide area and to the platform's simulator? Or is it emulator? - whatever! This would perhaps allow pooling of the resources. Hang on, is that not what the Tactical Data Links Support Unit do already? No doubt they have plenty of spare time. Well, even if they did have spare time, manpower and resources, can they connect to the wide area? Not sure, but it is technically feasible at least.

Fast forward to the present day. The A400M rig is still not ready, it's only 4 years late, the configuration will be obsolete in 6 months. The Portsdown rig will change its product later this year which will hopefully continue to allow it to take part in wide area network testing, will it suffer capability loss during the transition, who knows?

So why have we in the UK stopped interoperability assurance, well not stopped but let our ability to test interoperability drop at least? We know it's cheaper and better for the environment than live testing, we know it supports repeatability, we know we can test against a wide variety of platforms, we know we can verify platforms' implementations; perhaps I stumbled upon the reason during my run, literally.

It's simply not fun!

....I start muttering interoperability assurance to myself, followed by... "get a grip, think about football or something".

....Joint Services Publication! What happened to thinking about football?!

....through a gate, careful to shut it after me, 'cos it slows down the person behind,... not that I am competitive.



.....nearing the finish, there is that lady again, changed already! I knew I should have tripped her up - suppress that thought!.... and besides you couldn't catch her.



.....Perhaps I am not thinking clearly, tired now, but there is the finish line, a few more strides and then a well-earned rapid loss of altitude by 5ft 9inches.



# TDLS - IN THE NEWS

# CONSOLIDATED DEFENCE NEWS PIECES FROM AROUND THE GLOBE

## Collins Aerospace Demonstrates Data Bridge for JADC2

### July 2022 | https://bit.ly/3oYhKON

Multi-domain technologies tested in a recent exercise demonstrated how US joint forces can shorten long-range kill chains. Collins Aerospace used the recent biennial Valiant Shield 2022 field training exercise in to demonstrate how advanced communication, networking, mission computing and sensing technologies support the Joint All Domain Command and Control (JADC2) initiative by shortening long-range kill chains.

### Northrop Grumman to install cryptomodernization beyond-line-of-sight Link 16 tactical data link on E-2D

### March 2022 | https://bit.ly/3p1Nv97

The Link 16 tactical data link network that enables military aircraft, ships, and ground forces may exchange their tactical picture in near-real time. Avionics experts at Northrop Grumman Corp. will help the U.S. Navy add communications security to the Link 16 military tactical data link aboard the Navy's fleet of carrier-based E-2D Advanced Hawkeye surveillance and maritime patrol aircraft.

## New Capabilities for Fire Scout

### July 2022 | https://bit.ly/3JB5TPu

The US Navy's MQ-8C Fire Scout autonomous vertical take-off and landing (VTOL) platform is set to acquire significant new capabilities under roadmaps drawn up both by Northrop Grumman and the service. If all comes to fruition, the MQ-8C will in coming years be the beneficiary of an extended sensor package, enhanced Mine Countermeasures (MCM) systems, Satellite Communications (SATCOM), Advanced Tactical Data Link (ATDL), Anti-Submarine Warfare (ASW) capability, an optical landing system, a Sense and Avoid system, new weapons and an expeditionary basing capability.

# 586th FLTS helps showcase data link improvement

#### April 2022 | https://bit.ly/3d9Vxdo

The 586th Flight Test Squadron was involved last year in the testing and showcasing of the new Heimdall enhanced capability for legacy tactical data links. Heimdall was developed to increase data sharing for legacy tactical data links, or TDLs, in contested environments and improve warfighter readiness.

### L3Harris, Northrop Grumman awarded \$1.3 billion to build missile warning satellites

#### July 2022 | https://bit.ly/3B0051p

The U.S. Space Development Agency has awarded a pair of contracts worth more than \$1.3 billion to build a new series of missile warning and tracking satellites. On Monday, the SDA announced that L3Harris Technologies, Inc., and Northrop Grumman Strategic Space Systems would build 14 satellites each for a total of 28. They will be part of the SDA's Tranche 1 Tracking Layer (T1TRK) satellite program and will launch starting in April 2025.

### Global Tactical Connectivity Abounds for Warfighters

#### June 2022 | https://bit.ly/3Qa8sKV

Space Development Agency construct will provide key tactical radio communications. The three-year-old Space Development Agency, which was charged with rapidly developing a successful National Defense Space Architecture, is on track for providing increased global tactical connectivity to the warfighter through the widespread, legacy Link-16 radio capability.

### Cutting Edge New LEO Constellations Will Use Familiar Link 16 Tech

#### April 2022 | https://bit.ly/3bB70af

The Space Development Agency's experimental Low Earth Orbit (LEO) data transport constellation will employ bleeding edge new technology in space when it starts to launch later this year. But down on the ground, SDA Director Derek M. Tournear told the Space Symposium April 6, the satellites will employ more familiar tech: The 90s-era Link 16 tactical communications.

# SyntheSys Defence Training Schedule 2023



Sep 4 & Dec 6

**JREAP** Courses

Please contact us for further information including pricing and location details.

# WATCH THIS SPACE FOR MORE FREE TDL TRAINING

Following the overwhelming interest in our Summer 2022 free training series, we are running further free online training sessions in 2023 and would like to suggest you save the date. The focus areas are yet to be confirmed but will be based on feedback from the community.

Details and planned sessions will be published here: https://bit.ly/3SVhSuP

SIMULATE

# SYNAPSE TEST I TRA

For programme teams and organisations navigating the challenges of integration and interoperability testing and training, SyntheSys Defence introduces its latest innovation, Synapse.

Synapse combines powerful applications with best-in-class expertise to provide a tailored service to test Tactical Data Link interoperability and integration whilst enabling platform participation in a rich training environment.

Synapse improves platform and operator performance by ensuring standards conformance is built into your command and mission system test and training programmes.

For more information, or to discuss your TDL Test, Trials and Training requirements, contact: info@synthesys.co.uk





