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IN THIS ISSUE.....

Tom Moncur

EDITORIAL

Welcome to another RSI Journal, where the ever-eclectic range of articles embraces technology, history, future policy and general interest. The work and role of the RSI is expanding, reflected in the change of job title for Lieutenant Colonel Nigel Harrison's replacement, Lieutenant Colonel Phil Osment, who assumes the title of Director RSI. Our grateful thanks go to Nigel for all his hard work in carrying forward the work of the Institution, together with our very best wishes for the future with Cyber Challenge UK.

The focus in this issue is on the future of the Corps, as underlined in the article by the Chairman and the work of the Project Boyle workshops, as well as mention the timely article by Captain Martin Crilly. The Master, our Chairman and Major General Bill Robins, the workshop facilitator, are clear in soliciting views and opinions on the efforts to date. Our Foremen of Signals have traditionally been one of the Corps strengths, and from the articles based on projects from recent Foreman of Signals courses, it will be seen that the traditional high standards are being maintained, and some leading edge technologies are being embraced. The somewhat terse title of "IPV6" contains revelations of interest to all of us, and relates nicely to the article on "The Internet of Things" in the last issue.

For many of us, the name of FANY conjures up images of gallant and worthy ladies doing good deeds in support of the war effort. Today's organisation has evolved considerably from its pre-World War One origins, and the article by Mo Shannon will come as a revelation to many. The historians in our readership will have noted that among this year's anniversaries is the centenary of the Battle of the Somme, which makes Major Paul Knight's article on communications particularly timely.

In conclusion, articles and letters are encouraged on the broad range of topics mentioned above, with the proviso that space considerations may dictate some editing and alteration. The Winter 2016 Journal will appear in mid-December, and the final date for submissions is 21 November.

Best Wishes,
Tom

THE ROYAL CORPS OF SIGNALS

THE FUTURE OF THE ROYAL CORPS OF SIGNALS

A Notice by the Chairman of the Royal Signals Institution, Brigadier Michael Lithgow CBE

If the rate of change on the outside exceeds the rate of change on the inside the end is near - *Jack Welch*

Within this issue of the Journal there are a two specific articles I would recommend you read, each of which is looking at the future of Royal Signals. General Bill Robins has provided a summary of the work to date on Project Boyle, the future state of the Corps, and Captain Martin Crilly's thought provoking piece on leadership, skills and competencies that we will need to develop and retain to remain relevant to Defence.

The RSI was given the task by the Master of Signals of examining next generation (nextgen) Royal Corps of Signals – what should it look like and how do we make it better able to support the challenging needs of Defence. This nextgen examination was not concerned with structure and organisation but reflecting on the needs of: a fully digitalised Defence, a challenging recruiting and retention environment and recognition of ways of working of millennials. Two scenarios emerged:

• Minimum adjustment to the Corps skills/ competencies which might be constrained by change fatigue in defence, funding, executive sponsorship. The likely outcome of this approach was the Corps would remain relevant but largely as a provider of utility infrastructure services.

• Revolutionary change that was able to provide a wider range of service across the entire spectrum – from infrastructure and services through to applications and analytics. This would reflect the needs of Defence. Whilst Royal Signals would not be the sole provider, as the largest entity in Defence of professional IT/IS personnel, it was the logical building block upon which to create these capabilities.

General Bill provides an excellent summary of the work to-date. Across Defence there was recognition that the requirement lay in a more controlled revolutionary approach but that the window of opportunity for the Corps to adapt was narrow. At a macro level there were three high level capabilities we would need to provide:

• 'A professional engineering Corps'. Skilled, experienced and competent individuals that can design, build, run and configure complex and ad-hoc networks and structures supported by applications and data 'engineers'.

• 'Brokers'. This term reflects the requirement to design and deploy services to meet the needs of Defence as a Department of Government as well as operational employment. The 'Brokers' would be able to interpret business/operational need, understand how to integrate the service components, providing technical direction to teams and advise to commanders.

• 'Guardian'. These are the leaders at each level of support. Their role is to balance; risk, speed plus agility, resources and outcomes against business/operational drivers.

Re-defined trade structures plus new ways of learning would be required. Equally important was the need for a large cadre to deploy, survive, operate and provide close support in challenging environments.

On a very positive note there is genuine recognition and a will to change from the highest level in Defence. The challenge at the end of the year for the Corps is the leadership and resources to drive these necessary changes through at pace. The door is open for the Corps to change its role and nature of support to Defence, but we ourselves must take the decision and be bold enough to enter.

It is not the strongest of the species, nor the most intelligent that survives…It is the one that is most adaptable to change" *- Charles Darwin*

CORPS SPRING GUEST NIGHT

Sgt (PM) Tam Coleman leads in the Corps pipers to join the Corps Band

The 2016 Corps Spring Guest Night was held on Thursday 3 March in the Headquarters Mess Blandford Camp, with the Master of Signals presiding.

As ever, the event was an occasion where the Corps bid a formal farewell to its retiring officers, and welcomed those newly commissioned, as follows:

Officers Dining Out	Officers Dining In		
Lt Col K A Owen	Capt R J B Luke	2Lt J Clark	2Lt R Annable
Lt Col N Keen	Capt M J Lane	2Lt T Davis-Merry	2Lt F Drummond
Lt Col M Milne	Capt N Hill	2Lt P Goldsbury	2Lt A Eveleigh
Lt Col AP Hudson	Capt V Walsh	2Lt H Griffith	2Lt K Hadfield
Lt Col J Bradshaw	Capt J J Pearson	2Lt C Henderson	2Lt R Hawkins
Lt Col J Turner	Capt G M McArthur	2Lt M Heuston	2Lt J Marchant
Maj P White	Capt R Wade	2Lt R Illing	2Lt J Mould
	Capt M South	2Lt O James	2Lt A Nicholls
	Capt D M McDonnell	2Lt J Mitchell	2Lt J Reid
	Lt A Punter	2Lt G Perry	2Lt B Salero
	2Lt L Bennett	2Lt A Sanderson	2Lt M Shapiro
	2Lt J Carter	2Lt G Tonks	2Lt L Shortland
			2Lt D Younge

Lt Norton receives the Essay Prize from the Master.

A View from the Top Table

The Master presents Capt David Baxter with the Whistler Trophy"

THE PRINCESS MARY AWARD – COLONEL GRAHAM NORTON

The last issue of the RSI Journal notified the award of the Princess Mary Medal to Colonel Graham Norton, the former Regimental Colonel. The citation for this award was not available at the time of going to print, and it is therefore reproduced below.

Colonel Graham Norton assumed the appointment of Corps Colonel for the Royal Corps of Signals in March 2012, a time of unprecedented churn and uncertainty; the Corps was fully committed to operations in Afghanistan, Defence was about to move into one of the largest transformation projects it had seen for decades and 3 tranches of Redundancy were soon to start. Taking on the role, traditionally covered by a senior Brigadier, with limited staff, scarce resources and little precedent, he faced a virtually impossible challenge, but it was one that Colonel Norton was determined to rise to; if the morale and structure of the Corps were to remain intact there was no time for delay or room for failure.

From the outset Colonel Norton grasped the importance of people and heritage to start shaping a Headquarters that would be responsive and flexible enough meet emerging and short notice requirements. With boundless enthusiasm, bags of passion and a hardened determination to do what was best for the Corps Colonel Norton set about influencing, cajoling and encouraging others to support an intent that sought to promote the role of the Corps in a new era of Information delivery. By placing people first he skilfully minimised the detrimental effects on morale of Squadron amalgamations, redundancies and Regimental reorganisations - it worked. With Regular and Reserve manning on the up, Officer recruiting buoyant and the

Corps ideally placed to manage the challenges of future Reviews Colonel Norton has guided the Corps through a tumultuous period quite magnificently; in ethos and morale it has never been stronger.

Through personal sacrifice, selfless comittment and a desire to continually put the Corps first Colonel Norton has never once sat on his laurels. From developing the Corps Facebook page and incessant use of the IPAD, to an endless programme of visits to the Corps family, Colonel Norton has travelled thousands of miles and shaken many hands, always with a smile on his face and a spring in his step. His unfaltering commitment to the Regular, Reserve and Retired communities has been genuinely inspirational and few have done more to instil pride and confidence than he. The Young Officer fraternity think he's great whilst the older generations respect him for who is and what he has achieved. Across the Army he is invariably the Corps Colonel that others turn to for advice and guidance. A leader to all and a friend to many Colonel Norton moves on, rightly proud, in a modest way, of his herculean achievements.

Despite turbulent and uncertain times, the Corps, under the direction and mentoring of Colonel Norton has continued to go from strength to strength. His accomplishments have upheld the very highest traditions of the Royal Corps of Signals and he is strongly recommended for the Princess Mary Medal.

One mission, one team, one direction.

LETTERS

Dear Tom

Thank you for another interesting issue of the Journal. I found Lt Col Ian Buchanan's piece on cyber electromagnetic activity – based on his extensive experience in the area - particularly valuable and thought-provoking.

I hesitate to take issue with anything in his wide-ranging conclusions, but I do think he dismisses the use of Reservists somewhat quickly.

I can assure your readers that, far from 'recruitment being somewhat slow', if anything interest in the Joint Cyber Unit (Reserves) – JCU(R) - increased in 2015 and continues in 2016. The next 2 Joint Cyber Selection Boards, at which potential candidates are interviewed to ascertain skills and suitability, are full. JCU(R) attendance at the Cyber Security Expo, briefings to HP, Airbus, PwC and other companies, plus the Paris atrocity, have all maintained interest. Getting recruits through the Army pipeline and into their units has been slower than we hoped, but JCU believe these problems have now been overcome and numbers are rising steadily.

Finally, while it is generally true that most people 'join the Reserves to do something different', but beware of turning this into a dogma. Plenty of people do - and always have - become Reservists to test their civilian skills in a unique military environment. The signs are that there are many cybernauts who think the same.

John

J Crackett , Major General, Assistant Chief of Defence Staff

Dear Editor,

Brigadier David Hargreaves's article on The Corps and its Heritage (Journal Vol 33 Issue 1 Summer 2015) is very interesting, reflecting Corps members' apparent ignorance of the Corps' heritage and the consequent impact on esprit.

When I was a lad, the "Q" Course spent time on the Corps' history, structure and personalities and many of us, after our first tour at regimental duty, went to 11 Signal Regiment in Catterick as Troop Commanders to do recruit training. Amongst all the other activities, this involved teaching Army Certificate of Education in "Army and Nation" as well as Corps history. It was necessary, as the Brigadier points out, to know basic facts about the Corps' history, organisation and structure and the ranks, names and decorations of the most senior serving officers, for a recruit to successfully pass off.

Also, at Regimental Duty we were encouraged to include a non-mandated training subject (e.g. unarmed combat) or a talk in each weekly training programme. This provided an ideal opportunity to teach and discuss our Corps heritage and its heroes and was often informally tested in the course of preparation for CO's inspections and visits from senior officers.

If so many of all ranks have so very little knowledge of the Corps' heritage then clearly, we have only ourselves to blame. The note that the 'Association' produced a booklet for every member of the Corps in '27 is as intriguing as it is interesting and clearly, such an approach today would strongly support cap badge mentoring during Phase 1 training. One can only agree with the article; if the topics were to be adequately covered at this and subsequent stages of formal training the generation and maintenance of esprit de corps would more than compensate for the loss of a few technical lectures or practical activity.

Yours sincerely - Colonel John Roberts

Dear Sir,

In the Summer 2015 edition of the RSI Journal I found two serious (for me) omissions. This concerned the statement in the article on 27 Commonwealth Brigade Signals in the Korean War to the effect that when 27 Brigade withdrew in April 1951 after two and a half months in Korea, 29 Brigade "completed the full UK land contribution that continued after 29 Brigade was withdrawn".

This was not so, for 28 Brigade under Brigadier George Taylor also continued for two more years after the end of the war, with two UK battalions, a tank regiment, engineers, a signal troop which I commanded, and logistics, eventually combining with 25 Canadian Brigade and 29 Brigade to form the 1st Commonwealth Division. Moreover, many units of 27 Brigade remained in Korea after April 1951 to the end of the war, notably with the RAR, the NZ gunners, the Indian Field Ambulance and some South Africans as well as some UK units. Only a small element of 27 Brigade withdrew in April 1951.

There were also the Divisional units, all from UK, of a gunner regiment, engineer regiment, signals regiment, Army Air Corps and logistics units.

Yours sincerely - Brigadier Tony Bohannan

THE MILITARY DIVISION OF THE NEW YEAR AND QUEEN'S BIRTHDAY HONOURS LISTS 2016

Our congratulations go to the following R Signals and late R Signals personnel who have been recognised in the above.

PROMOTIONS IN AND APPOINTMENTS TO THE MILITARY DIVISION OF THE MOST EXCELLENT ORDER OF THE BRITISH EMPIRE

As Commanders

Brigadier David Graeme ROBSON

Colonel Malcolm Paul LLEWELLEN OBE

As Members

Captain Graham CAMPBELL

Major Graham Jackson CLARKE

Captain Roderick Duncan COWAN

Corporal Robert Ian HARPER, Royal Corps of Signals Army Reserve

Capt Naveed MUHAMMAD. Royal Corps of Signals Army Reserve

QUEEN'S VOLUNTEER RESERVES MEDAL

Lieutenant Colonel Julian Mark PICTON

UK-US TEAM WINS TOP DEFENCE ENGINEERING PRIZE

The annual Churchill Medal Award for professional engineering excellence was won this week by a mixed UK and US military team. The four-man group were honoured for their delivering a means of interoperable communications to support the coalition Kabul Security Force as part of the NATO Operation RESOLUTE SUPPORT.

The Anglo-American team were made up of Warrant Officer Class 2 Kearney of the Royal Anglians, Staff Sergeant (Yeoman of Signals) Piff, Sergeant First Class Henderson (US Army) and Sergeant Fothergill of the Royal Signals. In late 2014, the over 3000 strong NATO force were beset by problems in coordinating movement and force protection. Communications were critical but challenged by differing national systems and a shortage of funding. The UK-US team had to create a solution to achieve interoperable communications between the Kabul Security Force and wider NATO elements. Their innovative engineering solution incorporated static, vehicle and man mounted systems in a multi-layered system. The effort was recognised to have strengthened the operational effectiveness, protection and safety of US, UK and wider NATO forces in the Afghan capital.

The Churchill Medal Award is the premier Defence engineering accolade. Only re-instituted in 2011 at the request of the Churchill family it is presented to an individual or a small team for 'achievement in Engineering and Technical Advancement in support of Military Operations'. A list of notable medal winners include Sir Frank Whittle, Sir Geoffrey de Havilland, Sir Bernard Lovell and Sir Christopher Cockerill. The award is sponsored and supported annually by the civilian Professional Engineering

Institutions including the ICE, IMechE, IMarEST, InstRE, RAeS, SOE and the Engineering Council.

The award was presented on 12th November at the Royal Society of Chemistry by Air Vice-Marshall Julian Young and Mr Mark Bowman, Director of Flight Operations, Military and Air and Information BAe Systems. AVM Julian Young spoke as the Defence Engineering Champion, "The Churchill Medal Award is about celebrating engineering excellence, and this prestigious award demonstrates Defence's close links with the Professional Engineering Institutions and at the same time benchmarks the high level of professionalism of Defence Engineers & Technicians."

The Master studies Generation Y's homework!

PROJECT BOYLE: ROYAL SIGNALS IN THE 21st CENTURY

By Major General Bill Robins

Note: the views expressed here are those of the author, who facilitated the workshops described below.

INTRODUCTION

Outline

The 21st Century operating environment ("21COE" to friends) is already very different from that of the 20th Century: continued rapid changes in technology, society and geopolitics are intensifying demands on information professionals, particularly those in Defence and Security. The Corps must be at the heart of this new and demanding world.

Project Boyle is the RSI initiative assessing the changes needed to ensure that the Corps is fit for purpose in the 21st Century. This article gives a snapshot of the work so far.

The Issue

UK and its allies now face a variety of security threats from state and non-state actors in which information exploitation is a common thread. IT turns double somersaults every few months. People and organisations are changing their behaviour as a result. The Corps needs to respond to all of this.

Governments are steadily losing to the private sector the skilled workforce needed to handle these challenges and are developing new relationships to remain effective. Skilled information workers are demanding a different relationship with their employers than the traditional hierarchical arrangement: more open, more flexible, offering better opportunities for personal development.

Already some aspects of warfare are "Uberised": nastily profligate, with information services, surveillance and sophisticated weapons available to a wide range of troublesome players. The command driven defence and security structures of the 20th Century are struggling to cope with these 21st Century challenges.

To support these changes, the Army needs people and organisations supremely competent in the field of information and the machinery to deliver it. It looks to the Corps for this. But are we ready for it? Are our officers and soldiers selected, educated and trained to handle a world of ambiguous operations enriched by social media, cloud technology, data analytics, integration of secure apps, cyber operations, complex system engineering and fast changing decision support and visualisation techniques? Can we handle the new relationships needed

with commanders, supported formations and industries to handle these complex challenges? How should those relationships work? Project Boyle is trying to answer these questions, initially by running workshops with sets of different stakeholders.

The project's first workshop engaged with one star delegates, the second with junior officers and SNCOs. The third will work with RSI corporate commercial sponsors to attempt further to understand how the Corps can best work with industry. A fourth workshop in October will engage commanding officers. Further work will clarify options. The results will be assessed by the Corps and the Army during early 2017 to decide what to do about all this.

FIRST WORKSHOP: 21 APRIL 2016 AT BCS, THE INSTITUTE FOR IT, LONDON

The first workshop was chaired by the Master and held at one star level with Corps, Army, RAF, RM, CDIO and consultancy support. It analysed the drivers for 21COE as they affect the Corps. The key point emerging was that commanders now see the electromagnetic environment (EME) as critical terrain. They look to the Corps for support and guidance.

The workshop then attempted to develop a rich picture of a possible future Corps to meet 21COE. Delegates suggested that it might show some of the characteristics below.

Culture and Competence

• **The culture of a future Corps would grow beyond providing networks to fighting the information battle. This means developing the technical competences for information support as well as skill in handling close relationships with staffs to deliver it.**

The Master remains to be convinced

• **This would demand deeper ICS technical competence at information (not just network) level, whilst not losing wider leadership, military and advocacy skills**

• **A future Corps would be better at secure, agile internal communication between its hierarchy, its officers and its soldiers in staying up to date and sharing ideas**

Education, Training and Development

• A future Corps would invest more resources in lifelong learning. Closer relationships would be developed with commerce and academia for education, development and training. This might include two way exchanges with industry.

Maj Gen Robins ensures we stick to schedule!

• More Corps people would be encouraged to gain chartered status (eg) with IET and BCS

• Formal mentoring arrangements for high potential people may be worth considering

Marketing and Recruitment

• A future Corps would better communicate and market itself by adopting industry-recognised competency frameworks and language and emphasising to potential members the central place that cyber and data skills now play in Defence and Security.

Cyber

• Cyber should be a Corps mainstream activity, using shared competences with ICS in a Defence wide approach, using a shared language with other services and CDIO

Opinions varied as to how critical the need to change actually was. Delegates were asked: can we deal with the 21COE challenge (1) incrementally or (2) does it need a root and branch reassessment of the way the Corps works? The answer from this senior workshop was about 50/50 for each option.

Brig Greg Wilson briefs generation Y on the new trade proposals

SECOND WORKSHOP: 9 JUNE 2016 AT THE GENERAL STAFF CENTRE AT CAMBERLEY

Some 40 captains and SNCOs from across the Corps joined the Master for the second workshop at the General Staff Centre in Camberley. All delegates had studied the Workshop 1 report beforehand and had been encouraged to discuss the issues with their peers in units before they came along. The atmosphere was well-informed, lively and constructive.

Delegates built on the Workshop 1 report and validated its direction of travel. At the time of writing this article, the full write-up of the workshop is not yet complete, but the following general points look pretty clear.

Workshop 2 was asked the same question as Workshop 1: can we deal with this challenge (1) incrementally or (2) does it need a root and branch assessment of how the Corps should operate and train? The result was a 100% vote for (2), rather than the 50% when delegates at Workshop 1 were asked the same question.

Brigadier Greg Wilson, Army HQ, briefed the outline of the new trade structure developed by the Corps FofS(IS), Chris Crompton. The delegates largely liked what they saw. The workshop discussed the possibility of a common foundation trade (on the same lines as Combat Engineer), say Digital Warfare Engineer.

The workshop produced several ideas about recruitment and retention, many of them looking both original and practicable, at least at this early stage of assessment.

Workshop 2 was clear that the future Corps had no option but to expand Corps expertise from the network levels into the data and information levels of operation. There was general agreement that the Corps is not currently trained to do this. Full competence for the future Corps would need developing in both breadth and depth: in breadth, to engage with a wider set of stakeholders (including other services, HQJFC, CDIO, OGD, academia, professional bodies and industry) and in depth to be competent in the data and information support technologies needed to meet the 21COE. The Corps would have to learn to behave as an information services organisation, delivering comprehensive support to its clients but in more demanding environments than most ICS companies ever see.

The workshop worried about how realistic it was to expect competence at both breadth and depth from the same people. So Captain Martin Crilly of 39 Sig Regt was asked to brief the key points of his paper "The Future of Royal Signals" to the workshop. He suggested that an Information Services Branch (ISB) within the Corps (a Corps within the Corps) might be the most cost-effective way to deal with in-depth data and information work.

ISB might then provide field units with the expertise in deep technical data issues when needed. This echoes the Sappers' approach to using Professionally Qualified Engineers (PQE) for civil engineering tasks needing deep expertise. The workshop agreed that this approach may be worth consideration but time did not permit delegates to consider it in detail. It certainly should not let mainstream signallers off the data hook. There will doubtless be other ideas to solve this issue, but the Crilly idea is a possible start to solving an important issue. His article elsewhere in this Journal refers.

WHAT NOW?

During the Autumn the RSI will work with key Corps and Army staff to develop this work, outline the choices and assemble the bones of a suggested plan, before handing the work to the Corps at the end of 2016 for formal consideration.

Please join the debate: the Journal welcomes comment. But this 20th Century method of engagement must change soon to a well-moderated secure on-line debate within the Corps at all levels.

WCIT JOURNEYMAN SCHEME

The Worshipful Company of Information Technologists (WCIT) was formed in 1986 and later became the City of London's 100th Livery Company; it subsequently gained its Royal Charter in 2010. Formal links between WCIT and the Royal Signals stretch back to 1992.

The standard entry route into WCIT for those with suitable professional qualifications and experience is to be directly elected as a Freeman of the Company. However, in keeping with the traditional practice amongst the other Livery Companies, WCIT also have an entry route for younger and less experienced applicants; they are invited to undertake a three year 'Journey' where they are mentored by a more senior member of the Company.

The focus of the mentoring is towards developing individuals in the four disciplines of Competence, Confidence, Community and Company. The Journeyman Scheme has its roots in deep history, where apprentices in the City of London would serve as 'Journeymen', to confirm their worthiness to become Freemen of the City and independent practitioners of their chosen trade. In the modern era, a Journey is a three year opportunity to explore the life and opportunities on offer in a Livery Company.

In 2012 a pilot scheme was introduced whereby a small group of Royal Signals officers and soldiers were invited to become WCIT Journeymen; with the majority of their joining fees and annual subscriptions being paid for by the Royal Signals Institution (RSI). It has now been decided to extend the scheme and open it up so that any serving (regular or reserve) member of the Corps of the rank of staff sergeant, warrant officer, captain or major may apply for one of the (up to) ten annual RSI-sponsored places on the WCIT Journeyman Scheme.

Overall, the three year Journey typically costs an individual about £1,000 and the RSI will refund 80% of the costs of the Journey for the selected individuals. Upon successful completion of the Journey and the individual becoming a Freeman of the Company the RSI will reimburse the remaining 20% of the costs of the three-year Journey to help offset the cost of becoming a Freeman.

The closing date for applications has been set as 1 July annually; with a selection board taking place in the Summer before commencement of the Journey in September. Further information on the WCIT is available at https://www.wcit.org.uk whilst information on the application and selection criteria will be promulgated shortly through a Royal Signals Information Note (RSIN) and then embodied in PD 025. The POC for queries is Lt Col Ben Howarth, jfc-cap-c4isr-taccis-so1@mod.uk.

IP VERSION 6 IMPLEMENTATION

By SSgt (FofS(IS)) Sachin Thapa

EDITOR'S NOTE

SSgt (FofS IS) Sachin Thapa successfully completed the BSc (Hons) course in Management of Information Systems from Bournemouth University, achieving a First Class Honours degree and being awarded the accolade of Academic Best student for FofS(IS) Course 13. On completion of the course in October 2014, he was posted to 3 (Harrogate) Squadron, 11th (RSS) Signal Regiment and is currently employed there as Squadron Foreman of Signals (Information).

The Internet Protocol (IP) is a basic layer of the networking stack and the IP address is a fundamental identifier for any entity on the network. IP Version 4 (IPv4) allows end systems to communicate and forms the foundation of the Internet as we know today (Teare 2013). However, due to several inherent limitations of IPv4 there has been a gradual shift towards IP Version 6 (IPv6) technology which aims to overcome these limitations. The IP is also the fundamental building block of Ministry of Defence (MOD) Network Enabled Capability (NEC). It is also a vital component of coalition operations and MOD departmental business.

The main aim of this article is to investigate the impact of introducing IPv6 on military systems and in order to have a holistic view it is equally important to understand the impact of not introducing IPv6 on military systems. IP itself has two main variants; IPv4 and IPv6. IPv6 is the successor to IPv4 but IPv4 is the current MOD addressing scheme. It is crucial to understand the difference between the two and what advantages IPv6 has over IPv4.

One of the main differences between IPv4 and IPv6 is the number of addresses it can provide. IPv4 can provide roughly 4 billion addresses, however with the growth of internet and especially mobile users, 4 billion addresses is not enough to accommodate all the potential users and devices on this planet. Latest stats suggest there are roughly 7.1 billion people on our planet and the number of devices online is growing at a fast rate which is estimated to total 50 billion by 2020. Clearly, IPv4 cannot accommodate

these increasing demands, which is the main driver behind the emerging need and gradual acceptance of IPv6, which can provide roughly 340 undecillion (340 trillion, trillion and trillion) addresses. IPv6 can not only provide enough addresses for a foreseeable future, but also for centuries and centuries to come. IPv6 will allow us to ultimately achieve the 'Internet of Things' (see Winter 2015 RSI Journal) where an IP address can be given to every object or every object on the planet. For this reason IPv6 is also called Internet Protocol for the next generation (IPng) .

It is important to note that Internet Assigned Numbers Authority (IANA), responsible for allocating IP addresses, has already assigned the last set of IPv4 addresses in January 2011, which means that globally there are no more IPv4 addresses left to be assigned. However, MOD itself has IPv4 addresses left, which might make us wonder why we need to move towards IPv6. There are several internal and external factors which mandate and necessitate this eventual transition, which will become more apparent in the later part of this article.

Military Significance of New IPv6 Capabilities

Firstly, it is vital to understand that IPv6 has lot of technical advantages which makes it a more efficient and secure protocol compared to IPv4. Transition to IPv6 will increase the efficiency of the protocol. IPv6 header are much simpler compared to IPv4 header. A simplified header field means there are no requirement for processing checksums, a simpler and more efficient header mechanism and improved routing efficiency for performance and forwarding-rate scalability. Even though IPv6 headers are twice as large as IPv4 headers, they can be compressed more easily, and result in a compressed header which is the same size as an IPv4 compressed header and can be smaller.

Features of IPv6 such as stateless auto-configuration, multicasting and anycasting will increase the agility and speed up the deployment of the networks and services/applications running over them. Transition to IPv6 will also reduce the manpower required for network/system management, facilitated by auto-configuration/discovery capabilities provided by IPv6. In addition, the MOD complex and integrated Service Oriented Architecture (SOA) will benefit from such IPv6 advanced functionality.

IPv6 provides two new fail-over mechanisms, namely anycasting and Neighbour Unreachability Detection, which increases the resilience. Anycasting allows assigning same address to multiple nodes that provide a particular service

And growing by 300,000+ people every day!

ONLY 4.3 BILLION IPv4 ADDRESSES

7.1+ BILLION PEOPLE ON EARTH

BY 2020 THERE WILL BE:

50 BILLION DEVICES ONLINE

That's 10+ times more devices than IPv4 addresses!

which facilitates the nearest available one to be selected through the routing protocol. Neighbour Unreachability Detection provides a fail-over mechanism to cope with intermittent radio links. Moreover, new use of the network will emerge with larger address space and the ability to assign multiple different addresses to the same interface which can be used simultaneously. This will be possible from providing IP addresses to the devices that currently are not Network-Enabled

MOD Direction On IPv6

In accordance with the MOD's direction on ipv6 stated on 23 April 2004, the IPv6 Focus Group was established in order to co-ordinate the transition of IPV6 across MOD networks, and assumed responsibility for developing IPv6 strategy and policy for the transition. Although the Focus Group were responsible for the transition, the MOD decided to adapt a wait and watch strategy, and started monitoring the US DoD progress on IPv6. In 2007 the focus group was suspended due to the US pending progress on IPv6. On 02 August 2007 an IPv6 Global-Unicast address space (2001:40c8::/32) was allocated to the MOD by RIPE, and the allocation is currently held and distributed by the Network Technical Authority (NTA) in MOD Corsham. The DIN 2006DIN04-096 released in 2006 providing the interim direction on implementation of IPv6 on military system is still valid for MOD's current direction on implementing IPv6 on military networks. The key points to take away from the DIN are:

• A top down approach is required for the planning and co-ordination to move to IPv6.

• IPv4 will still be the MODs core internet protocol until transition to IPv6 is complete.

• The use of IPv6 is to be actively disabled on MOD networks until its use is authorised by higher formation.

According to JSP 457 (July 2007) Policy 457/1/02, IPv4 is currently capable of meeting defence requirements. In due

course MOD would want to migrate to IPv6, however the move to IPv6 in the MOD needs very careful planning and co-ordination in order to maintain interoperability, and therefore the use of IPv6 is prohibited until its evaluation and planning for MOD use is complete.

According to JSP 602 leaflet 1013, new equipment is to have dual (IPv4 and IPv6) capabilities including a conversion service. According to JSP 604 Issue 3 (Aug 2012), all equipment procured must be capable of supporting IPv6 either now or as a result of an identified manufacturers roadmap for providing IPv6 capability. However, IPv6 must not be enabled on the network until its use has been sanctioned by Defence policy. The Strategy emphasizes that the transition to IPv6 will not be easy, and MOD will operate a 'dual-stack' network running IPv4 and IPv6 for some time. Those specific systems that need to move to IPv6 soon to ensure continued interoperability between MOD systems and those of allies and coalition partners will be prioritised for transition. JSP 604 Leaflet 2107 published on September 2014 provides rules, direction and guidance relating to the procurement and design of 'IPv6 capable ICT [1] system'. JSP604:2107.002 clearly states that IPv6 capabilities must be securely disabled until IPv6 is authorised for deployment within defence.

IPv6 And Key Allies

The USA, one of our key allies, has taken significant steps and made substantial progress towards IPv6 implementation. The US first set formal milestones for a transition to IPv6 on 02 August 2005, which set a deadline for federal agency network backbones to be using IPv6 by 30 June 2008. A document published by the Office of the Secretary of the Army states that Army organizations/ agencies will upgrade public and external¬ facing servers and services (e.g., web, email, Domain Name System, Internet service provider services, etc.) to use dual-stack IPv6 by the end of 2012, and internal client applications that communicate with public Internet servers and supporting enterprise networks to use dual-stack IPv6 by the end of 2014. Currently, US Non-secure Internet Protocol Router Network (NIPRNet) implementation is complete internally and Secret Internet Protocol Router Network (SIPRNet) implementation is nearing completion internally; external dependencies are on Defence Information Systems Agency (DISA).

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[1] *Information and Communications Technology*

NATO IPv6 implementation road map is illustrated below and if everything goes as per schedule Beyond 2020 the NATO will have a fully IPv6 compliant network.

In 2008, the European Commission issued a communication to the European Parliament, the Council and others on "Advancing the Internet: Action Plan for the deployment of Internet Protocol version 6 (IPv6) in Europe". The Action Plan set the objective that IPv6 should be widely implemented by 2010, with at least "25% of users able to connect to the IPv6 Internet and to access their most important content and service providers without noticing a major difference compared to IPv4".

Transition Techniques

One of the biggest impacts of introducing IPv6 is that it is not backward compatible with IPv4. Since the eventual transition is inevitable, it is important to explore into the options that are available which will also help us to understand the impact of introducing IPv6 or not introducing IPv6. The successful adoption of IPv6 depends on its easy integration with the existing MOD infrastructure without significant disruption of the services. A wide range of techniques are available for the period of transition between IPv4 and IPv6. These techniques can be broadly grouped into three main categories .i.e. Dual-Stack, Tunnelling and Translation. It is not necessary or may not be feasible to use the same transition option for every MOD network, so the applicability must be determined on a case by case basis.

In dual-stack technique, hosts and network devices run both IPv4 and IPv6 at the same time. On each physical interface, both addresses are configured which allows the implementation and connection to both IPv4 and IPv6 networks on each node. IPv6 will be the preferred protocol .i.e. it will be used if an IPv6 service exists. It is a widely used transition technique in the Global Internet and within the US IPv6 Transition Plan and the NATO IPv6 Transition plan. There is a subtle difference between installing both stacks and operating a dual-stack network. Nearly all transition options involve installing both stacks at some point, and to some degree, but the key is to start testing and operating in a dual-stack environment to allow for a seamless transition. One of the main problems with this approach is that it increases the likelihood that hardware and software upgrades will be necessary as opposed to just a software upgrade. The advantages would include its simplicity in configuration and no tunnelling header overheads.

In Tunnelling technique, IPv6 packets can be carried over IPv4 or vice-versa. In this transition option, any particular router only routes either IPv4 or IPv6 packets, and the other version of IP is routed over the configured tunnel. One of the main advantages of this approach is that it can be applied at the pace required to support current operations, neither too soon nor too late. It is not deemed necessary to upgrade the routers currently being used from IPv4 to IPv6 immediately; rather some extra routers can be procured to provide IPv6 tunnels over the existing IPv4 routers. This option is favoured by FALCON, IPT and Prime Contractors.

In translation, the IPv6 header is replaced with an IPv4 header, and IPv6 addresses are translated to IPv4 addresses or vice-versa. This option is a special kind of Network Address Translation (NAT) which can be argued to not being actually a transition option in the sense that it does not actually result in an end-state where everyone in the MOD would be using IPv6. Rather it allows all the existing networks and applications to continue using IPv4 and interoperate with external networks that are using IPv6 via gateways. Moreover there are several disadvantages associated with this technique, such as negative cost/benefit ratio and bottlenecks which are on top of the undesirable features associated with NAT implementation.

The transition techniques and options discussed so far are not all exhaustive and there are other sub-methods available which can be used.
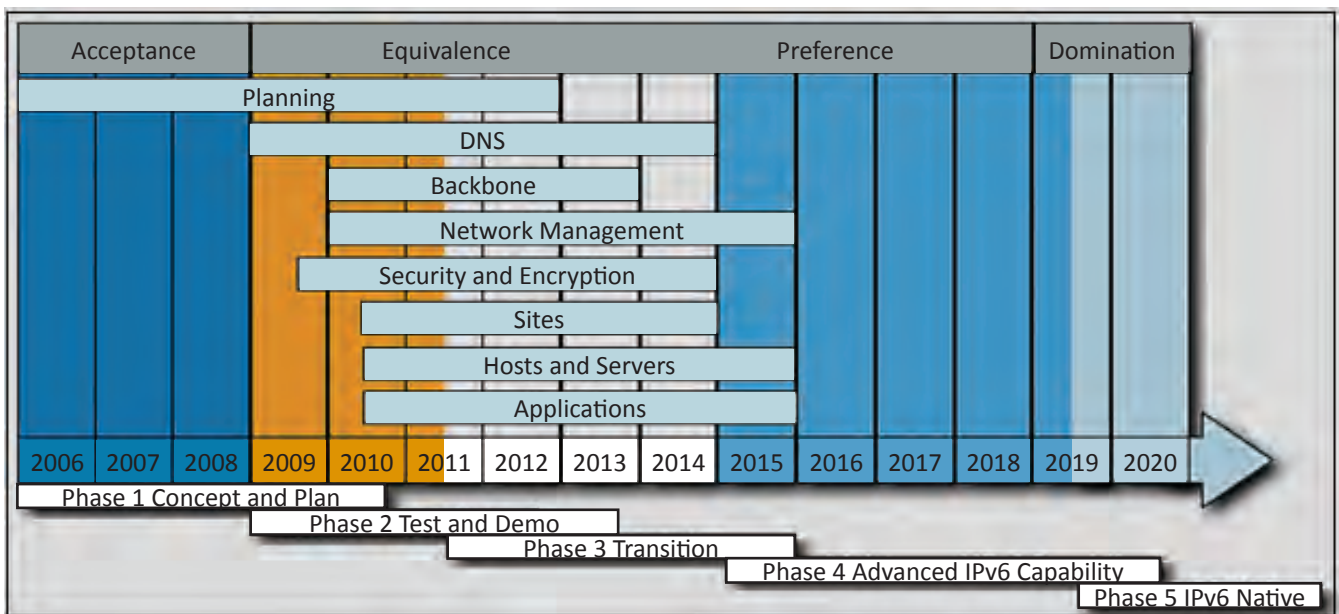
The Impact

There will be a major impact of introducing or not introducing IPv6 on our military systems, and a clear and thorough understanding is paramount. There will be an impact in Interoperability with the partner nations if IPv6 is not implemented in military system, as the majority of our key allies have implemented IPv6 within their core network. Although there are techniques to address the interoperability issues, reliance on solutions as such can be more inefficient and may have an implication on the MOD operational effectiveness. However, as it stands none of the public sector organisations have implemented IPv6 on to their networks, which may hinder the MOD collaborative working capability with organisation such as the Police department and NHS, and thus may result in interoperability issues between internal organisation and the MOD.

The cost implications of introducing IPv6 would be substantial, as the majority of the legacy CIS assets currently owned by the MOD do not support IPv6, and new assets capable of supporting IPv6 must be procured in order to support IPv6 compliant network. In a similar context, equipment and software upgrades (e.g. IOS upgrades on the layer 2 & 3 devices) will be critical requirements to facilitate the transition. Since there are very limited SMEs on IPv6, contractors will have to be hired to support the transition. Special training packages have to be conducted in support of the transition, adding more cost to the transition. Procuring IPv6 complaint equipment would require significant change to the contractual agreement between the MOD and the service providers, and contractual agreements would have to be reviewed on a case by case basis.

IPv6 is a relatively new protocol to the industry and has not been field tested as thoroughly as its IPv4 counterpart. It may take a long time to achieve the technological maturity for IPv6, and there will be a significant risk to network security over the transition phase. Transition techniques such as dual-stacking host both IPv4 and IPv6 traffic, and traffic multiple encapsulation is required, which increases the difficulty of performing deep packet inspection, thus hindering the information assurance posture of the network. There is a potential risk of hackers, and the attacker which may already have significantly more resources, knowledge and possession of many advanced IPv6 capable tools ready to attack the network. The primary military encryption device such as the DC2K does not support IPv6, therefore MOD may require to find alternate IPv6 compliant encryption solution for the transition.

The majority of the MOD owned networks such as DII, Housekeeper, Overtask etc have Windows XP installed as the Operating System (OS), and the downside of XP is it does not support IPv6. Implementing IPv6 on these systems will require OS upgrading, resulting yet another financial commitment. The complex configuration in support of different transition techniques will have implications on operational effectiveness. With the use of different transition techniques there will be an impact on network performance - transition techniques such as dual stack which requires double resources and double processing power to support both IPv4 and IPv6 traffic running at the same time, will potentially degrade the overall network performance

Recommendation

A two dimensional graph is plotted to understand various options available to us to deal with this issue. The X-axis represents the timeline and the Y-axis represents the progress of our key allies and world from a totally IPv4 network to a totally IPv6 network. The dotted vertical line represents end of life for IPv4, and the day when all our coalition allies and rest of the world would have transitioned across to IPv6. There is no set date for the end of life for IPv4, because this is something which cannot be predicted, but what can be predicted is that such a date will definitely come. We have possibly four options available to us. Option 1 would be to do nothing. It means we never make a transition to IPv6 at-all. Obviously, this will have massive implications on our operations capabilities, even lthough this will have minimum cost implications. So, this is not a wise option.

Option 2 is to take urgent reactive action once the end of IPv4 life has happened. This means adopting a Big-bang approach, which would have huge cost implications over a short period of time, and might adversely affect the operational capabilities of our military systems. Option 3 is to have last minute re-active approach when the end of life for IPv4 approaches. The danger with this approach is that it is very difficult to distinguish from Option 2. The exact date for IPv4 end-of-life is not known, which makes it very difficult to judge when to take the last minute reactive action.

Option 4 is to take a planned pro-active approach. An eventual move to IPv6 is inevitable, so the best approach is to start taking steps now towards IPv6 implementation. The exact nature and details of IPv6 implementation is quite extensive, and outside the scope of this article, however some of the key steps would include a clear top-down direction embracing IPv6, a firm stance on IPv6 rollout and adoption, set timelines for gradual and ultimate transition across to IPv6, training at all levels and to all the relevant soldiers and adequate testing to check the functionality and test end-to-end connectivity which is necessary to ensure IPv6 capability.

Conclusion

This article is by no means exhaustive since the concept of IPv6 and its implementation impact is extensive. Rather this is just a suggestion, and indicates of some of the salient drivers behind the inevitable change and its impact on the military systems. An eventual transition to IPv6 is unavoidable, hence it must be embraced across the military systems at the earliest opportunity with a clear top-down direction.

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THE WHISTLER TROPHY

Lieutenant D Baxter
21st Signal Regiment

Lt David Baxter is nominated for the Whistler Trophy for his outstanding leadership and example as an exceptional Troop Commander. He has successfully completed the United States Air Force Cyber Internship; led, mentored and managed his troop through the final Falcon Training and Advisory Team (FALTAT) uplift at 21 Signal Regiment; competed at the Corps Snowboarding and Cross Country Championships; and organised a Via Ferrata Climbing expedition to the Dolomites.

Lt Baxter epitomises professionalism: hardworking and selflessly committed he will always go that extra mile for his soldiers. With a Falcon Troop under his command he has played an instrumental part in the management, education and growth of his soldiers in understanding Falcon all the way through FALTAT process. Lt Baxter has approached the integration of Falcon into the Regiment with excellent foresight, identifying his soldiers' strengths and weaknesses he has challenged them to become better tradesmen and approached every hurdle with an analytical approach and a 'can do' attitude. This has seen him develop a highly effective and loyal troop that has respect for their Commander's decisions and a desire to impress.

Lt Baxter's exceptional leadership was highlighted time and time again during the numerous Falcon exercises he deployed on. His ability to remain calm under pressure and identify effective solutions to operational problems provided his soldiers with the inspiration to challenge themselves and never stop fighting for communications. Lt Baxter was the first choice to lead and manage the deployable Forward Headquarters during the final confirmatory FALTAT exercises, exceeding all expectations in the delivery of services he provided.

Technically astute and highly capable, this officer abides by our Corps ethos of seeking out new skills and knowledge for the benefit of the Corps. His desire to attend and complete the United States Air Force Cyber Internship saw him undertake a highly intense and technically challenging course in an area of communications that we as a Corps are only starting to grapple with. Lt Baxter was an exemplary ambassador for the Corps whilst detached in the United States and the knowledge he gained allowed him to personally brief the 2* Director of UK Cyber Intelligence and Information Integration on his return, on the benefits of the Cyber course to UK Defence.

A role model for all soldiers and junior officers, Lt Baxter has a remarkable level of fitness. A Regimental Snow Boarder and Cross Country runner he has participated in both Corps Championships and encouraged a number of Regimental soldiers to get involved. He recently organised a flawless Adventurous Training expedition to Italy with the group conducting Via Ferrata in the Dolomites with a team of 10 soldiers. All benefitted hugely from the experience and from his hard work in organising it.

Lt Baxter is an excellent junior officer who has attained some significant achievements, yet remains entirely humble. He is an officer who upholds the Corps values to the highest standard and is fully deserving of formal recognition for his services to the Corps.

Colonel S G Hutchinson MBE ADC,
3 March 2016

Colonel R SIGNALS

FANY – "THEY'RE NEITHER FISH NOR FOWL, BUT DAMNED FINE RED HERRING"

By Mo Shannon

EDITOR'S NOTE

After joining the OTC while at university in Sheffield, Mo was commissioned as a TA officer and joined 39 (SC) Signal Regiment(V) based in the City of London. She served in a number of roles, as a Recruiting Officer, Troop Commander, and Operations Officer in her 10 years with the regiment. She then transferred to take over as Paymaster and RAO at the London Regiment. On her retirement from the TA she joined the FANY, an organisation that she had worked with through her Signals role. Having undertaken a number of roles in the FANY over the years, she is current the Deputy Commandant and a Trustee. She is also a fully trained member on 24x7 callout to support London should the need arise

The First Aid Nursing Yeomanry (Princess Royal's Volunteer Corps), founded in 1907, is an all-female voluntary organisation which deploys multi-faceted rapid response teams to support civil and military authorities in times of crisis.

London lives under constant threat: threat of terrorism, natural disasters and unforeseen incidents such as tube or train crashes. FANYs train every week to ensure that they can provide a professional public service when the threat becomes a reality. Routinely, FANYs deploy in support of non-emergency operations, such as economic crime and murder investigations, operations to recover children assessed as at risk, and character player support to bring a degree of realism to training.

In 2005 vital resilience support was given to both the City of London Police and Metropolitan Police Services post the London bombings on 7th July:

• Some 44,000 calls were received into the Casualty Bureau during the 7/7 incident – 34,000 on the first day - and within 27 minutes of mobilisation, 13 FANYs were on duty at Bishopsgate Police Station manning the phones.

• Over the next days and weeks, FANYs completed 760 man hours and 56 turns on shift in Bishopsgate and with the Metropolitan Police's Anti-Terrorist Hotline.

"The FANYs have worked with the City of London Police Casualty Bureau for the past 40 years. Their dedication, motivation and commitment to this responsibility have been invaluable, not only to the City of London Police, but also to the general public."

Adrian Leppard, City of London Police Commissioner (2011-2015)

Membership and Roles

We have approximately 135 active members who are mostly in full time civilian jobs and give up their free time voluntarily. They receive no pay - in fact, they pay a membership fee and sometimes cover their own expenses to attend training and operational taskings.

Members are on callout 24/7 to respond to an urgent call for support for up to 72 hours in a number of roles, including:

• Operating the Police Casualty Bureau (Metropolitan and City of London Police), taking calls from members of the public who are worried about their friends and loved ones, who may be missing, out of contact and who could have been injured in the incident. Members have to handle a sometimes distraught person on the telephone and at the same time record the details accurately on the Police computer system. Members are trained and qualified in National Call Handling protocols

• Acting as Incident Support Officers at Survivor Reception Centres to take details of anyone who was in the vicinity of the incident, who might have been reported missing and who might have information of use to the police investigation.

• A few members are trained to work in the Police backroom matching details of survivors and casualties reported from the incident site or the hospital against missing person reports taken in the casualty bureau. This matching is crucial to enable the Police to notify relatives quickly about the whereabouts and status of their loved ones.

• Support to HQ SJC in their UK Resilience role, acting as Personal Staff Officers helping to co-ordinate the Military Assistance to the Civil Authorities (MACA).

• Personal Staff Officers supporting the London Coroners during a major incident involving multiple fatalities.

• Training support in the form of character players to the British Transport Police during their probationers' training at various London mainline stations.

• Training support to various military units on exercises, providing civilian and military character players.

• Training support to the Army Cadet Force for annual camps and other exercises such as the Elworthy Trophy, involving driving, radio communications, scoring, running stands, etc.

Recruitment

The Corps recruits women, normally between the ages of 18 and 45, who live or work inside the M25. Potential recruits are mainly found through word of mouth, usually an existing member recommending the Corps to a friend or colleague. A selection day is held in September and a maximum of 25 recruits begin training in the autumn each year.

Training sessions take place most Wednesday evenings and occasional days at the weekend. Subjects covered include First Aid, Police Casualty Bureau, National Call Handling, Corps History, Military Knowledge, Drill, Navigation, Voice Procedure and Airwave Radio. Each January they attend their first weekend in a military environment, held at Blandford Camp, with training provided by staff at the Royal School of Signals. Recruits who have achieved the required level of attendance and demonstrated that they have acquired the necessary skills, pass out and become full members of the Corps each May.

Ongoing training

The Corps runs a busy training programme for all active members, with training sessions every Wednesday evening and many weekends. Training is focused on a mixture of refreshing core skills for operational readiness, capability training to enhance teamwork, leadership, etc., and general interest such as self-defence, fitness and well-being.

All active members must complete a minimum commitment of training and support to stay on the active list. This covers refresher training for key roles, section competitions that test core skills, and at least four days of support to partner organisations each year.

In addition, there is a long weekend camp in May each year, where members are able to do more in-depth training in different subjects.

History

The FANY was formed in 1907 as a unit of first aid nurses on horseback, providing succour to wounded soldiers on the battlefield. The horses were quickly replaced by motor ambulances and the role evolved as the need changed.

In 1914 when war broke out, the FANY offered their services to the British War Office only to be rejected. However, the Belgians were much more welcoming and asked the Corps to provide ambulance drivers. The first group of FANYs crossed the channel on 27th October 1914 and immediately took over an abandoned convent school in Calais and opened Lamarck Hospital. There were ambulances queueing up outside the door before the FANYs had even unpacked.

FANYs drove ambulances carrying the wounded from casualty clearing stations to the hospitals, sometimes under enemy bombardment and in the most arduous conditions. The vehicles were of the kind now only seen on the London to Brighton run, with rudimentary screens or none, uncertain engines, and tyres depressingly prone to punctures. The severe weather meant that the engines had to be manually turned every hour overnight in order prevent them seizing up.

By late 1915 the British realised their mistake and asked the FANY to help. On 1st January 1916 sixteen FANY ambulance drivers replaced men of the British Red Cross Society working on the British part of the Front. Surgeon General Woodhouse famously summed up the FANY, saying "they're neither fish nor fowl but damned fine red herrings". In other words, impossible to categorise but extremely useful.

FANY WW1 medal presentation - Sadie Bonnell & Gen Sir Herbert Plummer GOC 2nd army

Always showing flexibility and initiative, the FANY provided help in any form it was needed, setting up regimental aid posts, motor kitchens and even a mobile bath vehicle. This amazing creation had been brought over by FANYs Marion and Hope Gamwell, and was called James - and offered the luxury of a hot bath to 40 men per hour.

On the night of 18th May 1918 there was a particularly severe bombing raid in St. Omer, with bombs falling everywhere. The FANY ended up being tasked to rescue the wounded from an arms depot which had been hit. Sixteen Military Medals and three Croix de Guerre were awarded to the drivers of FANY Unit 8 for their bravery that evening, and this picture (picture 1) shows the Croix de Guerre medal ceremony in the Grande Place at St. Omer. In all, FANYs were awarded 19 MMs, 27 Croix de Guerre, 1 Legion d'Honneur, and 11 mentions in despatches during the First World War.

After the War, when other units were being demobilised by the War Department, the FANY, being independent, continued to exist, and provided a number of drivers during the General Strike in 1926. As a result of this work the Corps was finally rewarded by an entry in the Army List, although there was no funding associated with it.

During the inter-war years members were mainly trained as military drivers and mechanics and the Corps changed its name to the Women's Transport Service (WTS). In 1937, with the likelihood of another war increasing, the Government wanted the FANY to become part of an all-embracing women's service, the Auxiliary Territorial Service (ATS) Motor Driver Companies. Many members did transfer to this new organisation but at the same time some, remembering what happened after the

previous war, decided to retain their independence and to stay FANYs.

After the German invasion of Poland in 1939, 24,000 Poles escaped to re-form into fighting units in Scotland, and the FANYs provided them with uniforms, weapons, vehicles, equipment, food, and administration and drivers' services.

Another FANY unit was in France with the BEF, returning via St. Malo during the Dunkirk withdrawal.

Other FANYs worked during the War as radio officers, encryption specialists, wireless operators, radar operators, personal assistants (drivers, coders and decoders) in the UK, North Africa, Italy, India, Ceylon and the Far East.

Gallantry awards included: three George Crosses; two George Medals; a King's Medal for Courage in the Cause of Freedom; a King's Commendation for Brave Conduct; two Commendations for Good Service; and 36 Mentions in Despatches. Also: one CBE; six OBEs; 23 MBEs; and 10 BEMs. There were numerous foreign decorations too: one Chevalier of the Legion d'Honneur; six Croix de Guerre; two Medaille de la Reconnaissance; one Norwegian Liberty Medal; one US Bronze Star; and one US Medal of Freedom with Bronze Palm.

FANY and SOE – 1940-1945

The Special Operations Executive (SOE) was formed in July 1940 on Winston Churchill's orders to 'set Europe ablaze'. The purpose was to organise active resistance to the Germans by any means possible, legal or illegal, gentlemanly or otherwise. SOE was divided into various Sections – the most famous being F Section, which took care of operations in France. Others included Norway, Greece and the Balkans.

One major contribution by the FANY to the work of the SOE was in Communications, in both Signals and Cipher departments, where they received intensive training on Morse code. Many FANYs were posted to Grendon Underwood listening station, waiting to receive messages from the agents, because wireless was the most valuable link between the FANY operators based in the UK and the agents on the ground.

Another major contribution was the FANY agents in the field: they worked mainly in France. Thirty-nine of the 50 women sent into France were FANYs. Women could move around much more freely, because, since over 1.6 million French men had been deported by the Germans into forced labour, male Resistance fighters were dangerously conspicuous. The FANY had to have perfect knowledge of France, very good (though not necessarily perfect) French, and few family ties.

They undertook their initial training at Arisaig (Scotland) in silent killing, weapon handling, fieldcraft, and sabotage; and did parachute jumps at Ringway aerodrome. They also learned how to operate wireless sets, which they would have carried around in their cases, made to look like ordinary leather suitcases.

At Beaulieu, known as the finishing school for secret agents, they learned the arts of espionage, including complex encoding and message sending.

The Conducting Officers for the agents were also FANYs – they took part in the training, and reported on agents' strengths and weaknesses. They were also the one to give the agent a small token of humanity before their departure into the field, such as a compact, lipstick or perfume – and, of course, their deadly cyanide pill.

Thirty-nine FANYs actually went into the field, of whom 13 were captured and murdered by the Gestapo.

Some of the most famous include:

Noor Inayat Khan, who was part of the ill-fated Prosper network which operated around Paris. Noor was eventually the only SOE wireless operator in Paris. She was arrested and under torture said nothing, and twice tried to escape, but was sent to Dachau, where she was shot in September 1944.

Odette Sansome (later Churchill, later Hallowes) was arrested after seven months, and brutally tortured (with a red hot poker on her back, and her toenails pulled out), but she gave away nothing and somehow managed to convince the Gestapo she was married to Peter Churchill, the agent with whom she had been arrested, and that he was closely related to Winston Churchill. She was sent to Ravensbrück Concentration Camp, where she was kept in solitary confinement in a room next to the furnaces, and with the heating turned on full blast throughout the summer to try

and break her. She survived pneumonia and the war and lived to old age, still completely modest about what she had done.

Violette Szabo was one of best shots in the Corps and one of the fiercest characters in SOE, and was captured after a major shoot-out, only being taken when she ran out of ammunition. She was shot at Ravensbrück in January 1945.

Lise de Baissac was part of the Scientist network near Poitou and would cycle around the countryside looking for fields suitable for drop zones, with her radio hidden in pieces up her skirt and in her bra. Lise also survived the war and lived into her 90s. In 2002, to celebrate the 60th anniversary of her parachute drop into France, she was awarded her parachute wings by the Commandant of the French Parachute School (ETAP).

Violette Szabo, Odette (Churchill) Hallowes and Noor Inayat Khan were all awarded the George Cross, Violette and Noor posthumously.

Memorial to Noor Inyat Khan unveiled by the Princess Royal

Nancy Wake was the most highly decorated woman of the Second World War, known to the Gestapo as the White Mouse – she undertook a bicycle ride several hundred miles to the Pyrenees from Auvergne to get a single radio part back to her Maquis unit, where she single-handedly commanded some 1,500 men.

Odette Sansom & Tanya Szabo at St Paul's War Memorial.

All those FANYs who lost their lives are commemorated on the FANYs' memorial at St Paul's Church, Knightsbridge. The picture above shows Odette holding Tania Szabo at the memorial.

1946 to 2014

Post war, the Corps moved towards a more Signals based role, with training in wireless telegraphy provided by the Royal Corps of Signals at Worship Street. FANYs also trained as cypher operators and two qualified as instructors.

In 1968, the FANY Mobile Communications Unit (MCU) was formed to provide assistance to the City of London Police in support of disasters within the London area and in 1975, the Corps provided round-the-clock support in the aftermath of the Moorgate train disaster on 28th February. This was the first major emergency supported by the Corps and would be the start of 40 years of continued service to the City of London.

FANY Commandant-in-Chief, HRH The Princess Alice, Countess of Athlone, died in Spring 1981, after which HRH The Princess Royal became Commandant- in-Chief.

One little-known role of the FANY during the Cold War, which has recently been revealed, involved arrangements for ensuring the continuity of Government in the event of a substantial attack on the United Kingdom. In such an eventuality, members would have been required to assist 2 Signal Brigade by deploying to one of a number of secret bunkers established around the country designed to house 'dispersed government'. These bunkers contained all the facilities required to sustain a community of people for several months. 'CHANTICLEER' was the Cabinet Office codename for the site, which was to be activated by the codeword 'ORANGEADE'. It has been suggested that in the event of a nuclear attack, having a cadre of intelligent young women present in these bunkers might have helped to ensure the future survival of the human race!

FANY police Casualty Bureau Training

HRH Prince Harry at the WW1 commemoration Folkestone 2014

In 1991, the outbreak of the First Gulf War led to the involvement of the FANY in OP. GRANBY: the Ministry of Defence asked for, and received, FANY volunteers to augment Regular Army personnel at the PS4 (A) Casualty Section at Empress State Building (ESB), and at Chatham COMCEN, on a continuous 24-hour basis.

In 1999, after HRH The Princess Royal kindly gave permission to use her title, the Corps changed its name from WTS (FANY), which was no longer seen as appropriate to the current roles, to FANY (Princess Royal's Volunteer Corps), commonly abbreviated to FANY (PRVC). Over the years, there have been various proposals to remove FANY from our title but these have been robustly rejected by the Corps members!

In 2003, the Corps was involved with supporting the Army and Emergency Services for Op FRESCO (Firefighters' strike) providing watchkeepers to operate in the London District operations room.

In 2012, during the London Olympic and Paralympic Games, the Corps supported seven organisations, providing 2,351 volunteer hours, with 92% of Corps members undertaking one or more roles.

Present Day

In 2015 FANY provided over 524 days of support to 20 different organisations completely free of charge. In addition, members received professional training in crisis response management so that they were ready to deploy.

Today, the Corps has 130 active members trained and ready to provide support when needed. Should an incident occur tomorrow, they will be there, answering phones, helping members of the public and undertaking other duties to support the UK Resilience effort.

*FANY passing out parade
- Hon Col James Everard
inspecting*

VISIBLE LIGHT COMMUNICATION

By SSgt (FofS) Allen and SSgt (FofS) Foley

Wi-Fi Protected Access II (WPA2) Security Enhancement using Visible Light Communication (VLC) could be used to rapidly deploy HQ reducing the time of Initial Operating Capability (IOC) and Full Operating Capability (FOC) by 30-50%. The Commander's capability will be enhanced through speed of deployment reducing HQ infrastructure, manning and equipment.

VLC is a cutting edge technology that is becoming an alternate choice for next generation wireless networks with significant security enhancements over WiFi alone.

A prototype was developed using a Raspberry Pi 2 B to provide a WiFi Access Point (AP) capable of generating a frequently updating 63 character pseudo random WPA2 Pre Shared Key (WPA2-PSK). A pre-production prototype VLC solution from HW Communication Ltd was used to transmit the password. When outside the range of the VLC solution the User Access Device (UAD) is disconnected from the AP and the user no longer has access to the network.

Introduction

The security of WiFi depends on the strength of the access password and is vulnerable to attack if the password is predictable (Poddar 2014). In field and mobile deployments there is considerable scope for password compromise due to loss and social engineering. VLC can be used to pass a frequently updating WiFi password to a device at low risk of interception (Pavithran 2015).

A device could be used in a secure area and taken elsewhere in range of a Wi-Fi AP, but Network setup is only available within the range of the VLC system. The inspectable area of the VLC network would be smaller than that of the radio AP (Kuhn 1998).

Aim

The aim of the project is to identify Wireless Local Area Network (WLAN) vulnerabilities in order to develop a VLC solution using Consumer Off-The-Shelf (COTS) equipment capable of enhancing the security of WPA2.

WLAN Overview

WLANs are very easy to deploy providing mobility, flexibility and resilience to networks. Joint Doctrine Publication (JDP) 6-00 (2008) identifies the principles of CIS as prioritisation, security, capacity, interoperability and agility. JDP 6-00 (2008) describes the principle of agility as:

"Agility provides the ability to respond quickly and appropriately to change; as with other critical combat assets, flexibility and resilience are of particular importance for CIS."

To ensure that agile, effective and efficient CIS solutions are delivered to accommodate the Commander's Intent, WLANs must be considered as an alternative to wired LANs. If not the Commander can lose the operational advantage against the adversary. Although WLANs provide agility to the Commander there are many serious security concerns that obstruct its deployment. Joint Service Publication (JSP) 440 (2015) states:

"Wireless networking technologies, using Radio Frequency (RF) or Infrared (IR) carriers, are normally only permitted for carriage of OFFICIAL information."

WPA2. WPA2 is an encryption scheme that was designed to supersede WEP and WPA. WPA2 supports PSK and Enterprise authentication. TKIP and CCMP can be used as encryption algorithms supporting AES.

WPA2-PSK. A WLAN encryption protocol that has the option of using an 8-63 character PSK for authentication between a client and AP without the requirement of an authentication server. It is important to note that the encryption keys are derived from PTK which is derived from PSK meaning that confidentiality of data can be compromised if the PSK is known (Sakib et al. 2012).

WPA2-Enterprise. WPA2-Enterprise relies on the 802.1x port based protocol (EAP-framework of protocols) consisting of a supplicant (client), authenticator (AP) and an authentication server. The three most popular EAPs are:

Ser	Type	Description
1	PEAP	Authenticates user through username and password. Easy to implement.
2	TLS	Very secure due to validation conducted with SSL certificates. The certificate authority is controlled by the server and client certificates are issued.
3	TTLS	No certificates required reducing network management

Table 1 - Popular EAPs

The supplicant and the authenticator communicate using EAP Over Local Area Network (EAPOL) across layer 2. The authenticator sends the EAPOL message as a RADIUS message to the authentication server. The authentication server receives the EAPOL message and checks if it is compatible with the supplicant EAP. If the supplicant and authentication server are compatible then they share a Pairwise Master Key (PMK) and access to the network is granted (Kumar et al. 2014).

Providing that the PSKs or PMKs match WPA2 provides Robust Secure Network (RSN) with the development of two handshakes; the 4-Way and Group-Key Handshake. The RSN establishes an association between the wireless client and an AP providing the 4-Way Handshake takes place RSN Associations (RSNA). This association allows the wireless client and the AP to negotiate the key used to encrypt the traffic sent over the network without an observer being able to guess the same key. WPA2-Enterprise has larger management overhead over WPA2-PSK due to authentication management. The Group Key Handshake is used to decrypt multicast and broadcast traffic (Pavithran 2015).
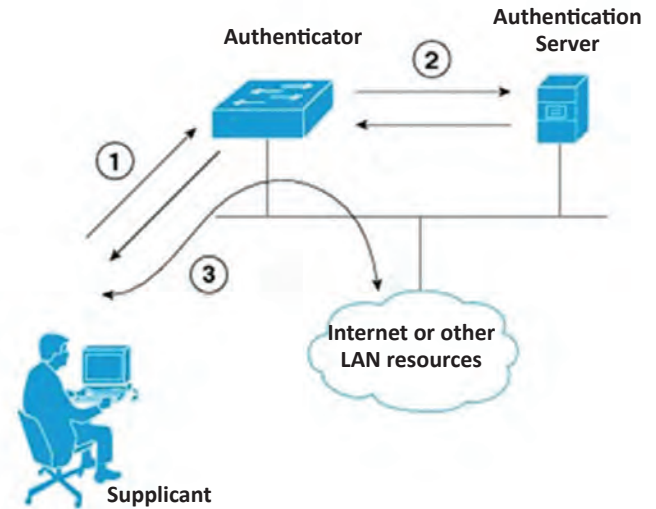

Figure 1 - EAP Process (Kumar et al 2014)

Security vulnerabilities

"Information security means protecting information and information systems from unauthorised access, use, disclosure, disruption, modification or destruction." (Cornell Law 2016). In order to assure information security across WLANs information confidentiality, integrity and authentication must be protected whilst ensuring that availability is maintained. WLANs have vulnerabilities that can be exploited by the following attacks:

Table 2 - WLAN attacks (Gambhir and Kumar 2014)

Ser	Attack	Description
1	Traffic analysis	The attacker can access three types of information. The first type of information is related to identification of activities on the network. The second type of information important to the attacker is identification and physical location of access point in its surroundings. The third type of information an attacker can get by traffic analysis is information about the communication protocol.
2	Eavesdropping	In the case of eavesdropping an attacker secretly listens to the private conversation of others without their permission if the PSK is know. If not the attacker can conduct traffic analysis. Eavesdropping attacks include passive and active eavesdropping.
3	Unauthorized access	If the attacker has the PSK to the network they are able to initiate some other types of attacks including man in the middle, high-jacking and replay attack.
4	Denial of Service	An attacker tampers with the data before it is communicated to the sensor node. It causes denial of service attack due to wrong or misleading information. Jamming is one DoS attack on network availability. It is performed by malicious attackers who use other wireless devices to disable the communications of users in a legitimate wireless network.
5	PSK	There are several approaches to PSK cracking including; social, dictionary, brute force and direct attacks.

In order to enhance the security offered by WPA2 and to investigate the possibility of using VLC as a security solution the project team developed a VLC solution using Consumer Off-The-Shelf (COTS) equipment capable of enhancing the security of WPA2

System implementation

During system development individual units were procured with the intention of integrating them to create a number of prototypes prior to the final system being delivered. HW Communication Ltd equipment was implemented, along with the Raspberry Pi 2.

A risk-driven process model was required and the spiral model was chosen to allow risk analysis to be conducted at each iteration of the development cycle enabling rapid prototypes to be developed (Boehm 1988).

SSgt Allen and SSgt Foley setup the AP using Raspbian Wheezy OS. The AP was installed, Defence Host Configuration Protocol (DHCP)/AP was configured and a Network Address Translation (NAT) was established between wlan0 and eth0 (Adafruit 2015). SSgt Allen focused on the configuration of the Pi and interaction between the OS (Windows and Linux). SSgt Foley focused on development of the server/client relationship using Python high-level programming language.

The physical connectivity of the final VLC solution can be seen below:

Test results analysis

The results of unit, integration and acceptance testing were captured, and compared against the project mandate and problem understanding. Tests proved the prototype system is capable of generating a 63 character pseudo-random WPA2-PSK, and the frequency at which the password can be updated was flexible and could be changed to meet user requirement. This maintains a low management overhead and system setup.

Using UDP for the client/server socket introduced a vulnerability to UADs as the socket remained open listening for password updates. Valli et al (2012) identify UDP exploits including UDP flood, storm and fraggle that can cause Denial of Service (DoS) to users on particular ports. These attacks were considered however the prototype solution only opens port 4446. Cisco (2016) identifies Rockwell Automation application as a vulnerability that allows unauthenticated remote attackers to execute arbitrary code against a target system using buffer overflow on port 4446; the same port used by this project.

The team found that it would be unlikely for a threat actor to exploit a vulnerability through the VLC base unit (UDP port 4446) unless they had a device secreted within the beam width. The base unit is paired with USB 3 VLC adaptors using 802.15.7 standard reducing the risk of a threat actor exploiting this vulnerability. The project team also recognises that JSP 440 supports physical security regarding secure areas including vetting and
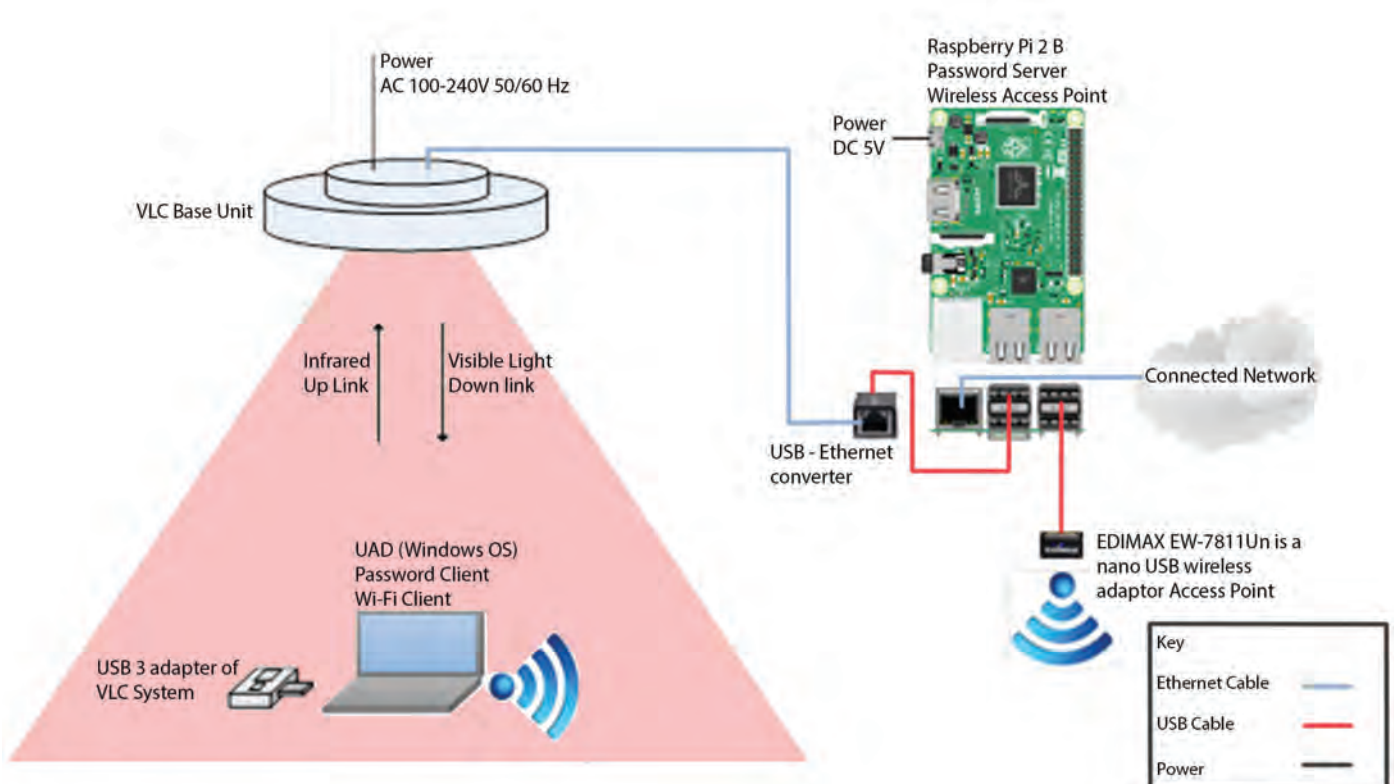

Figure 2 - Physical Connectivity VLC Solution

access control, considerably reducing the risk of a threat actor having a device secreted within the beam width. Although risk was reduced against the base unit on UDP port 4446 the risk remained on the UADs.

Acceptance testing identified a vulnerability regarding network availability and data loss or exfiltration. UADs maintained network availability when outside of the light source but within the RF radiation of the AP, for a maximum of 30 minutes (frequency at which the password was set to update). Due to network availability and UDP port 4446 potential vulnerabilities the PT decided that the UDP port should be closed and information leakage should be mitigated when UADs are removed from the light source. A data browser solution was researched and developed by the PT to reduce risk to both network availability and UDP port 4446. A working prototype was developed to support the practical presentation. Once removed from the light source and the password times out, network availability is no longer available and information leakage is denied.

Acceptance testing identified that users lost availability with the network for approximately three seconds every time the WPA2-PSK was updated. The prototype solution was tested updating the WPA2-PSK every two minutes whilst streaming HD video and there was no interruption to the user.

Once the data browser solution was implemented the prototype system was tested successfully meeting the project mandate and problem understanding considerations.

Discussion and Conclusions

The literature review identified the requirement for MoD to develop a WLAN Point of Presence (PoP) (JDP 6-00 2008) despite this requirement JSP 440 (2015) highlights serious security concerns. MoD viewpoints are not clearly understood when discussing WLAN deployments due to a gap between what the MoD wants (mobility, flexibility and resilience of networks) and the risk appetite it is prepared to accept.

In order to "fill the gap" a user survey was created to gather data for potential users of a WLAN PoP. A brief survey was designed to encourage a quick response whilst identifying how the concept may be used including benefits and risk (Angold 1995).

Positive feedback was received from military units that have a high readiness capability to respond to Operations. Booth (2016) and Burnham-Packham (2016) agree that a deployable WLAN PoP could be used to increase Initial Operating Capability (IOC) and Full Operating Capability (FOC) for rapid deployments. Joint Logistic HQ has an IOC of two days and FOC of three days. Booth (2016) stated that using a WLAN PoP could reduce Joint Logistic HQ IOC by 24 hours and FOC by 72 hours as infrastructure does not need to be laid. Bradley (2016) suggested that it could be used for incident response, technical response and for the deployment of tactical HQ.

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ROYAL SIGNALS
- INTO THE FUTURE

EDITOR'S NOTE

Capt Crilly is 2iC of 43 Signal Squadron, 39 Signal Regiment. His day job is as an Enterprise Architect Consultant with DE&S. He has mobilized in J6 roles in BFC, ISS/GOSCC, J6 plans during the Commonwealth Games and NATO Summit and as J6 MLO on Op PITCHPOLE.

He had a 12 years 'gap year' from the Corps founding, leading and disposing of a suite of international Business Intelligence, Media and Publishing companies. In his early career he was a Troop Commander with 3 Battalion Military Intelligence and with 40 (Ulster) Signal Regt.

It has been suggested recently that the 'the end of the Corps is nigh' but in the Information Age this couldn't possibly be true, or could it? The world around us is changing rapidly; the nature of enemies and warfare is changing rapidly, availability and communication of information is changing rapidly so it follows that the needs of military commanders are changing rapidly. So if the needs of our 'customers' are changing rapidly so the services supplied to them must change rapidly. There is an appropriate adage from the commercial world 'It used to be the big ate the small, now the fast eat the slow'. All organisations go through life-cycles but, if they can redirect and re-invent themselves to be more adaptable, nimble and agile then they can come back, maybe even better than ever. So can Royal Signals re-direct and re-invent itself to become more agile and flexible and adapt to this changing world?

In recent years the stresses on the military have been considerable and from many different quarters – the closing of the Afghan conflict, multiple smaller engagements, the emergence of new enemies in ISIS and its affiliates, for instance. But pressure has also come from other quarters. As the government seeks to maintain 'battle winning Armed Forces' in an age of austerity, they envisage a smaller, leaner more professional military underwritten by a hard-headed approach to what we can afford with new equipment and new investments that have been hard fought over.

But changes also in the wider environment such as the constraints caused by increasing legal issues and the associated media attention, along with the pressures on recruiting caused by wider societal changes, have left the whole army with the challenge of finding a new way forward.

The Royal Corps of Signal is uniquely placed to thrive in these times, but only if we seize the opportunity, master information exploitation and demonstrate capabilities that deliver what military commanders seek. Failure to adapt to our new environment will leave us at the mercy of these pressures - the choice to enter and totally embrace this information-centric world is not discretionary.

Information as a Weapon

The 20th century was shaped by large, organized and structured physical wars between great powers. But in this century, non-state, even individual proxy-conflicts are now shaping the dynamic and the execution of conflict. The 3-4 major conflicts of the past ten years have morphed in today's 25 mini-conflicts and will be tomorrow's 100s of globally synchronized, local executed micro-battles. This new reality of warfare does not primarily use kinetic weapons, it prefers to use terror, psychology and information as its weapons to influence thought processes, beliefs, emotions, and ultimately behaviour. Military forces must also become experts at navigating and prioritizing in this field, to also wield information as a weapon. [1]

"Dominating the information domain is as essential today as controlling land, sea or air space was during the era of mechanised warfare. The military advantage gained through information is today as significant as the military advantages of massed armour formations or bomber formations in the era of mechanised warfare. It enables forces with lower numerical strength to concentrate their effort in the right place and at the right time to make a disproportionate impact on their relative military strength". [2]

The current 'social war' with ISIS, offensive cyber-attacks in Georgia[3] and co-ordinated information operations in Ukraine[4] are part of this new style of information-centric or 'hybrid' war articulated recently by General Gerasimov[5]. It is ideology and a force that cannot be destroyed by kinetic weapons.

All wars, kinetic or psychological, have as their practical objective causing the enemy to give up the ideas that animate their struggle. This was true for the Third Reich and the Soviet Union just as much as it is true for Al Qaeda or ISIS. Victory can only be achieved by making the enemy accept the illegitimacy of their ideology or crushing those who hold it, or as is most often the case, through a combination of both. Future joint effect fires will be as much psychological and cognitive as they are kinetic.

Such information warfare has already become mainstream, it has already happened and we have already been defeated several times in the past years by Russian Maskirovka in the form of 'reflexive control' [6] and territory seceded as we spend billions buying the latest kinetic weapons. The next wars have already begun and our adversaries - whether state actors like Russia or North Korea, terrorists/proxy-forces or indoctrinated lone-wolves - are quite clear on why they exist, what their aims are and their intent to use/abuse information to hurt our nation and its people. 'Whoever wins in the Information space, wins the war' - CDIO [7].

So What Does This Mean for the Army?

'With technology enabling the greater volume and integration of information, future land forces must develop greater expertise and capabilities in information management, exploitation, timeliness and assurance. The importance of information superiority should be recognised and mainstreamed as a discipline – the land force needs to improve its information exploitation skills.' [8]

So how can Signals Support Military Commanders in this New Environment?

We need to enhance our contribution to the 'next fixture' beyond our current command support, electronic warfare and force protection services. The future of signalling should encapsulate these but it must also take us fully into the world of cyber and electromagnetic activities (CEMA), information warfare and into the provision of agile, innovative and fast-paced ICT services, on the move and in some very hostile environments.

'Getting the right information to the right place at the right time, so that the right decisions are made and implemented, has never been more important.' [9]

Figure 1 – Cognitive Hierarchy & Information Domain Owners
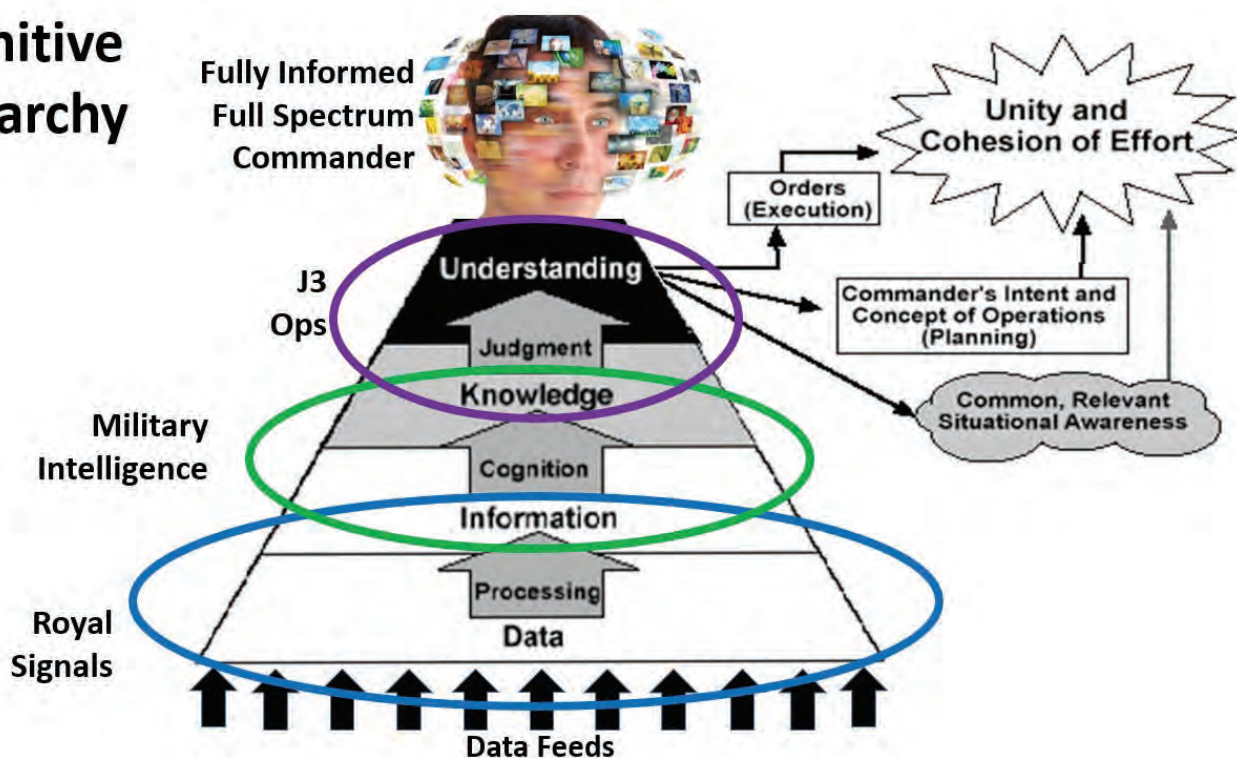
[1] 1 JCN 2/12. Future Land Operating Concept, DJF(C&D), MoD, May 2012, page 2-16

[2] Battlespace Technologies: Network Enabled Information Dominance'. Deakin, 2010. Page 134

[3] Mary Ellen Connell and Ryan Evans, "Russia's ' Ambiguous Warfare and Implications for the US Marine Corps" May 2015

[4] Pierre Jolicoeur and Anthony Seaboyer, "The Evolution of Russian Cyber Influence Activity: A Comparison or Russian Cyber Ops in Georgia (2008) and Ukraine", Royal Military College of Canada, 2014.

[5] Gerasimov Doctrine' and Russian Non-Linear War, Military Review, Feb 2016

[6] Maria Snegovaya, Putin's Information Warfare In Ukraine: Soviet Origins of Russia's Hybrid Warfare, Sept 2015

[7] CDIO, Information Symposium Nov 2015

[8] JCN 2/12. Future Land Operating Concept, DJF(C&D), MoD, May 2012, page 2-18

[9] James Carafano, Conflict in a Socially Networked World, 2012, page 151

[10] FM100-6, US Army Field Manual of Information Operations

We must become the creative and innovative architects, operators and enablers of the 'agile exploitation of our information capabilities to improve effectiveness and efficiency on operations and in support areas through access to, and sharing of, timely, accurate and trusted information'. [11]

- We must deliver agile information services that allow the commander to understand better, decide quicker, more accurately, more decisively and enable implementation, at pace. "C2 on steroids"

- We must deliver a full suite of end-to-end information services with confidence and competence so that our customers receive the most from the full range of tools available to them in the Single Information [12] Environment , so they realise the force multiplying effects of defence's investment. [13]

- We must protect our information service and data flows. As we seek to gain advantage over our adversity's information loop, we must protect and deny them access and influence over our information domains. [12]

The successful delivery of these capabilities will in the majority of cases rely on the adoption and exploitation of the multiple options, easy availability, cost effectiveness, high capacity, flexible rapid deployment and continuous improvement offered by modern, commercially produced, off the shelf technology (COTS).

The Shape of the Future Royal Signals

To deliver these capabilities we need to augment a new suite of advanced information skills onto our current set to enable us to maintain flexibility, adaptability and agility in exploiting all the opportunities offered by such modern information and communications technologies.
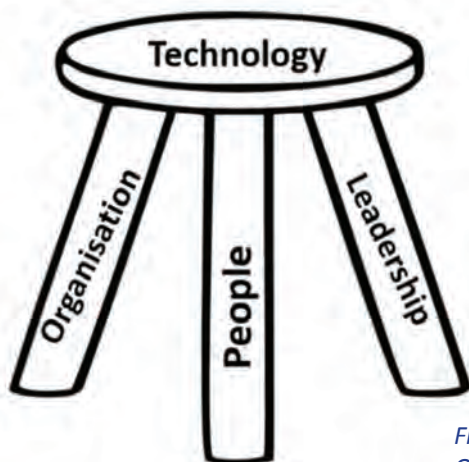

Figure 2 – Royal Signals Organisational Design Philosophy

Our Future People

Just recently, in The Times, Major General John Crackett referred to 'the need to find cyber and technical specialists to swell the ranks of the military's new … offensive digital fighting force.' [14] General Sir David Richards, as CGS, made the statement that future wars 'will require fewer tanks and ships but more high-tech troops', [15]

Those best placed to enable Royal Signals to adopt, adapt and exploit the opportunities offered by modern technology are those who have never known anything else – the millennial generation.

So Who are the Millennials?

Born between the early 1980s and early 2000s, there are 14 million millennials in UK. The first truly digital native generation, most were born with an Information Services Device, probably an iPhone, apparently physically attached to their right arm and instinctively know how to use all forms of modern technology.

Whilst they typically have a very short attention span and require almost instant gratification, they do have the capability to consume, process and analyze vast quantities of conflicting information at lightning speed. Whilst they are prepared to engage with ideas and debate – sometimes too much – and research shows them less than supportive of the use of military force (Iraq aversion), they are not inherently anti-military. Indeed 71% of the current US Military are millennials. [16]

They are however idealistic and have an absolute disdain for ISIS. They are very open to military service as a way to satisfy their generational desire to do good, meaningful work and to have a positive impact on the world. They want to work collaboratively in teams to overcome challenges within a creative, empowered and innovative culture.

They do have high expectations of their employer/ leaders and this can be challenging. But if we as leaders effectively communicate and align our organisational and employee purpose, focus on capabilities and outcomes for our customers, sincerely care about the life success of our soldiers, pull them together through a shared purpose/goal/vision, then we will experience greater soldier and customer engagement, less turnover, and greater Corp success.

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[11] MOD Information Strategy 2011
[12] A logical construct whereby assured info can pass unhindered from point of origin to point of need (anywhere in the network).
[13] MOD ICT Strategy Oct 2013

[14] Major General John Crackett, 'Military seeks tech specialists for its digital fighting force' The Times 5 Apr 2016
[15] General Sir David Richards, Sunday Times 17 Jan 2010
[16] Millennials, a Military Generation http://thegbrief.com/ articles/saluting-millennials-a-military-generation-579 Feb 2016

So How Should We Recruit,
Train and Lead Them?

The armed forces today -

'We need to radically address how we currently bring our people into our system, how we mound them into a single green/light blue/dark blue model, drill into them conformity, condition them into the single military way of thinking and then deliver insufficient technical training' [17]

Such an analysis of current military practice is manifestly out of step with the desires and values of millennials (a factor underlying recent recruitment issues perhaps?) so what should we offer to attract them?

Ideally we would offer trades with enticing pay (competitive with the private sector), collaborative working, comprehensive training and intellectual challenges, all dedicated to a worthwhile cause. With this we could go to colleges and universities and recruit the intelligent and creative young information warriors that we require to help the Corps adapt and drive forwards in the modern world and military environment.

Figure 3 – Ideal Millennial Recruiting Package

So How Should We Organise
to Deliver the Vision?

First it is important to recognise that, just as our current organisation is not built around the exploitation of information, it does not appeal to those best placed to support and enable such exploitation. But rather than overhaul the entire structure, it is suggested that we should seek instead to build an annex to it – an information services branch. As a distinct entity, with

its own dedicated trades, training, tasks and ethos but nevertheless central to the Corps, such a model would allow the creative environment demanded by the need to develop these new capabilities whilst maintaining the current.

This information services branch should be treated as an entity composed of professionally qualified personnel – in this case information technology – in a similar way to other existing entities such as RAMC, QARANC, Corps of Army Music, Army Legal Services, etc.

The use of such an organisational structure would, in line with other professionally qualified service units, enable a higher priority to be placed on professional IT skills and a lowered emphasis on infantry skills with only the shortest possible basic training for both soldiers and officers. It would also enable promotions to be based on stage of professional training and expertise, rather than infantry based command courses, with trade pay also being commensurate with a skills and knowledge level beyond that expected of personnel in the operational signals units.

Such an entity would exist independently of, but provide services to, existing operational signals units. Its expert young officers and soldiers would be tasked with the introduction of the best and most appropriate modern information and communications technology. Introducing not just combat equipment to signals regiments but also across all operational formations in conjunction with local commanders, specifying, designing and installing upgraded ops rooms in brigade HQs for instance. Working on short-term, project based attachments in small teams as internal experts, consultants and project managers, it is envisaged they would report to a professional structure based at Blandford. Such short-term attachments, rather than longer term rotations, would allow for the maintenance and development of an effective centre of excellence whilst allowing for rapid dissemination of knowledge and implementation of modern technology. Importantly it would also mitigate any tendency to assimilate with conventional units, risking the distinctive culture that is required for effectiveness and retention.

These young professional information warriors are typically very fast learners with a thirst for knowledge so, once initial basic training is complete, it would be important that these specialists join their expert teams and be exposed to as much of the variety of army operations as possible in a short timescale.

To maintain their skills and knowledge of up and coming technologies they should regularly interface with the commercial sector through such avenues as attendance at technology conferences and exhibitions, both military and commercial. They should also be given regular opportunities to undertake appropriate, external training similar to other professions in the Army.

This would serve the dual purpose from the diagram above of providing an interesting modern career for young IT experts considering options on graduation –

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[17] *Vice Admiral Potts CB, Director General JF Dev & DA, Warfare in the Information Age Symposium, DSTL, Apr 2016*

an option that would be very unlikely to be considered currently - but also providing the tools and ability to not just engage but also retain them through improved T&Cs, challenge, camaraderie, progression and access to AT, etc. This without impinging on current operations, structures, progression paths and trade scales, hence easing the introduction.

It would be expected that this branch would work on a regular basis, but in co-operation with, for instance, 254 Sqn as projects or planning required. Indeed, it could be envisaged that co-operation, liaison and joint working with DSTL, MoD Corsham and Joint Forces Cyber may also fall within their remit over time to ensure smooth selection and introduction of updated technologies and software. Such a branch would be an ideal vehicle for accessing and leveraging some of the commercial skills already within Signals in the reserve regiments, both operational and specialist.

Our Future Leadership

Future soldiers will need to become more forward-looking, more proactive to support smarter, dynamic, faster, multifaceted, agile, public facing based decision making processes. Big data, business analytics, ubiquitous connectivity, 5G, satellites and the proliferation of mobile devices have transformed the way we communicate and work. The software/hardware, distributed workforce, secure UAD that is increasingly the expected norm for millennials means that future soldiers in this domain will not always work in an office or a barracks and their output should be measured on productivity/output not attendance. This is a journey of continuous learning, switching units, external collaborative assignments in industry, trials, working abroad and volunteering for 'that impossible assignment' that will push the boundaries. The harnessing of the collective power of these expert soldiers is what will drive the future success of Royal Signals but for their leadership it cannot be 'business as usual'.

One of the most fundamental changes with the new generation is the growing fact that the future soldier won't just follow and accept a leader because of role, authority, decades of experience or some other privileges. They will accept leaders because of transparent practices and ability to inspire. So in this environment, the prime responsibility of our future leaders is to 'empower' their team to deliver. This is done by driving a culture where individuals are valued, equipped with the tools, skills and opportunities for external influences they will need to succeed.

This is the personification of the 'Authentic Leadership' style as discussed in the Army Leadership Code. But get the basics right and communicate clearly what's going on, what's planned, and how things are going; flavour

it with a true personal interest in soldiers, their lives, and individual career paths. Finally, add some flexibility goodies as sprinkles on top and you are on track to grow your sub-leaders. Also, ensure that proper feedback and personal development mechanisms are in place, much deeper than procedural MPARs and SJARs.

This will introduce a new level of challenge to our current leadership approach and range of styles. Future Information leaders need to be fully conversant with world of the hyper-connected workforce and be open to adopting new, more flexible ways of working. Best placed to handle such a shift are those for whom it also comes naturally as they are millennials themselves. This will mean a shift from a typical top-down, rank driven, hierarchical approach to a leader:leader [18] style, one where confident leaders actively seek advice and input from their junior officers and, instead of utilising command and control, seek to guide, facilitate and assist their specialists.

The growth of technology will continue to impact and challenge how we work, how we deliver services to the Army and how we as an organisation are led. It makes it all the more vital that future leaders are those with the best contemporary leadership skills, who seize new challenges and experiences and recognize opportunities to innovate and be more influential.

The way we can influence and master the crucial transition in leadership style required is by preparing not only ourselves but primarily our leadership teams to navigate these disruptive times and transition.

Conclusion

There are those amongst our ranks, affectionately referred to as 'information dinosaurs' who will advocate 'entrenchment' instead of 'advance' into the largely unknown scary future. Yes staying still is undoubtedly the safe option, the road less travelled could very well have dangers, pot-holes and hazards. In our dominant risk averse culture the safe option would be definitely be the favoured option - the alternative road ahead is only for the brave, the visionary and those capable of dealing with uncertainty. Please do not dismiss those colleagues who do not wish to travel this road, their articulation of the risks and their fears are real and important, as are your discussions, arguments and reassurance that there is a place for them in the future Corps … as regrettably not adopting and not traveling further into the information age is not discretionary.

So in conclusion, whilst we all enjoy speaking to the 'old boys' in the Legion, as they lament the demise of their valve radios and leaky glass batteries, we need to be careful that we do not join them in lamenting about our wars in Iraq and Afghanistan, about the demise of Bowman, Reebok, Ptarmigan and giving off about these new-fangled on-line/ internet/ IP/ smartphones, operated by those cheeky young opinionated teenagers. Else we are in danger of sounding like our fathers.

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[18] *Capt David Marquet USN, Turn the Ship Around!: A True Story of Building Leaders by Breaking the Rules , Sept 2013*

Have YOU claimed YOUR refund?

In December the MOD announced a new scheme by which serving members of the Royal Signals and Queen's Gurkha Signals who are Chartered Engineers (CEng), Incorporated Engineers (IEng), Engineering Technicians (EngTech) and ICT Technicians (ICTTech) can reclaim their annual professional membership and registration fees irrespective of the post that they currently occupy. The scheme also applies to similarly qualified members of the RE, the REME, the RLC and their RN and RAF counterparts.

Full details of the scheme are contained in 2015DIN07-182 and any Royal Signals related queries should initially be directed to rsiganlshq-wld-c2@mod.uk. The start date of the scheme has been backdated to 1 Apr 15 but claims must be made during the financial year in question. It should be noted that the scheme does not apply to the CITP qualification awarded by the British Computer Society (BCS). Nor does the scheme apply to initial registration; these fees may already be reclaimed via Standard Learning Credits.

The scheme shows the MOD's commitment to promoting a culture of engineering excellence across the Services and is recognition that a career in the Royal Signals is now regarded as a fully-fledged pathway to becoming a professional engineer. There has never been a better time to get professionally qualified and registered; if you haven't done so already, what are you waiting for?

604 SIGNAL TROOP

By Col John Roberts

EDITOR'S NOTE

Colonel John Roberts did his bit for the Cold War with five tours in BAOR: first as Peter Burke's 2i/c of Alpha Troop, 4 Division HQ & Signal Regiment, commanded by Lt Col JMW Badcock in Herford, a few years later, as a Captain, OC 604 Signal Troop, in Munster, followed by appointment as Adjutant of 13th Signal Regiment commanded by Lt Col JN Taylor at Birgelen. Later, and again at Herford he commanded 3 Squadron (Commhead Oscar) 7th Signal Regiment, under COs Lt Col CH Storey and Lt Col KP Burke. Finally, in BAOR, he was CO of 13th Signal Regiment (Radio). In between he served in regimental and staff appointments in UK, Singapore, Hong Kong, Cyprus, and Brussels. His last appointment was Senior Military Officer RSRE which he left with some relief on voluntary redundancy in 1994. Following a 10 year stint with DERA and QinetiQ he set up and ran a consultancy firm. Now fully retired, he lives in Herefordshire where he beats, shoots, fishes and sings also holding Elizabeth, his wife's, handbag and paint brushes as she is engaged as a long standing SSAFA case worker in the county, an active Soroptimist and keen painter in oils. He has 3 children and 5 grandsons.

Background and History

604 Signal Troop was formed from the Guided Weapons Support Signal Troop in 1959 and came under command of 8 Regiment RCT in Nelson Barracks, Muenster in 1965. The regiment's role was carriage of 1 (BR) Corps' Special Weapons, proviision of transport support to 570th US Artillery Group, the US custodians of the nuclear weapons. Protection was provided by a dedicated mechanised infantry battalion. The whole organisation, which included 583rd US Ordnance Company, was given the title Weapons Support Group (WSG). Because of lack of space, the regiment moved to Portsmouth Barracks in Muenster in 1968. At that time it consisted of 5 and 13 Squadrons RCT, 604 Signal Troop and a REME Workshop. In 1970, 27 Squadron joined the Regiment from Bielefeld.

Over the years following, the regiment was restructured several times until 8 Regiment's unique task of Special Weapons movement ended on 15 March 1988 at which time 604 Signal Troop was disbanded, to be revived later in Aldershot with a completely different role.

Role

The BAOR role was to provide HF voice communications for the WSG in peace and war. In peace, to convoys carrying nuclear munitions from the Muenster area to the south of Germany for maintenance and their return; in war and hence on exercises, between the NATO Atomic Supply Point (NASP) and Weapons Holding Area (WHA), to convoys between them and forwards into the combat zone.

Modus Operandi and a memoir of 604

Serving in 19 Signal Regiment in Singapore in 1971, and knowing it was to be disbanded, the Captains and Majors of the regiment gathered for a talk by AG11 who told us that we would not be posted to BAOR in view of the difficulties often experienced by officers and their families in finding somewhere to live in UK during lengthy disembarkation leave and before accommodation was available in Germany.

In the event, I was posted to BAOR, like everyone else from 19 Signal Regiment, and joined 604 in 1971. The troop was equipped with D11s mounted in Austin K9s - later on 4 tonners – of which more below. The K9s were decorated with large, red and white "Lebensgefahr - Danger to Life" signs, towed 1 ton trailers with twin 3.5 KVA generators and when operating on the move with convoys, used tied back, twin vee antennas.

A significant challenge to the crew was how to change fuel jerricans for the generator in the trailer. Crawling from the K9's back door into the trailer and back again while travelling at 30 mph became the norm. Peacetime convoys and the WSG were protected by the Nuclear Convoy Escort battalion, from the Royal Anglian Regiment at that time; convoys were escorted by German Polizei detachments who secured rest places and ensured the convoy proceeded along the right route at good speed.

In 1971, the troop's establishment was largely made up of Radio Telegraphists, together with Radio and TE Technicians, Electrician Drivers, my Driver and a Clerk Technical. We also had our own REME Vehicle Mechanic and ACC cook. Although an independent troop, no clerk was provided, this role being performed by a volunteer. During peacetime and in barracks the VM and Cook were based in the Regimental Workshop and Cookhouse respectively; on exercises they worked with the troop based at the NASP. The REME VM had his work cut out to keep a minimum of 8 out of 10 K9s on the road while the troop's technicians had the responsibility of keeping all D11s in full working order for 24/7/365. Sometimes, generators, vehicles and D11 major spares were authorised to be taken from the HQ BAOR controlled war maintenance reserve (WMR) to keep the show on the road. One day, HQ BAOR phoned to tell us that our K9s were to be replaced with 4 tonners. Generators would be on board the flatbed along with the 'sawn off' K9's D11 container. As a result, Cpl Taylor (ED) designed the fit then led the first mini-convoy of K9s from Muenster to Marshalls in Cambridge to explain what needed to be done. We were all very pleased with the outcome: a unique rig, much more space for crew kit, very much safer to change jerricans while on the move, and because the 4 tonners were brand new, a considerable improvement in vehicle reliability. The 'Lebensgefahr' signs remained. Other vehicles were an empty TEV for technical stores and tech workshop, a 4 ton truck for admin, including field kitchen stores and three land rovers.

Squadron Life

The soldiers were a tight knit bunch, loyal to the troop and the wider Corps and a delight, from my point of view, to motivate and lead. Some of the RTgs were ex-boys, and many had previously served with 602 (SC) Signal Troop, and as a result, in addition to having excellent morse skills, were used to deploying and working alone or in self-contained small crews independently for lengthy periods.

I was responsible to CO 8 Regiment for the troop's readiness and fitness for war, had delegated powers of subordinate command and evidently he was well satisfied. CO 22 Signal Regiment had a watching brief on the troop and his RHQ was available for Royal Signals matters as well as technical advice. He sent a Squadron Commander on one occasion to inspect. So satisfied was he that that was the only visit from 22 Signal Regiment in the whole two and a half years of my tour.

Our weekly training programme was enlivened by route marches, runs, tactical and communications exercises. I frequently gave a talk, often based on my staff promotion exam studies. We experimented with different antennas having sought and obtained advice from the School of Signals and found that certainly at the frequencies we were allocated, the Shirley antenna was a dead loss for the short range skywave for which it was designed and to which we aspired. Short range sky and ground wave HF voice remained the big challenge.

Peacetime convoy routes from the Muenster area down to Augsburg and beyond were marked with nicknamed report lines which had to be reported to the WSG so that progress could be monitored. Within the convoy the mechanised infantry escort from the Nuclear Convoy Escort Battalion communicated to the D11 and the convoy commander on A41 VHF sets. To ensure proper monitoring of the convoy's progress, we deployed relay D11 crews at intervals alongside the whole route which established voice communications with Portsmouth Barracks before the convoy left with its load. Allocated frequencies were never optimal, usually in the 2 to 4 Mhz range. We organised a trial with C11s, which totally failed, and often wondered what the Russian intercept teams thought of all our traffic.

Some of the Troop

Individual skills were of a very high standard. No doubt contributing to my present deafness, we went shooting at least once a week. There was never any shortage of ammunition, Dutch and German Army ranges were nearby and we achieved our aim that every member of the troop was a marksman in his own and one or more of the troop's weapons– 9mm pistol, SMG, SLR and LMG. Sadly, the Corps did not permit marksman badges to be worn, perhaps just as well, as quite a few would have been entitled to wear all four. Our highly qualified first aider, Cpl Taylor, ensured everyone was up to date and practised first aid. From his contacts he obtained an early "ResusciAnnie".

We were volley ball fanatics; we played each day after flag raising and over lunch, and once a week in our NBC kit and respirators. The programme included PT, navigation, recce and fighting patrolling, ambush drills, route marches and morse. An occasional escape and evasion or night navigation exercise on the Teutoberger Wald added interest. On exercises we always dug in – camouflaged slit trenches with overhead protection. "Cam, comms, coffee", and "Survival is next to Godliness" Cpl Taylor would say. Such visitors as CSO BAOR and Commander Comms 1 (BR) Corps were, I think, quite impressed by our camouflage (in which we always tried to outdo the infantry) and our defences.

Following one visit, the Commander Comms tasked the troop to provide an enemy for Flying Falcon, his annual Corps level signals exercise and we had great fun finding, approaching and attacking BRUIN commcens from our concealed operating bases. We had no advance notice of where the commcens would be and our comments on the commcens' reaction to a night attack ranged from "Everyone was asleep" to "Hard to find, guarded and alert".

Modelling the latest pattern of Combat Kit.

For a pre-FFR inspection in addition to the usual preparations we redecorated all the troop accommodation, and the lads took it into their heads to become film producers and make a film on the local training area of their vehicle ambush and anti-ambush drills which used up a regiment's allocation of pyrotechnics and which we duly screened in our cellar bar to a rock and roll accompaniment. The CO's only major comment on the troop's presentation, readiness and performance was that the music was too loud.

We were young, fit, enthusiastic, well trained and independent! My time in the troop was good for me personally and in career terms. The day after Liz my wife came home with baby Sara the troop were at the door with crates of beer to wet the baby's head. When the time came to take my staff promotion exam, the CO said as my troop was in good shape why not take a month off and work at home to study for the exam? When I asked CSO BAOR if he would support a request for me to do another year with the troop he said he would agree an extra six months. I was delighted, I loved it at 604 and was very sorry to leave.

Officers' Mess functions were lively and international, and because 8 Regiment held the bulk of the RCT BAOR team and the CO was chief selector, the Rugby was very good. As well as "passing at Staff", I qualified as Fire Officer and was lucky enough to do both Parts 1 and 2 of JDSC. I was not at all pleased when a posting order appointing me as 2ic, 5 Brigade HQ and Signal Squadron in Tidworth arrived out of the blue. With some support from the Regiment and perhaps, CSO, I appealed that this would be a backwards step after independent, subordinate command, and it was agreed to post me as Adjutant 13 Signal Regiment (Radio) in Birgelen instead.

There was no record of past OCs. My predecessor was Captain Peter Stanley and I handed over to Captain Chris Donnelly. Troop Sergeants in my time were Staff Sergeant Davis, Staff Sergeant Grattan and Staff Sergeant Scott.

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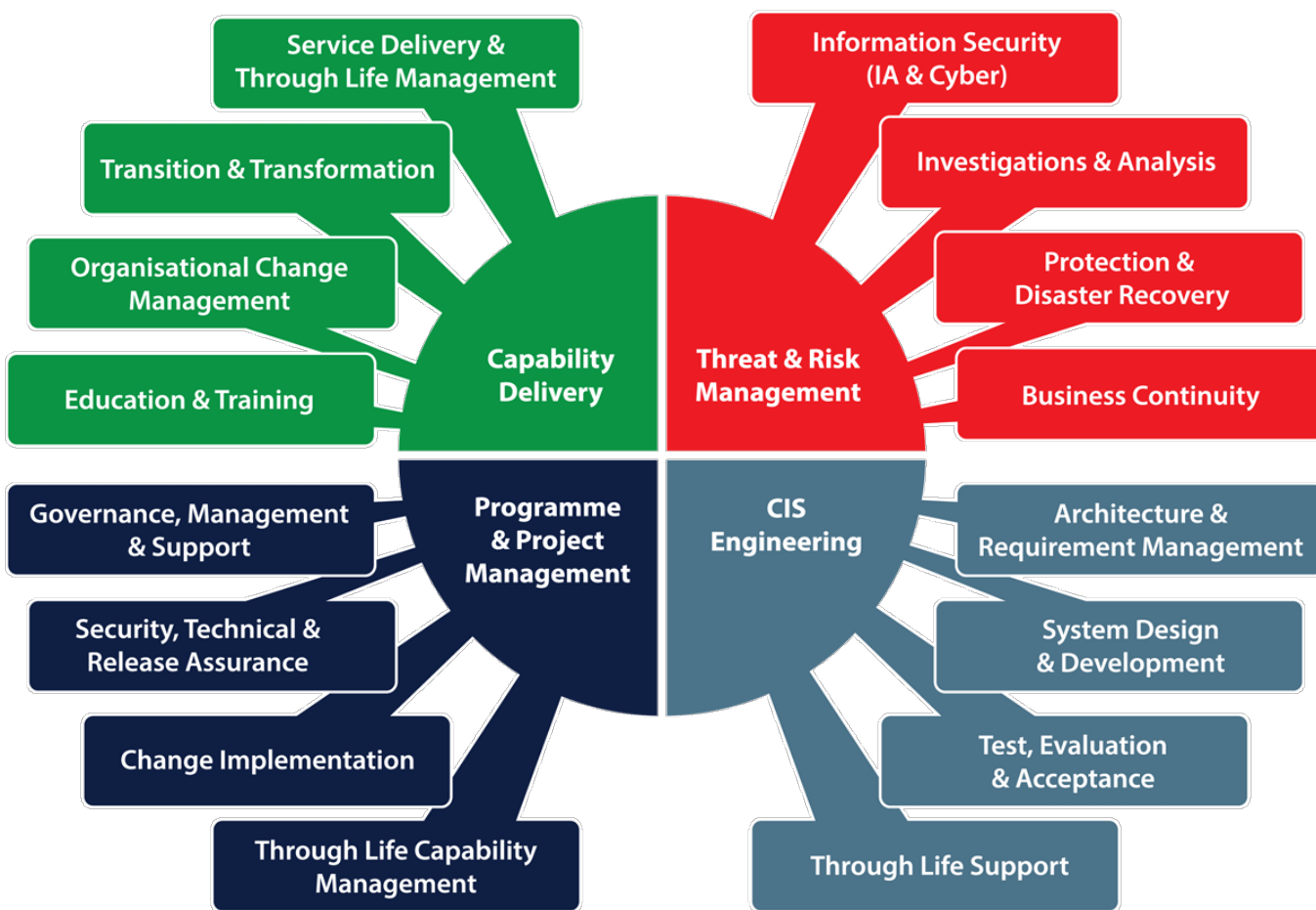
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BEARERS OF OPPORTUNITY

3G	4G	5G
384 Kbps	100 Mbp	10 Gbps
2001	2009	2020
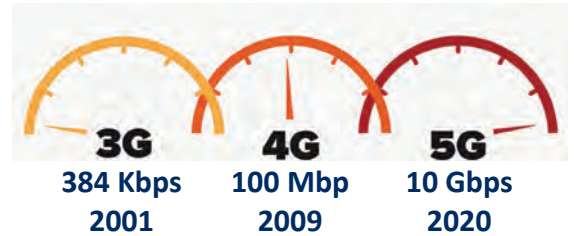
By SSgt (FofS) Lill & SSgt (FofS) Morgan

UK Operational deployments have frequently resulted in military personnel occupying civilian or government buildings with a fixed communications infrastructure. However, military communications for these deployments are routinely achieved through the exclusive use of satellite bearers, which are not necessarily cost effective and do not provide the bandwidth of more traditional UK Wide Area Network (WAN) bearers such as 4G or broadband services.

The aim of the project is therefore to investigate Bearers of Opportunity (BoO), such as bonded 4G/3G and Internet Service Provider (ISP) bearers in order to determine if they can be effectively utilised on UK Operations. Initial research permitted a determination to be made of which bearers should be investigated. These were 4G/3G mobile telephony, ISP, Wi-Fi and satellite communications. An analysis of 4G/3G bearers was conducted in order to determine the viability of cellular networks for delivering primary WAN connectivity, taking into account resilience, security and network coverage.

Commercial equipment was identified, procured and tested in order to determine their feasibility; the Cisco 819 and 829 Integrated Services Routers and the Viprinet VPN Multichannel 510 Router. Analysis of these test results enabled conclusions to be drawn and recommendations to be made.

Conclusion

The Viprinet 510 router tests indicated that bonded WAN bearers are effective at providing connectivity to mobile sites. Thus, the project was successful in demonstrating that the use of cellular and ISP bearers are potentially feasible for UK Operations, but further field testing is required in order to confirm feasibility in situations where communications limitations exist such as poor mobile network coverage.

Principal Recommendation

The Viprinet 510 routers proved to be efficient, flexible and simple to configure. In spite of concerns raised during the project, a field trial of the system is recommended in which a UK operational scenario is simulated. Further analysis could subsequently be performed in an environment where staff users are producing real-time network data such as Voice over Internet Protocol (VoIP) and Video Teleconference (VTC), as opposed to the simulated traffic utilised throughout the project. In addition, it is recommended that tests are performed in areas of poor mobile network coverage and where interference is likely in order to determine how cellular bearers perform under such conditions.

Introduction

UK Operational deployments have frequently resulted in military personnel occupying civilian or government buildings with a fixed communications infrastructure. However, military communications for these deployments are routinely achieved through the exclusive use of Satellite Communications (SatCom) bearers, which are not necessarily cost effective and do not provide the bandwidth of more traditional UK Wide Area Network (WAN) bearers such as 4G or broadband services.

Aim

The aim of the project is to investigate Bearers of Opportunity (BoO), such as bonded 4G/3G or Internet Service Provider (ISP) bearers and to determine if they can be effectively utilised on UK Operations.

Background

Research has shown there are a number of different BoO currently available on the market. The BoO considered were:

- ISP.
- Wi-Fi.
- 3G mobile telecommunications technology.
- 4G Long Term Evolution (LTE) mobile telecommunications technology.
- Satellite Broadband Communications.
- SatCom.

Each BoO has advantages and disadvantages, these were compared and analysed to produce a selection of required, desirable and discarded bearers in order to achieve our project aim.

Equipment under test

Equipment was researched to find suitable candidates that met the criteria. Even though the selection of equipment was to meet the LAN requirements, WAN requirements were considered as the project was to evaluate and recommend alternate BoO. After further analysis of the equipment features some of the commercial equipment researched was discarded as the criteria was not met.

The research indicated that there were three pieces of equipment that met all but one of the required criteria including some of the desirable features. The criteria that could not be met was 'Is it simple to use?'. The devices were:

Viprinet Multichannel VPN Router 512. Virtual private network (Viprinet) solutions are able to bond various technologies into one high-speed connection. This reduces the risk of an outage as connections are distributed over different technologies and different providers. The Multichannel VPN Router 512 seen in Figure was selected for its WAN and LAN features (Viprinet, 2016a):

WAN Interfaces. 1 x Gigabit Ethernet (GbE) channel and 4 x 3G/4G interfaces.

LAN Interfaces. 1 x GbE interface and a Wi-Fi AP.

Figure 1: Multichannel VPN Router 512 (Viprinet, 2016b)

LAN Features. QoS, DHCP server and GUI.

Pepwave Max HD2 Dual 4G LTE Mobile Router. The Max HD2 provides fast connectivity using its SpeedFusion Bonding Technology[1], multiple technologies and connections are combined into one data pipe (Peplink, 2015a). The router supports connections to Cisco and Juniper equipment with the use of IPsec[2] VPNs. The Max HD2 router seen in Figure 2 was selected for its WAN and LAN features:

WAN Interfaces. 2 x GbE, 2 x 3G/4G interfaces, Universal Serial Bus (USB) and Wi-Fi.

LAN Interfaces. 4 x GbE interface and a Wi-Fi AP.

LAN Features. QoS, DHCP server and GUI.

Cisco 829 ISR. The 829 ISR is a ruggedised router designed for deployments in harsh conditions making it ideal for military use. With its use of multiple Wireless LAN (WLAN) technologies it creates a self-healing, self optimising WLAN. The WLAN AP is integrated with Multiple-in, Multiple-out (MIMO) technology which utilises Dynamic Frequency Selection (DFS) to detect and avoid interference (Cisco, 2016). The Cisco 829 seen in Figure 3 was selected for its WAN and LAN features:

WAN Interfaces (dedicated). 1 x GbE, 2 x 3G/4G interfaces and USB.

WAN/LAN Interfaces. All connections can be configured for either the LAN or WAN. These are 4 x GbE interfaces and 2 x Wi-Fi interfaces.

LAN Features. QoS, DHCP server and GUI.

Figure 2: Max HD2 Dual 4G LTE Mobile Router (Peplink, 2015b)

A summary of all four of the research candidates can be found in Table 1, the green shows the required features while the yellow shows the desirable features.

Analysis

The aim of the project was to investigate BoO for use in UK Operations. 3G/4G was investigated and tested using the Viprinet solution which proved successful as a bearer with the added bonus of implementing link bonding which produced one big virtual pipe.

When it comes to network problems there are two possible solutions; solution one, is to increase the bandwidth which can become expensive requiring extra equipment and possibly installation charges, or solution two using QoS to prioritise the traffic. The QoS for every network will differ depending on the network and business requirements. It is best practice to employ a network monitoring tool to identify what network services will benefit from QoS implementation such as real-time applications like VoIP and VTC.

Before planning QoS an intimate knowledge of both the network and applications used is recommended. Knowing the router policies to support QoS is important as it will indicate which models can be implemented.

QoS requirements or best practises are used when creating QoS policy. Some examples are:

Marking the packets as close to the devices as possible (or even on the device using the ToS/DSCP flag).

Most traffic if not identified will fall into the default class so it is best practice to make sure this class has sufficient bandwidth.

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[1] *Proprietary end-to-end tunnelling protocol.*
[2] *IPsec – see glossary.*

Figure 3: Cisco 829 ISR (Cisco, 2016))

Real-time traffic should use priority queues and be assigned adequate bandwidth.

Once the QoS policy is implemented it will need to be monitored and maintained as overtime new applications may be deployed.

Issues faced

Funding. The issues faced during the project were mainly linked to the equipment in some way. Minimal budget caused restrictions to testing as only equipment that could be borrowed from other departments could be utilised and the routers investigated were also limited. Luckily a small amount of funding was available through IT Wing as the basic principles of mobile communications could not have been tested without the use of SIMs and data packages.

Configuration. The configuration of the Cisco equipment is historically difficult to use (Kerravala, 2014) lending itself more towards the services industry, where companies pay vast amounts of money to train their IT staff. Within the military a basic understanding of Cisco equipment is required by engineers who are often trained to CCNA standards. The project team found this basic knowledge insufficient to configure the 800 series routers with its extra WAN technologies and the configuration of QoS not being experienced before.

Support. Subject Matter Expert (SME) support for the Cisco equipment was given initially but due to other commitments was not available throughout. Research resulted in contradictory findings which made the task more difficult. The support with the Viprinet equipment was longer lasting and more beneficial with visits to both Horsebridge and Wired Broadcast.

Firmware. The firmware upgrade to the XenaCompact essentially took the equipment out of action due to only part of the unit being changed. Other traffic generation software had been identified earlier meaning testing was not delayed for longer than necessary. The Cisco 819 ISR had its firmware upgraded due to bugs not applying configurations immediately. The Viprinet 510 router also required its firmware upgrading to possibly allow QoS to work which was a fundamental part for this report. Identification that the firmware in each case was at fault took precious time.

Recommendations

Using initial features in their requirement the teams' preliminary recommendation is the Viprinet solution; the intuitive GUI is an important advantage as it makes it easy to configure. Issues throughout the project regarding QoS functionality necessitates the need for further testing including field trials to simulating a UK Ops deployment, where further analysis could be performed in an environment where staff user generate real-time network traffic to confirm its viability.

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Ser	Router	Features					
		QoS	Wi-Fi AP	Multiple Wi-Fi AP	Ethernet	GUI	DHCP
1	SCS-200	✗	✓	✓	✓	✓	✗
2	Viprinet Multichannel VPN Router 512	✓	✓	✗	✓	✓	✓
3	Pepwave Max HD2 Dual 4G LTE Mobile Router	✓	✓	✓	✓	✓	✓
4	Cisco 829 Industrial ISR	✓	✓	✓	✓	✓	✓

Table 1: BoO Candidates

THE DEANE-DRUMMOND PRIZE ESSAY COMPETITION WINNER

By Lieutenant Robins, 255 Signal Squadron

"By the end of 2015, for the first time in its history, 95% of the Corps will be based in mainland UK. In parallel, 2016 will see the start of the delivery of a number of measures as part of the NEM programme, aimed at providing greater stability for Service personnel and their families. Is the nature of service changing; does it matter that in future, service in the Corps may be regarded by some as just a job, rather than a career or a vocation?"

The image of the Armed Forces and how they sit within wider society has been an evolving relationship since its earliest days. The question here pertains to how this is playing out in the 21st century with the latest iteration of changes in the light of not only societal influences from below, but the impact of structural governmental policies such as Army 2020 from above. This essay will assert that the nature of service is changing, however it will go on to demonstrate that this is not a negative. Although for some service within the Corps may be 'just a job', it will be argued that New Employment Model (NEM) provides an opportunity to move the Army into the modern career market to make it competitive, attractive and therefore more than 'just a job' to the talent we wish to attract and retain. This essay will show that the NEM can be seen as a handrail for commanders, not as a restriction as we move into contingency and life after Germany and major sustained operations such as Op HERRICK. Throughout, the Armed Forces and Army will be talked about generally and interchangeably, before the discussion moves specifically to the Royal Corps of Signals in detail. This essay will be begin by giving a brief outline of what the NEM entails and the identified need it fulfils, before moving on to examine in earnest how this will effect the view that changing service nature will result in a shift in attitude.

The NEM has come about due to a number of factors. According to Lt Col Donaldson, the main reason for its introduction was the previous model's inability to meet the expectations of soldiers and families with regard to how tooey currently live their lives (2011). This is a phenomenon that had been identified by academics a number of years ago, as Edmunds and Forster (2007) explain;

The Military Covenant – the contract between the nation and service personnel and their families who make personal sacrifices in return for fair treatment and commensurate terms and conditions of service – has been damaged almost beyond repair. A new civil–military compact is necessary… a pledge between the government (on behalf of its citizens), the military as an employer and individual service personnel. (p. 13).

Although using slightly hyperbolic language, what they recognised was that there was a disconnect between the

expectation of serving personnel and what the Army was willing or able to provide. In their opinion, the result of this disparity has been low morale and increasing rates of departure. Indeed, as we shall see below, numerous surveys undertaken by the Ministry of Defence in recent years have demonstrated this trend, showing a tension between the desire to serve and the need for stability and transparency. Back in 2007, Edmunds and Forster were some of the academics and researchers that recognised the military as an employer and therefore needed to come in line with the rest of the career market if it is to retain and attract future personnel. It has arguably been to the detriment of the MOD, that its senior commanders felt themselves above the label of regular 'employers', exempt from the normal requirements made of other organisations. Recently, there has been recognition of the step change in the attitude of personnel and their expectations. As a result of the changing nature of both service and society, the Armed Forces have taken up seriously within the last few years and begun to implement policies, taking the form of the NEM.

The NEM has been initiated in response to this gap, drawing upon earlier focus groups and interviews that came to shape the proposed policies (Court, 2014). Designed to be fully implemented by 2020, some of its policies, such as the Help to Buy Scheme, have been active well in advance of this. The NEM's policies will eventually cover the main areas of terms of service, accommodation, training and education, and pay and allowances, but its aims are best surmised thematically as targeting attractiveness for recruitment and retention, agility to respond to changing service requirement and its affordability to delivery better value for money. Harper summarises this as a need to 'address the growing gap between what Defence offers and what our people expect' (2015). This 'growing gap' has been demonstrated quantitatively in number Armed Forces Continuous Attitude reports, which have consistently shown that the impact of service life on families is cited as significantly the highest factor in increasing intentions to leave – almost 10% higher than the next cited reason – and 59% indicating that they feel disadvantaged in family life due to their service (MOD, 2015). This is a damning set of facts that cannot be sustained if the Army wishes to remain an attractive and competitive employer. There was, and remains in some spheres, an expectation to move rather than to stay across all services and cap badges, that undeniably has an impact on family stability, whether this is in the 'standard' nuclear package or otherwise. Moreover, while the drawdown from Germany has meant that personnel may no longer reasonably expect to serve in continental Europe as had been the case during the Cold War and early 2000s, there is arguably still a notable disruption when moving around the UK mainland. Within the Corps, full-time personnel can currently serve from Salisbury Plain to Yorkshire, Haverford West to Colchester, regardless of where they originate. The end of a British

Forces presence in Germany does not change the nature of service in the way it is proposed as in the case of the Royal Signals for a number of years it has been reducing steadily, leaving only two major units by summer 2015 (British Army, 2015).

Whilst there may be little quantifiable evidence of a shift to service being considered 'just a job', this gap between expectations and reality is undeniable. In the context of this discussion, it is a move that recognises that the 'just a job' attitude cannot work in the Armed Forces given the demands made on its employees. The NEM's policies are designed to ameliorate the frictions of service life, it is the 'big idea' that the Army will attract and retain quality people by offering them the opportunity to exercise genuine choice about the way they live (British Army Journal, 2011).

The nature of service is changing as a consequence of a number of entwined factors. Army 2020, the SDSR and a shifting society have all produced different pressures and requirements of both the Armed Forces and those that serve. The Armed Forces currently number just under 200,000, making its personnel around 0.3% of the population and its composition is shifting as the role of the Reservist element in all the Forces rises (Defence Statistics, 2015). Therefore, although approval ratings may be currently high, notably the high levels of trust in the 'squaddie' further down the ranks (Faulkner, 2014), this small proportion means that there is a natural ignorance of what service life entails from the average member of the public. Therefore the recruiting pool that the Armed Forces draws on has different expectations than it did only a generation ago. As a result, Lt Gen Sir William Rollo suggests that nationally the British population is firmly fixed in a 'peacetime' mentality and the 'certain degree of latitude' and 'slack' that a larger Army affords is no longer possible (Rollo, 2012).

Despite these changes within the last few decades within the Armed Forces and society, there is a wide spectrum of different reasons for joining. Crucially, the pivotal crux remains that all are volunteers; there continues to be a distinct difference between a career in the Armed Forces and 'just a job', a simple position of paid regular employment (Oxford Dictionary, 2015). In the light of a decreasing budget and a smaller number of personnel, the more it is critical to attract and retain people with the right attitudes, qualifications and skills (Rollo, 2012). The NEM can be seen as a manifestation of 'G1' policy approach to this shift in society, a response to the changes that are being wrought from both above and below. What is important to remember is that the fundamental core of service within the Royal Signals and the wider Army has remained the same. It is a volunteer Army and, especially within a technical Corps such as the Royal Signals, filled with highly skilled and proficient personnel, who are also in demand elsewhere in the economy (Edmunds and Forster, p. 32). To consider that the majority of personnel join and remain as 'just a job' is myopic and reactionary.

The effect of the changing nature of service and the NEM upon the Royal Corps of Signals is something that needs to be actively engaged with by all levels of command; perhaps more so than in other cap badges that can rely on a static source recruits. Given the improving state of the economy, the Corps' pool of trained, talented and motivated personnel are increasingly finding employment elsewhere a desirable reality. There are those who may consider their service a vocation, but if the Corps and Army cannot provide them with the stability and assurance where another organisation can, they are naturally going to leave. Lt Gen Rollo may not have been talking about the Corps in particular, but his words are apt;

If we cannot recruit and retain the kinds of people we need at all levels of rank, then our Forces' capability will be fundamentally undermined and the national investment made in them will have been wasted, no matter how much expensive, high-tech equipment we may have bought. (2012)

The NEM is the background upon which the Corps can project its intent and provides a handrail for commanders. Where the Corps needs to exercise caution is in the management of soldiers careers given the introduction of Project 21. This aims to reduce the manning 'churn' that results in financial costs to the Corps but also sets out to increase stability for service personnel and provide career stability. The expectation to move will be replaced by the expectation of an open ended assignment that will allow junior soldiers to remain in mainstream units if they desire (Royal Signals Information Note, 2015). This 'static model' is a recognition also that service partners aspire to have their own careers, a reflection of the 'double income' sociological norm where both partners are likely to work (Hennessey, 2013). Although stability is crucial, it must not be forgotten that individuals join the Corps for a number of reasons and when managed correctly, movement within the Corps is welcomed and desired for personal and professional reasons by those with and without family. This needs to be managed carefully at the unit and sub-unit level to ensure that soldiers have the varied and balanced careers they need to be competitive with their counterparts in other cap badges. In addition, the NEM is designed to cater for those with asymmetric family life and those who are not married; a subtle but significant break from the traditional hegemony of married family units; elements that are often neglected. Importantly, commanders should not be reticent about the impact of the NEM – it is designed to make a more effective workforce by shoring up the foundations that make up the Armed Forces, the soldiers themselves. The MS Binding principle still remains underpinning value and reference point;

The needs of the Army must come first; those of officers, soldiers and their families must come a close second. But to be worthy of its pre-eminence the Army must be seen to give due consideration to the best interests and preferences of each individual officer and soldier. (Military Secretary Web, 2015)

The NEM aims to develop and recalibrate how we facilitate service for families and personnel. It is designed to assist those who do join for more than 'just a job'. It is a framework for commanders within the Royal Signals to provide stability and consistency for service people and their families. Project 21 is an excellent example of the Corps engaging with the changes and this impetus needs to transcend throughout the officer corps and senior ranks. Given that a lack of work-

life balance and instability has been a substantial factor in people leaving the forces this can only be a positive. The NEM is not designed to impede operational effectiveness, the willingness to deploy on sustained exercises or to undermine the ethos that is so crucial to every service and every trade or cap-badge within. By creating an attractive working environment, the NEM does not make serving personnel any less operationally effective and less able to deliver desired effects to commanders. What is being achieved through the NEM is a balance between the needs of the Army with those of its people, acknowledging that individual aspirations change over time depending on age, career stage and family (Defence Statistics, 2015). With regards to the mainstream withdrawal from Germany and mainland Europe, this is not a new phenomenon and is something that the entire Army is undergoing. That new recruits will cease to be routinely posted away from the UK is not a negative, it is part of the evolving nature of the Armed Forces. Whilst it is an end of a chapter it does not negate future norms of service.

Viewed broadly and alongside other services in conclusion, NEM is a tool that places an emphasis on more choice and responsibility on an individual level (Harper, 2015). Where the RAF and RN have visibly 'bought in' to the scheme, the Army and the Royal Signals need to ensure that they are not left behind to the detriment of their personnel. As discussed before, the Royal Signals holds a lot of talented individuals that have proactively chosen a career in the Armed Forces; only those who are physically and mentally able serve in the Royal Signals. It is up to commanders to make the most of them and to provide the support that must be required of an organisation that will always be more than 'just a job'. Lt Gen Rollo has highlighted the need to learn from our sister services, that 'one size does not fit all, and perhaps never will' (2012). The NEM is a flexible approach that is designed to give individuals more choice and control, therefore allowing commanders to get the most out of their men and women. This essay has set out to discuss the changing nature of service within the Armed Forces and the impact that this, coupled with the NEM, has had on attitudes of personnel serving within the Corps. The Armed Forces are a broad reflection of society, albeit slightly skewed and disproportionate in places, and if the composition of society has changed over the last few decades it can be shown that this is apparent in the Army. Reasons behind enlisting have always been varied and it is naïve and unhelpful to think that the latest and next generation of soldiers will consider service any less of a vocation than previous personnel. It presents a platform from which to launch a new approach to the future that is up to the challenges not of warfare, but of adequately supporting personnel that reflect a changing society. The NEM is a means of engaging with changes in society and to aid retention of a trained and valued resource in this organisation; people.

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Communications on the Somme

By Major Paul Knight

Collar Badge and T. As would have been worn by Major Oppenheim, the collar badge of the Royal Engineers over a T indicating the Territorial Force.

55th (West Lancashire) Divisional Signal Company, Territorial Force, August – November 1916

The West Lancashire Divisional Signal Company of the Royal Engineers Signal Service was raised as part of the Territorial Force (TF) on 1 April 1908 with soldiers training at Copperas Hill (now Jubilee Barracks) St Helens and Tramway Road, Aigburth, Liverpool (a plot adjacent to Toosey Barracks). The role of the TF was Home Defence in the event that the six infantry and one cavalry divisions of the British Expeditionary Force deployed to France. The TF could mobilise fourteen infantry divisions and fourteen mounted brigades, plus Army Troops and non-deployable units like artillery and engineers assigned to the Port of Liverpool defences. There were no Regular Army units within these divisions or brigades.

However, within weeks of the outbreak of the First World War, it became clear to the War Office (WO) that the war would not be over by Christmas and that more men would be needed. Volunteers from the TF were asked for and, if there were sufficient numbers, they would serve overseas together in that unit. How these volunteers were used by the WO varied. The East Lancashire Division sailed, complete, for the Suez Canal in September 1914; the West Lancashire Division was broken up with the infantry and some of the Royal Engineer Field Companies and Royal Army Medical Corps Field Ambulances supporting divisions operating overseas – 1/10th King's deployed to France in November 1914, 1/1st Field Ambulance supported 29th Division during the Gallipoli landings and 1/2nd Field Company joined the East Lancashire Division on Gallipoli.[1]

The invasion threat to the UK remained. Those men who were too old, too young, medically downgraded or who did not volunteer for overseas service (an option until conscription was introduced) formed a duplicate Second Line Territorial Force. These Second Line TF units were supported by those First Line TF units which were not immediately required overseas. The Second Line also held and trained recruits who were surplus to establishment for First Line units, and supplied battlefield casualty replacements to them.

To clarify the naming conventions, TF divisions were not numbered until 1915, by which time there were 41 divisions in the army. Numbers were allocated in the order which they deployed overseas as complete divisions. The East Lancashire Division was the first to deploy overseas complete and was numbered 42nd. The West Lancashire Division was the penultimate TF division to deploy overseas (event though individual units had been since late 1914) and was numbered 55th. Units retained their TF county titles with numbers depending on how many there were in the division: one Signal Company, two RE Field Companies rising to three later, three RAMC Field Ambulance, four Royal Field Artillery brigades (regiments). The Signal Company became 1st West Lancashire Divisional Signal Company. To distinguish between the First and Second Line Signal Companies, they became 1/1st and 2/1st with a depot unit to support them, 3/1st. With the numbering of the divisions, they were re-titled 55th (West Lancashire) and 57th (Second West Lancashire) Divisional Signal Companies.

55th (West Lancashire) Divisional Signal Company, TF

The Signal Company was not required on the Western Front until the West Lancashire Division was re-formed in France in January 1916. Until that date it had been held in England in the Home Defence role.

The OC was Major W. Oppenheim, TD from mobilisation throughout most of the Somme Campaign. Unfortunately, his 'P-File' has not survived and it is likely that it was destroyed during the 1940 Blitz. His Medal Index Cards have survived. He was Mentioned in Despatches, and received the Metorious Service Medal and the Territorial Efficiency Medal. Coincidentally, a Medal Index Card gives his post-war address was in Huyton, Liverpool, only a few miles from Alamein Barracks, the home of the Army Reserve's 33 Signal Squadron today. On 10 November 1916 he was replaced as OC and posted to VII Corps Signals. His replacement, Captain Tebbitt, was probably a regular, having been awarded the 1914-15 Star.[2]

The divisional history lists the Company's losses as ten killed, 61 wounded and one man missing.[3]

55th (West Lancashire) Division, TF

The re-formed division consisted of a number of operationally experienced units, but was inexperienced as a formation. It consisted of three brigades, (164, 165 and 166) and all units were either Territorial or had been raised since the war began – there were no Regular Army units. Major-General Jeudwine, later Royal Garrison Artillery, was appointed GOC. By the end of the Somme Campaign, at least one historian has described 55 Division as in the top third on the Western Front.[4]

The Somme Campaign

The First Day of the Somme (1 July 1916) is normally remembered as a bloody failure. The most successful sector was in the south where 30th Division achieved all of its First Day objectives for relatively light casualties. It was also supported by one of the West Lancashire RAMC Field Ambulances. Their successes around Montauban could not be exploited without creating a vulnerable salient, so the initiative was surrendered.[5] The offensive was renewed with the capture of Trones Wood, prepared German positions in the villages of Guillemont and Ginchy which were infamous for Germans appearing from tunnels behind the assaulting British troops, Flers where tanks were used for the first time and finally Morval. The campaign ended in the middle of November 1916 after 141 days during which the British Army advanced some 6 miles.

55th (West Lancs) Divisional Signal Company TF on the Somme

The Company War Diary summarises the activities.[6] It is very matter of fact, and unfortunately, lacking in great detail – later in the war, detailed maps of the communications plan have survived and been included in the War Diary. There is, however, enough information to analyse the Divisional Communications Plan.[7]

55th Division's first attack took place at 0430 hours on 8 August 1916 against Guillemont. In preparation, 165 Brigade relieved 164 Brigade on the 6th and the War Diary confirmed communications were established. The following day a more detailed communications plan was established and proved, between Divisional HQ and two forward locations:

> Cable and Visual to Arrow Head Copse, **Wireless to Maltz Horn.**

Heliograph at Fricourt on the Somme, September 1916. 55th Divisional Signal Company in action, with the divisional Red Rose badge on the board behind them. Another photograph in the series shows King George V and the Prime Minister, Lloyd George, having a picnic beside the sign so this would have been a quiet sector of the front by then. Image courtesy of the IWM.

The attack failed, and overnight on the 8th/9th, another, hasty, attack was planned by 166 Brigade. The opportunity for chaos of troops moving forward at night to relieve troops who were re-organising after the failed attack is evident: the War Diary states that communications with HQ 166 Brigade was established at 0300 hours, only 90 minutes before H-Hour. This was a relief in place and the communications infrastructure was already in place and working. Unsurprisingly, this attack also failed.

Two days later, with more time to plan, a join Anglo-French attack was launched. The War Diary simply states that communications were established with the French, and frustratingly glossed over issues like interoperability and common languages.

In early September in preparation for attacks on Ginchy, the entries start to become more revealing. In the evening of the 5th, the Germans intermittently shelled around Divisional HQ damaging numerous cable routes but without seriously effecting divisional communications. By the 9th, we see a more detailed communications plan. Wireless and Visual Stations were established at Longueval, Trones Wood and Pommiers Redoubt. Runners Posts were also established which acted as rest stations and shelter where the message could be passed in relay. On the 10th, the Trones Wood Station was knocked out by German shell fire, but communications were re-established an hour later. The 'Office' (CommCen) was operating at Bellevue Farm at this point, with a Forward Exchange at Fricourt. Seven Military Medals were awarded a week later, which may have been connected with the Ginchy attack. In October, a Distinguished Conduct Medal would be awarded to Corporal R. Boyce, for all these awards there is no indication in the War Diary for when or why the award was made.

At the end of September, an even more complex communications plan was in place:

Divisional Runners Relay Posts along the Flers – Longueval – Bernafay Wood Road

Wireless Stations at York Trench and at the junction of Switch Trench and the Longueval – Flers Road (another unmentioned station would have been at Divisional HQ)

which were supplemented two days later by:

Increased Cable communications to the Forward Brigade

More Advanced Visual Points for working back to Longueval

This is the last entry indicating a build up by the Signal Company for a divisional attack.

Characteristics of the Means of Communication

Throughout the campaign, four forms of communications were in use: cable, runners, visual and wireless.

Today we would expect all four means of communication to be transmitted and received through one CommCen. The 1916 equivalent is always referred to as the 'Office', but they did operate a Forward Exchange if the situation required it. The reliance on fixed line communications in the Divisional Rear Areas and to higher formations made Divisional HQ fairly immobile. That said, when at rest, the Signals did practice mobile communications with the cable laying wagons, even though they were hardly used between late 1914 and late 1918.[8]

The nature of the communications used in 1916 constrained the communications battlefield in a way in which the modern equivalent familiar with SatComm is not.

Cable was the most common means of communications used. This developed from pre-war lightweight cable intended to be deployed for limited periods during a set piece battle and then recovered, to waterproofed, armoured cables which could be laid permanently. Within the divisional area, cables had to be laid in trenches six feet deep to adequately protection against a direct hit by a German 5.9 inch shell.[9] Even this was inadequate against multiple hits. To prevent a buried cable system from being deliberately targeted it had to be camouflaged. A section of trench had to be laid out, dug, the cable laid, filled in and the surface replaced in one night. Any trench which was not filled in and covered during the daytime would be identified by German aerial reconnaissance and targeted. The cable trench would be laid out by a Signals officer, but actually dug by the infantry on their rotation out of the front line trenches when they were nominally 'at rest'. The speed at which new cable could be laid to support an advance was therefore extremely limited and not practical at the tactical level. Further to the rear, cables could be suspended from telegraph poles (Airline).

Buried Cable Crossing a Stream. This image illustrates the labour intensive protection required for fixed line cables. Image courtesy of the Royal Signals Museum.

Visual Signals. Although from the Battle of Arras in 1917, this shows the combination of telescope and signalling lamp in use in daylight. Note also the signaller's white and blue brassard. Image courtesy of the IWM.

Visual covered a range of means and could be the most effective in the immediate aftermath of an advance. Traditionally, we would think of semaphore or heliograph. Semaphore exposed the operator to death or injury from shrapnel while heliograph was constrained by the unreliable sunlight in north-west Europe. Lamps, and to a lesser extent, shutters were used, even in daylight, to transmit messages. Lamps transmitted on a narrowly focused beam and needed to be accurately laid for maximum efficiency. A critical factor was that the forward station needed to operate where an obstacle (bank or a captured pillbox) blocked the onwards signal to the enemy. It was also possible to remote the lamps so that they could be operated from a safe position (the bottom of a trench or inside a pillbox) although an operator would need to be exposed in order to observe and read an incoming message.

Wireless (radio transmitting Morse code) is not normally associated with the First World War, but has been show in this paper, up to two sets were deployed in the front line trenches. These divisional attacks were conducted by two, sometimes just one, brigade and so Wireless can be seen as an operational, rather than a tactical, level asset. Effective, mobile wireless would not be available during the war, it was "the missing link in Great War technology affecting all activities at the tactical level."[10] Perhaps unsurprisingly, Heinz Guderain, who developed German armoured warfare doctrine in the late 1930s, was a signals officer in the First World War and identified this as the missing component to the otherwise highly successful British Army of late 1918.[11]

Runners were slow, manpower intensive and dangerously exposed. The physical delivery of a message by a man remains valid today. What is different is the use of Runners as a divisional asset. Runners were not mentioned in the August attacks, but this should imply that they were not being used. Rather, as the campaign proceeded, the use of Runners was rationalised to provide a single, clearly identifiable route (presumably with protection in roadside ditches if necessary) with clearly marked staging posts for day and night use where a Runner could rest having passed his message to a fresh Runner.

166 Brigade Signallers. Taken in September 1918, Brigadier-General Kentish, Commanding 166 Brigade and the brigade signallers from the Divisional Signal Company. The right forearm of some soldiers show the overseas service chevrons, one for each 12 months outside the UK. Image courtesy of the IWM.

There are two other means of communications which would have been used, but which are not mentioned in the War Diary. The first is the motor cycle Dispatch Rider – the DonR – as seen on the front cover of the Summer 2015 volume. There were a number of DonRs in the Signal Company but these were most effectively used on better quality roads away from the immediate battlefield (although not out of danger of German long range artillery fire). The other is the homing pigeon. These were not held on the company establishment, but in March 1916 two Pioneers, Pinkstone and Birchall, arrived from J and W Carrier Pigeon Service, RE respectively. Pigeons remained an effective means of communication throughout the war, provided that it was not misty or dark.

Conclusions

Six or seven months into the war, the British Army had already identified the limitations of communications on the Western Front. For the commander in battle "control passes largely out of his hands except under exceptionally favourable conditions".[12] It was in this communications maelstrom that the Somme was fought just over a year later.

Despite this, and despite the changes in technology since 1916, two lessons are identifiable as relevant to the modern Royal Signals.

The first is the use of four means of communication, which brings to mind the modern concept of Primary Secondary Alternate and Emergency means of communications. The means have changed and so has their practical application. The most important difference is that the physical means of transmission required different routes which required different collection points. Omni-directional Wireless could be received pretty much anywhere in the geographically compact 1916 battlefield but Visual required direct line of sight (although the author remembers that requirement for certain links on Ptarmigan), whereas the Runner required a clearly identifiable good surface to avoid becoming lost. Deep buried Cable was a fixed asset which could not be adjusted in the planning cycle of a 1916 battle. However, the basic concept remains consistent a century later for built in redundancy and alternative means of communication.

Secondly, Signals officers adapting their equipment to suit the prevailing operational environment. This is most clearly displayed in the adaption of deep buried Cable and Runner Relay Posts. We should not be blinded to the process by the low technology in use at the time. Wireless was cutting edge, Visual was effective, Cable entrenched six feet down proved reliable and Runner Relay Posts adopted a pre-existing means to current situation. At the outbreak of the war less than two years previously, Wireless was greatly restricted in its use, Visual relied on semaphore flags, Cable was light and temporary, and Runners could sprint to the next higher formation which was usually within sight.

[1] McGilchrist, A.M., The Liverpool Scottish; 1/1st Field Ambulance was renamed 87th Field Ambulance, The National Archives (TNA) WO95/2296/1; 1/2nd Field Company became 420th Field Company, TNA WO95/4314

[2] The National Archives WO372/24/79631; WO372/24/47364; WO372/15/58209; WO372/19/186801; WO372/23/174200; WO372/24/61138; WO372/24/61139.[13] MOD ICT Strategy Oct 2013

[3] Coop, J.O., The Story of the 55th Division 1916-1919, p. 182.

[4] Griffiths, P., British Battle Tactics on the Western Front, pp. 80 – 1.

[5] TNA WO95/2325/1; Stedman, M., Manchester Pals; Maddocks, G., Liverpool Pals.

[6] TNA WO95/2916/4.

[7] TNA WO95/2916/4 July 1918.

[8] Welti, A., Signals from the Great War, p. 33.

[9] Hall, B.N., 'Technological Adaption in a Global Conflict: the British Army and Communications beyond the Western Front, 1914 – 1918', in The Journal of Military History, 78 (Jan 2014) p. 41.

[10] 'The High Tide and the Turn', The Editor, BAR 119, p. 91.

[11] Craddock-Adams, P, Monty and Rommel, p. 209.

[12] "Report on the Operations of the IVth Army Corps from 10th to 15th March, 1915" undated, WO 158/374 TNA quoted in Hall, 'Technological Adaption' p. 45.

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HOW SAFE IS YOUR USB STICK ?

By Guy Bunker, SVP Products, Clearswift

Cyber security experts have often questioned the safety and security of using a USB to transfer files and upload data. To all outward appearances, it is a relatively innocuous piece of plastic and hardwiring, but losing, or inserting, an unknown USB into a company computer could have devastating effects for the organisation.

USB security issues are a result of a number of things, but a major problem is the lack of security protection on the devices themselves. Many USB manufacturers do not protect the firmware (the permanent software that controls the "communications" function of the USB) in their devices. This provides an open door for criminals to reprogram or reverse engineer the USB to hold malware capable of compromising computer systems.

The Internet is rife with complete computer malware kits designed to steal security credentials and critical security information just by plugging in the device. A hacked or reprogrammed device can imitate a keyboard in terms of issuing commands, mimic a network card and redirect a company's Internet connection by changing the Domain Name System (DNS) or infect a computer's operating system leading to a virus outbreak or encryption with ransomware.

The effects of this on an organisation can be disastrous; stealing the contents of anything written to the drive while spreading malware through multiple computers on the same network. Our own research showed that 83% of organisations had suffered some form of data security incident and over a third of these security threats were the result of employee misuse of USB or storage devices to save company data, making them a
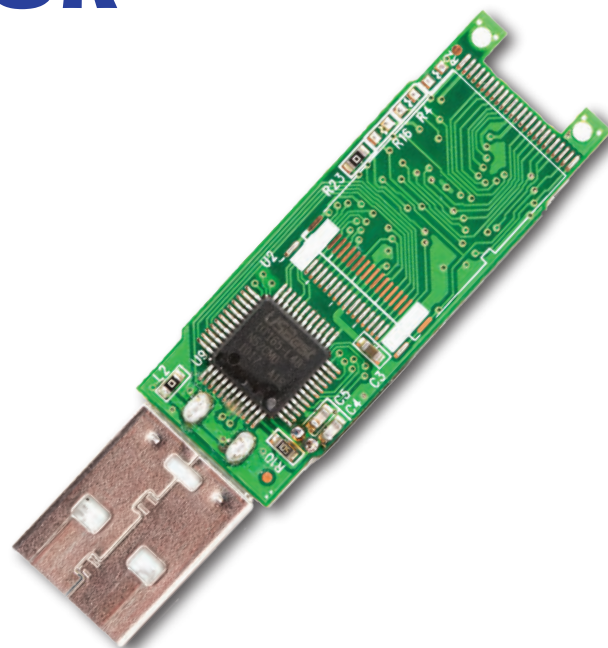
data loss threat that cannot be ignored by individuals or organisations. With the proliferation of cybercrime in recent years, these security incidents have become even more commonplace in the workplace.

However the lack of security built into USB devices is not the only problem. Social engineering is becoming the method of choice for many hackers. This involves the gathering of information through various social media channels available publicly to find out anything from e-mail addresses and phone numbers to which financial institution an individual banks with. From here hackers can use the information to create a false source that appears both convincing and trustworthy.

Amongst cybercriminals this type of personal data is a commodity growing in value and is often the sort of information that can be found in the documents and files on an individual's storage device. The problem is, even the seemingly worthless data can be used to

piece together a profile of an individual which can then be used against them. It means that losing any type of data, even the most nondescript, could for example result in being contacted by someone posing as an employee from a bank requesting an immediate transfer of savings.

In a recent social experiment carried out in Chicago, 200 USB sticks were dropped in public places. In around one out of every five instances, a member of the public picked up and plugged the dropped USB into a device. These individuals then proceeded to open documents and folders on the unknown USB, which, had this been programmed with ill intent, could have had far-reaching, damaging consequences. Even with the number of high-profile data breaches 0n the rise, individuals still did not understand the potential risk of misusing a USB flash drive. This has made USBs a major tool for cybercriminals, with an aim to steal personal or corporate data.

It is not surprising that, whether malicious or accidental, the greatest threat to any organisation's data security comes from removable storage devices/USBs. This comes from employees not following corporate data protection policies and using unauthorised devices at work.

Despite the serious threats USBs pose for businesses and organisations, there are ways of safeguarding data against their misuse. To start with, no matter how tempting it may be, an unknown device should not be used, especially not with a device that conations any company data. There was a case of mass produced USB sticks being handed out at a show, where the stick also (unintentionally) contained a virus along with the marketing materials it was supposed to have. This common sense fact may save a company from suffering a serious data breach. In fact, to reaffirm this point, an unknown USB should not be used at all.

To fully defend against rogue USBs businesses should secure themselves with both a data loss prevention and an endpoint solution. Data Loss Prevention (DLP) solutions encrypt sensitive data, preventing it from being sent in an e-mail, or from being uploaded to a website. Importantly, it prevents critical information from being copied to USB stick and other storage devices.

Endpoint solutions control where sensitive data is located and how it is used on end-point devices, such as USBs. It ensures that critical information can be controlled when transferring data between corporate and personal devices, including via USB sticks and iPhones. The solution significantly reduces the risk of losing company data to a malicious or accidental breach.

What businesses can do immediately is to provide a level of clarity on best practice e or the use of USBs on the workplace and ask key employees a number of key questions: how many USB storage devices do they have? How many of them have company critical information on them? Is the device or information encrypted? How many have been lost or given away? How many have been gained for "free", including those picked up at the last trade show?

Good security includes education and awareness campaigns with employees. Just informing people about the risks and consequences around USBs, and then providing company USBs which have encryption will help improve the risk profile of the business.

With the number of employees that currently use UDBs as a medium for transporting information it's time to take the USB threat seriously – and keep critical information safe.

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ANY PORT IN A STORM?

By Tastevin

The Beginnings

There are three things on which military types of a certain age profess themselves to be experts. One is boots, another is training and the third is port. An outlook shaped by a career exposure to the vagaries of all three tends to develop a certain appreciation of their higher forms of expression, and port has acquired over the years a particular reverence for the military community.

In the armed services it is associated with tradition, quality, hospitality and a mild form of discipline, evidenced by the immemorial practice of seniors fining their juniors for minor misdemeanours in glasses or even bottles of port. We should know more about this wine, so beloved of military messes, private members' clubs and increasing numbers of young people who have come to appreciate its virtues.

Interest was first kindled in 1678, when a Liverpool wine merchant sent two new representatives to Portugal to learn the wine trade. While on a vacation in the Douro, the two gentlemen visited the Abbot of Lamego, who treated them to a "very agreeable, sweetish and extremely smooth" wine," which had been fortified with a distilled spirit. The two Englishmen were so pleased with the product that they purchased the Abbot's entire lot and shipped it home.

Port became very popular in England after the Methuen Treaty of 1703, when merchants were permitted to import it from Portugal at a low rate of duty, while war with France deprived English wine drinkers of French wine. Contrary to popular belief, port was not created by British sailors spiking the wine with brandy to avoid spoilage during the long voyage north. More accurately, British importers can be credited for recognizing that a smooth, already fortified wine that would appeal to English palates would coincidentally survive the trip to London.

The continued English involvement in the port trade can be seen in the names of many port shippers: Cockburn, Croft, Dow, Gould, Graham, Osborne, Offley, Sandeman, Taylor and Warre being amongst the best known. Shippers of Dutch and German origin are also prominent, such as Niepoort and Burmester. The British involvement grew so strong that they formed a trade association, which became a gentlemen's club.

Where and How?

The port-producing region is centered on the valley of the river Douro, in northern Portugal. Along this stretch of territory, the climate varies considerably. Porto at the river mouth is the second wettest city in Europe, with an annual rainfall of 1200 mm. In Pinhao, roughly halfway upriver, has 700mm, and at the Spanish frontier it is 400mm. The climate thus varies from maritime to dry continental, with summer temperatures reaching 30 degrees C, heavy rainfall in spring and autumn and occasional severe winter frosts.

As if this does not make growing conditions bad enough, the vineyards are planted on the steep slopes of the Douro and its tributaries, making vineyard management difficult, to say the least. The problem is eased in the flatter region of the Douro Superior, near the Spanish border, but downriver various forms of terracing have been developed over the years to facilitate cultivation.

A form of production control is imposed by the controlling body, the Instituto dos Vinhos do Douro e Porto, or IVDP. It decides annually how much of the grape harvest can be made into port, based on current stock levels and predictions for the vintage. Remaining grapes can be made into ordinary wine. This system is called beneficio, and prevents gluts in production, protects prices and guarantees employment in a rural area where opportunities are few.

The Grapes

Portugal has many native grape varieties, with different regional names, constituting a great range and variety seldom in found in other countries who focus on the more well-known international varieties. About one hundred grape varieties are authorized for port production, with around thirty being particularly recommended.

In actual fact, most port is made from only five varieties. The Touriga Nacional is considered the finest Douro grape, giving a low yield of small bunches and berries, and producing full-bodied, concentrated wines. It is however, difficult to grow, and due to its rarity, cost and quality is used only for the best wines.

The Touriga Franca is almost on a par with the Touriga Nacional, and in good years can outperform this grape variety. By contrast, the Tinta Roriz (or Tempranillo) is relatively lightweight, whose yield can vary considerably with climatic conditions. A small percentage of vineyards produce the Tinto Cao, a late-ripening variety producing small berries and tannic wines. Finally, the Tinta Barroca has larger berries and a thinner skin, and suffers in excess heat, but usually produces high sugar levels.

Comparatively smaller amounts of white port are also made, using white grapes, the most common being Esgagna Cao (known elsewhere as the Sercial) and Malvasia, but there are numerous others, such as Rabigato and Voisinho.

The Regions

Beginning around 70 km upstream from Porto, the growing region of the Douro valley extends eastward nearly to the Spanish border, as already mentioned. The region is protected from the influences of the Atlantic Ocean by the mountains of Serra do Marao, and is sub-divided into 3 official zones - the Baixo (lower) Corgo, the Cima (higher) Corgo and the Douro Superior.

The Baixo Corgo is the westernmost zone located downstream from the river Corgo. This region is the wettest port production zone, receiving an average of 900 mm, and has the coolest average temperature of the three zones. The grapes grown here are used mainly for the production of inexpensive ruby and tawny ports. Cima Corgo is located further upstream, where the summertime average temperature of the region is a few degrees higher and rainfall about 200 mm less. The grapes grown in this zone are considered of higher quality, and are used in bottlings of vintage and Late Bottled Vintage Ports, described below.

Douro Superior is the easternmost zone extending nearly to the Spanish border. This is the least cultivated region of Douro, due in part to the difficulties of navigating the river Douro past the rapids. This is also the most arid and warmest region, the terrain being generally flat, and is the only vineyard area of the Douro with the potential for mechanization.

The Production

Port production requires the rapid extraction of colour and tannin from the grapes in around 24 to 36 hours, after which the wine is fortified and removed from its skins. The traditional method of treading the grapes is still used for some premium wines, but more modern methods use auto-vinifiers, piston plungers and even robotic feet to produce the same effect.

Once the wine has fermented to about 6 to 9 % alcohol, a grape spirit known as aguardente at 77% alcohol is added in the ratio of one part spirit to four parts wine. This kills the yeast and stops the fermentation while still retaining some sugar in the wine. The wine is now ready for maturation.

The wine was formerly transported downriver by sailing boats, the barcos rabelos, to the cooler, more humid climate of Via Nova de Gaia on the coast, which is better suited to maturation. Transport is now largely by road, although the advent of climate controlled warehouses is increasingly allowing maturation to take place in the vineyard area. Wine for sale as tawny port, on the other hand, where oxidation is desired, is matured upriver where the high summer heat produces faster ageing and colour loss.

Traditionally, the wine was stored in wooden casks, or pipes, of about 550 litres capacity. Only seasoned wood is used, otherwise undesirable excessive wood flavours are imparted to the port. Many ruby wines and some vintage wines needing more fruity aromas are stored in stainless steel tanks or large oak vessels.

Port Styles

Port can be produced in various styles. White port is generally golden in colour, of low acidity with the typical honey and nut aromas of oxidation. They can range from off-dry to sweet, and the style is usually mentioned on the label. They are non-vintage and are normally sold at two or three years old, although some can be aged for longer. The main port styles however, are ruby, tawny and vintage.

Basic ruby port is an inexpensive young wine, usually less than three years old, and normally sweet with primary fruit flavours. Further up the quality scale, Reserve ruby ports are blended from higher quality wines, and must be cask-matured for up to five years before bottling. They are full-bodied, with richer fruit and have no need of decanting.

Late Bottled Vintage (LBV) port is ruby port aged between four and six years in cask, and in the modern LBV style, filtered and fined before bottling, when it is ready for consumption. Such ports do not mature further in bottle, nor do they need decanting. They have richer, more complex fruit flavours and increased tannins compared to reserve ruby ports.

Less common is the bottle matured LBV, which continues to improve in the bottle, as it is not fined or filtered before bottling, and will thus need decanting before consumption. This port is only released for sale after three years bottle ageing, and the best wines will have something of the structure of a vintage port.

Vintage ports are well known, but represent only about 1% of all the port produced. They are intended for bottle ageing, and are bottled without fining or filtering after a relatively short time in cask, usually of the order of 18 months to three years. They are the longest-lived wines anywhere, and can age for decades. Indeed, some 19th century ports are still in prime drinking condition. Vintage ports throw a heavy deposit, and need decanting before serving. Once opened, oxidation can start immediately, so early consumption is recommended!

Crusted port is similar to vintage, in being bottled without fining or filtration, but differs in being made up of a blend

of different years. It can be exported three years after bottling, and is a low cost alternative to vintage port.

Tawny ports are paler and browner in colour than ruby ports, and the best will have complex aromas from oxidative ageing. A large amount of inexpensive, light tawny style wines is exported to France, where it is commonly consumed as an aperitif. Such wines are usually produced from lighter coloured grapes grown in the Baixo Corgo, and matured in hot conditions. The colour is sometimes adjusted by the addition of white port.

Reserve tawny port on the other hand, must spend at least seven years maturing in wood, and have a complex, smooth and soft texture, with a russet or tawny colour. Tawny port with an indication of age can only be labeled as 10, 20, 30 or over 40 years old. These are average ages, rather than the age of the youngest component in the blend, and the year of bottling must be stated on the label, as the wines lose their freshness after bottling. They are the finest of all tawny ports, and the best are complex and exceptionally concentrated. They do not throw sediment, or need decanting.

The rare Colheita ports are best known in Portugal, and are wines of a single vintage that have been aged in wood for a minimum of eight years until just before sale, although some are aged for longer. They are thus vintage dated tawny ports, and the labels show the bottling date as well as the vintage year.

Single Quinta ports are made similar to vintage ports, but are the product of a single estate or quinta. They are made more frequently than vintage ports, but not every year.

History and the Bishop of Norwich

Port is traditionally served in military messes at the end of formal dinners, and is usually passed to the left round the table, as most people are right handed. There is also a theory that the custom arose from the need to keep one's sword arm free, and that it originated in the Royal Navy.

If a guest fails to pass the decanter on to his or her neighbour, it will come to a standstill. This usually arises because a guest does not notice that the decanter is there, does not realise that they should pass it on or, more rarely, hopes that no one will notice so that they can have a second glass.

Guests waiting further down the table for the decanter to arrive may become impatient. However, it is considered bad form to demand that the decanter be passed on. Instead, the person who is preventing the decanter from continuing its journey round the table is asked politely 'Do you know the Bishop of Norwich?' This is a gentle reminder to get the decanter moving again. If the meaning does not sink in, the less subtle alternative 'Is your passport in order?' may be used.

A more practical method of ensuring decanter progression is to adopt the hoggit, a spherical bottomed vessel which by design cannot be allowed to rest on the table. An example is held by the Headquarters Officers Mess Royal Signals.

The origin of 'Do you know the Bishop of Norwich?' is attributed to Henry Bathurst who was Bishop of Norwich from 1805 to 1837. Bishop Bathurst lived to the age of 93 by which time his eyesight was deteriorating and he had developed a tendency to fall asleep at the table towards the end of the meal. As result he often failed to pass on the Port decanters, several of which would accumulate by his right elbow to the consternation of those seated further up the table. A bon vivant said to possess a prodigious capacity for wine consumption, he was sometimes suspected of using these frailties to his advantage.

BOOK REVIEWS

THE SECRET WAR: SPIES, CODES AND GUERILLAS 1939-1945
By Max Hastings

Max Hastings tells a great story. Here he covers the spying, subversion, disinformation, courage and treachery inseparable from warfare. The book covers the secret activities of the major powers with telling asides on other players.

The dictatorships handled intelligence differently from the Allies: the difference was intellectual integrity. In general Stalin and Hitler were not prepared to hear bad news. The only similarity to this in UK was the RAF, which tended to ignore any intelligence which failed to support its obsession with strategic bombing. Indeed by the end of the War Bletchley regarded the US Army Air Force a more important and responsive customer for Ultra material than its own Air Force.

There were significant unsung German successes against British and US networks. The German Navy found RN wireless security so exploitable that they could not imagine such opponents running a sophisticated intercept and analysis operation against them, a perception which made them blithely complacent about their vulnerability to Ultra.

The German approach to prisoner interrogation was more subtle than they have been given credit for in the self-congratulatory British literature of the war. The Wehrmacht's Guidelines stated, "if cordially addressed, every Englishman will answer all questions entirely frankly" and indeed, this frequently proved to be the case, says Hastings. Soviet prisoners were different, largely because the Soviet soldier knew little outside his own sub-unit.

Soviet intelligence services were a strange mix of brutish incompetence and superb sophistication. Russia proved excellent at deception and was ruthless in implementing it, accepting the deaths on one occasion of 70 thousand Soviet soldiers as a necessary evil.

The worlds of spying and special operations attracted its share of fantasists and crooks. Some spies flavoured their reports to enhance their personal value and in time many capitals started to distrust them. This meant that once Ultra became trusted, it created an unhealthy dependency on this single source.

Hastings is scathing both about the bureaucracy of MI6 and of the raffish approach of SOE. Indeed, SOE's own people referred to it as "The Racket". Neither agency, he says, produced much intelligence of value but SOE's courage kept the spirit of resistance alive on the continent. SOE was little loved by conventional soldiers: Lt Gen "Boy" Browning wrote, "I have yet to meet the senior officer who can bear with equanimity the tribulations inflicted on a suffering world by the clandestine organisations".

Larger than life characters strut through the book: "Wild Bill" Donovan, who formed OSS, later the CIA; the arrogant genius Hugh Trevor-Roper, who knew more about the German Intelligence Service than its Chief, the incompetent Admiral Canaris. And Churchill, impossible to handle but generous in the support he gave to bright but difficult people over resentful bureaucrats.

Stalin never lost sight of his post war aims. US and UK governments passed sanitised Ultra decrypts to USSR, ignorant that Stalin was fully aware of Bletchley from his spies, Philby and Cairncross. At the final wartime Allied conference at Yalta, Stalin had a detailed brief on the US and UK negotiating positions.

Searing tales of intelligence failures occur throughout the book: Stalin ignored warnings from Germany and Japan of the German invasion of June 1941. Churchill warned him personally by letter but Stalin saw this as a hoax: his own spies had given him the minutes of the British Joint Intelligence Committee which was sceptical of the German plan to invade.

Hastings reminds us of the difference between "secrets" and "mysteries": the knowable (the capability of a weapon) and the unknowable (what the opposition think). A member of the Joint Intelligence Staff admitted to misjudging the obstinacy of Hitler and his capacity to ignore intelligence and military advice. The relationship of the JIC to Churchill was significantly different and reminded Hastings of the relationship between Elizabeth I and her spy chief, Walsingham: "If she had taken his advice every time, she would have been ruined. If she had never taken it, she would have been ruined no less".

Major General Bill Robins

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THE END OF THE COLD WAR 1985 – 199
By Robert Service
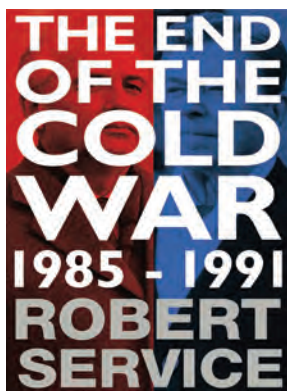
Robert Service, Professor of Russian History at Oxford University, has produced a magisterial work on a period of great importance to readers of the Journal. Older readers will have served through that period of literally incredible change that from a parochial viewpoint, led to the vast bulk of the British Army returning to the UK and generated the strategic backdrop to the Balkan Wars, First Gulf War and arguably Afghanistan. Echoes from that period still resonate around Europe as the West grapples with the Russia of Vladimir Putin and jihadism.

Service has fully exploited the archives to bring the period to life and open up the human interactions as well as economic factors that led to the seismic shift in international relations. I am not usually gripped by political history and I did find the early chapters to be heavy going but that was a worthwhile exercise to understand the dramatis personae – in the process demolishing a number of stereotypes. First amongst these was that of President Reagan and his determination to reduce the risk and effect of nuclear war: his persistence against strong opposition from within his own party and administration, not to say allies, came through very clearly. It did not seem as though there was much need of stiffening by Thatcher. The widely held worries about Reagan's negotiating skills failed to recall his past as a union negotiator. Throughout, the degree of 'cat-herding', persuasion and arm twisting by both Reagan and Gorbachev was fascinating if unsurprising for those who have enjoyed the workings of Whitehall. The role of Kohl emerging as a key player towards the end-game gave a contemporary twist to Churchill's observation,

'In war it is not always possible to have everything as one likes. In working with allies it sometimes happens that they develop opinions of their own.'

The importance of the personal relationships between Reagan, Gorbachev, Shultz and Shevardnadze and the efforts amongst them to develop trust are well brought out and in many ways the most engaging aspect of the book. In this context it is interesting that the one Russian phrase memorised by Reagan was 'Doveryai, no proveryai [Trust but verify]'. It made one wonder how such trust could be developed with the current incumbents in the Kremlin or indeed Tehran. It would be tempting to compare President Obama's engagement with Tehran.

A rather thought provoking sketch was the bizarre Rust affair of the young West German pilot who flew a light aircraft from Helsinki through the Soviet air defence system landing in Red Square. The General Staff and Defence Ministry had up until then strongly resisted Gorbachev's efforts at arms reduction. The humiliation provided the opportunity to retire hundreds of top commanders and allowed Shevardnadze to close a key meeting directing his officials to 'prepare the question without worrying about the General Staff'. What might have happened had the Cessna been shot down?

It is too easy for military people to ignore the economy as a national instrument of power but underlying the story laid out by Service is the parlous state of the Soviet economy even if they did manage at that time to provide funding for the Union of Mineworkers and the Morning Star! The decline of the economic conditions within the Soviet Union and more widely in the Warsaw Pact accelerate in tandem with the break-up of the USSR and the Warsaw Pact. The most blatant use of the economic instrument was by Kohl and one is left pondering how it might have backfired. In this case the balance of coercion versus humiliation worked.

The latter chapters of the book move at pace and one is left wondering how the relatively peaceful conclusion was reached with key characters changing and events moving so rapidly: exit Reagan for Bush; Shevardnadze for Bessmertnykh; Shultz for Baker and finally Gorbachev for Yeltsin with a short-lived coup thrown in. Overall, a fascinating book that is worth the effort to understand what was, arguably the last act of World War Two, but sadly not the 'End of History'.

Lieutenant General Robert Baxter

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CAPTAIN DAVID HENRY INSALL

David Insall's career and many accomplishments merit a full biography rather than an obituary. David was born in February 1939 in London, settling later in the family home in Scrooby, Near Doncaster in Yorkshire. His father was Group Captain Gilbert Insall, who served in the Royal Flying Corps, then the Royal Air Force, from 1915 up to 1945, earning both the VC and MC in World War 1. The discovery of Woodhenge led directly from an aerial photograph he himself took in 1925. David's early schooling took him to Marlborough College from which excellent grounding, he became an accomplished violinist, and entered Welbeck College in January 1955 for his A Level school years. His interest in shooting began there, as did his apparent distaste for the higher realms of mathematics and engineering.

Progressing from Welbeck to the Royal Military Academy Sandhurst in January 1957 he excelled in shooting, and in his own terms, "scraped through" to a commission into the Royal Corps of Signals on 19th December 1958 and began Young Officer training at the School of Signals, Catterick Camp. He is remembered there, not especially for his communications prowess, but for driving the wrong way around the HQ Officer's Mess and crashing into the car driven by a senior 'living-in' major. He continued his serious shooting and was heard to remark that he never drank tea before a competition as it made his eyeballs sweat.

Somewhat mistakenly David was then sent to RMCS Shrivenham to study for an external London University BSc in engineering. His skills embraced the classics, music and shooting and led to completion of what he described as the "two year RMCS degree course"! During the first Summer Vacation he crossed the Sahara Desert solo by motor-cycle. In his second year he was arrested on the outskirts of Salonika for carrying a hunting rifle whilst hitch-hiking. After one night in prison he was despatched to Turkey and then arrested in Tehran for sound recording during the 1961 Mossadeq anniversary riots. His eventual return to RMCS that summer marked the end of his engineering studies and his posting to 4th Armoured Division HQ & Signal Regiment as a Troop Commander. As Officer in charge of the motor cycle team he attempted to obtain new ones in place of the three that he had discarded over a cliff, an action that was strongly condemned during the annual vehicle inspection.

He subsequently moved to 21st Air Formation Signal Regiment and began a serious and distinguished shooting career in which he excelled in all small-arms weapons, representing the Army and England. Whilst training the Army and regimental teams in Catterick, David repeated his driving excesses by speeding at 48 mph in a Lotus XI in a local 30 mph limit. Claiming that he had only a revolution counter and no speedometer was insufficient to avoid a £3 fine by the local authorities. He was also known not to drive into nearby Richmond and park because the Lotus had no handbrake. His British Army military career ended in 1968 when he retired from 30th Signal Regiment in the rank of Captain.

For a couple of years David trained in London with a civil engineering firm before the siren calls of both the military and the Middle East drew him in 1970 to a commission in the Northern Frontier Regiment, the Sultan of Oman's Armed Forces. His five years in the HQ saw action in the Dhofar War and the establishment of Oman's first Military Secretary's branch and a recruiting office. He founded the Wadi Sareen Wildlife Reserve for the endangered Arabian tahr (a rare form of goat), having hand-reared one for eight months till it stole a meal of rice and keeled over. Finding time to deploy his civil engineering knowledge he

took up weekend rock-blasting for road building teams serving remote communities in northern Oman.

In yet another change of direction he joined the Royal Air Force of Oman as a Squadron Leader responsible for recruiting and the air force's Omanisation programme. Later, as a Wing Commander, became head of Recruiting and Training in 1978. He joined the National Committee for Protection of the National Heritage, finally ending his stint in the Oman in 1982 having been awarded the Sultan's Distinguished Service Medal and the Order of Oman. Before he left David had published his first article in the Journal of Oman Studies, "The Code Languages of Oman". In his research of the dialects he adapted a method of annotation. He discussed the limitations of the annotation with a linguistics professor who was astounded at what David had achieved, asking him where he had done his advanced studies! Typically, David was modest about such achievements.

Where next? He and Jeannette, they had married in 1978, 'retired' to a rather run-down sheep farm in North Wales and enjoyed an uninterrupted 12 years with the sheep and a small beef herd. David described his early attempt at a 'One Man and his Dog' career as unsuccessful – one dog had got the sheep through the two gates and leapt out of the arena, and the other had cornered the sheep at the entrance but refused to allow them to go in! He worked all day, every day, to make the farm a viable business. After two years without a day off, he and Jeannette went for an away-day to Aberystwyth. It was in the depth of winter and David slipped on ice and broke his femur. Jeannette, then heavily pregnant, found herself feeding the herd. As many were also pregnant she soon found out about 'leaners' in the rather confined stalls. It was the end of days off for David! This period served as a quiet sojourn but the call of the Middle East once again drew them back to the Oman in 1994.

For the next six years he was a Civil Servant in the Oman, working as a nature conservation advisor in the environment ministry, setting up ranger units, developing management plans for nature reserves and conducting environmental impact assessments and field studies. He was also appointed Managing Editor of the Journal of Oman Studies, a considerable tribute to his skills as an Arabist. Proof of that may be gleaned from the many articles he published covering archaeology, history, the tahr and musical instruments. David returned to military work in 2000 when he rejoined the Omani Air Force as a retired officer. He taught environmental subjects and IT in Arabic, helped set up the Defence Studies Centre (later part of the Office of the Chief of Staff) and was then appointed as Assistant Head of Research. He and Jeannette returned to North Wales in 2005 to sell off the sheep and to do battle with a neighbour who was planning an extensive wind farm that would have had a serious impact on the indigenous wildlife especially the red kites. From then until his serious breathing problems struck in 2015 David and Jeannette shuttled to and from between the farm and the Oman, where he provided continued research and consultancy in conservation and archaeological projects. They hurried back to the United Kingdom for treatment. David had a brief period of recovery, but suffering from a number of lesser ailments as well as virulent lung cancer, he succumbed on 8 August last year.

His funeral in North Wales was extremely well attended, the congregation including a number of representatives from the Oman, past military colleagues and many friends from his numerous activities and interests. He leaves Jeannette, a son Nicholas, a keen sportsman, and daughter Katherine, a proficient sky diver, both of whom studied at Manchester University. As Nicholas remarked when giving his eulogy, David was characterised by his ever present broad and welcoming smile. With such a distinguished father it is perhaps not surprising that David grew to be a unique character. He was a man of an extraordinary range of talents: linguist, marksman, author, violinist, farmer, archaeologist, environmentalist, but above all an adventurer. Given a different time-frame in which he lived, it is entirely possible that he might have put even Lawrence of Arabia's exploits in the shade.

Brigadier Mike Taylor CBE DL - A TRIBUTE

Firstly can I say how honoured I am to have been asked by Mike's family to provide my reflections on Mike, a much loved husband and father and known to many of us as an outstanding Chairman of the Dorset Police Authority.

Mike became an independent member of the Dorset Police Authority in 1999 and he was elected Chairman in 2002, a post he was re-elected to annually by his peers until the dissolution of the Authority in late 2012. This was a huge testament to the respect that the members had for Mike and it is excellent to see so many of those former members here today. During Mike's tenure he worked with four Chief Constables, three of whom he had a hand in selecting and they are also all here today.

When Mike joined the Police Authority its membership was a mixture of elected councillors from Bournemouth, Dorset and Poole, Magistrate Members and Independent members. Consequently, chairing the authority required a deft touch (that's code for 'herding cats') and this required a huge amount of consultation by Mike to ensure that he was able to take into account the wide range of views of his Members. Councillor John Lofts was Mike's Vice Chair for something like 9 years and John was succeeded as Vice Chair by Colonel Geoff Brierley, both of whom are also here today. I know how much Mike valued his regular Sunday morning call from John Lofts, which was never shorter than an hour and inevitably began with John's usual greeting, "Hello, it's me".

As Chairman of the Authority Mike had a huge range of duties and responsibilities for what was an unpaid, part time role. Consequently, he had to put enormous trust in the support provided by the very small number of staff in the Police Authority office. This was particularly so in respect of the Clerk to the Police Authority Peter Harvey and Peter's successor, the Authority's Chief Executive, Martin Goscomb. I know how much Mike valued and respected both Peter and Martin and during my time working alongside Mike he regularly spoke of them both in the warmest of terms.

I first met Mike in 2002 at which time I was the Deputy Chief Constable for Gloucestershire. The occasion was a meeting of the five Chief Constables and five Police Authority chairs for the South West of England, which were always a joy! At that time, three of the five police authority chairs in the South West were former Brigadiers and I recall thinking at the time that Mike clearly understood that the Crown had been on his hat and not on his head. In my experience Mike had absolutely no airs and graces. He personified what it means to be a servant of the public, never putting himself first. All that he ever wanted was what was best for the public, which meant that both the Police Authority and the Force had to succeed, not by any means but by the proper means.

As the police collaboration agenda came to the fore, Mike had to attend many regional and national collaboration meetings, often in the company of his Chief Executive, Martin Goscomb. Mike always preferred to do the driving and these longer trips around the country were always a good opportunity for Martin to brief Mike fully on the meeting agenda and for the two of them to discuss the full range of police authority matters.

At this particular meeting some enormously challenging and weighty issues had been raised, which Mike and Martin continued to discuss in the car on their way back home. Mike joined the M5 at junction 12 as usual and so immersed were they in their discussion that it wasn't until they reached the outskirts of Birmingham that they realised they had been travelling north instead of south!

Mike had an acute understanding of the types of issue that might attract the unwanted attentions of the Home Office and he had a nose for any issue that might have been described by the Civil Service as either 'novel or contentious'. As a consequence, there was many

an occasion when Mike was able to steer the Police Authority and the Force away from what might otherwise have been choppy waters. Mike was also very conscious of his personal responsibility to maintain the dignity and decorum of his role as Chairman, which was not always easy.

For example, on one occasion Mike went to a Home Office conference at a hotel at Gatwick Airport with the then Deputy Chief Constable, George Pothecary. During one of the breaks George left the conference room and headed for the toilets, closely followed by Mike. In his haste George "misread" the sign on the toilet door and they found themselves in the ladies loo. George thought it strange that there were no urinals but even then the penny didn't drop (as it were), he simply put it down to the fact that they were in an upmarket hotel. As our two heroes headed for the cubicles they only realised their mistake when they heard female voices coming in behind them! They then had to hide like naughty schoolboys in a cubicle until they thought the coast was clear, emerging gingerly as the clatter of high heels receded so that they could head back to the conference. George's defence is that the outline figure on the door to denote gender was wearing a mini skirt which was hardly visible!

Now, you can imagine Mike's blushes at such an incident and his relief at not being rumbled by the Daily Mail (because we all know how much Mike loved being in the media - not!). Around that time there were a number of 'celebrity' Police Authority chairs, which Mike absolutely abhorred, far preferring the outcomes achieved by the Force and the Authority to speak for themselves.

So, once is accidental but twice is looking accident-prone because it wasn't long before there was another incident that would have been of huge interest to the tabloid press! This occurred at The Association of Police Authorities annual conference in Belfast, which Mike attended along with Captain John Lofts (Vice-Chair), Peter Harvey (Clerk) and Martin Goscomb (Policy Officer).

Accommodation at the Conference hotel was fully booked and so it was that the Malmaison Belfast was chosen for the Dorset Police Authority contingent and, better still, Mike was upgraded to a superior room (at no extra charge to the public purse).

On arrival at the hotel Mike's suspicions should have been aroused by the strange dark decor and the dim lighting, not to mention the somewhat erotic imagery and effects around the hotel. All became clear when Mike's upgrade transpired to be the Hotel's Honeymoon Suite with a number of unexpected extras! Consistent with the hotel's style and ambiance, these 'extras' included a bed of enormous proportions, a double bath and Jacuzzi, a double walk-in shower, two televisions viewable from the lounge and the bed, complete with a shelf displaying a wide selection of pornographic videos ... all accompanied by more than ample supplies of free condoms should these be needed! Mike greatly enjoyed giving his Authority colleagues a guided tour of the facilities and it is down to their enormous discretion that we only discover this now!

However, as anyone who knew Mike will know, he was actually a very private person who loved his family and his cats and I always felt it a great honour when he shared some personal glimpses from his earlier life, one or two of which I feel able to share!

For example, I think it was in a school report that it was reported that "Taylor will do everything possible to avoid physical exertion!". Mike once told me about the medical that he underwent when on first joining the armed services, during which it became clear to the Medical Officer that Mike was colour blind – not great if you're a signaller! However, it was in a different age and the officer clearly saw some potential in Mike, asking him such questions as "What colour is this blue wire". Inevitably, Mike passed his medical and the rest is history!

Mike also told me about an incident involving "The h'occurrence book". As a young officer Mike had gone out into the town in his small sports car and one thing led to another, which resulted in him having far too much to drink. The next thing he could recall was waking up in his bed back at camp with very little memory of the night before. He quickly looked out of the curtains only to see his car parked neatly back in its space. Mike realised that neither he nor his car could have got back to the camp without some assistance and that there must have been some kind of outside intervention which may have led to the making of a record in the camp's occurrence book.

Being a man of great integrity Mike was ready to face the music and went to the guard room where he saw the duty Sergeant. In his inimitable fashion Mike cleared his throat and said, "Er, sergeant, I believe there may have been an occurrence last evening in which I may have been involved….". The Sergeant opened the said occurrence book and carefully ran his finger down the page for the previous 24 hours, finally proclaiming, "I have examined the h'occurrence book sir and I can find no record of any h'occurrence, so there cannot have been an h'occurrence as it would have been recorded in the h'occurrence book". A knowing look passed between the two men. Mike quickly cottoned on, stood to attention, said, "Thank you very much Sergeant, I understand!" and marched smartly out of the guard room with a huge sigh of relief!

All of this illustrates Mike's very well developed sense of humour and there were many occasions when his sense of humour was sorely tested. One such example was the occasion on which a wheel literally fell off a police van, following which it was discovered that the vehicle had no MOT! Jane Stichbury was Chief Constable at the time and as you can imagine the whole issue was liberally reported in the Dorset Echo. Thankfully, Mike was his usual calm self and after asking a number of well-considered and probing questions he took the long view and the furore soon subsided. With the healing balm of time this incident subsequently became something of a standing joke with Mike regularly commenting that "at least the wheel hasn't come off"! Like many of us here today, Jane greatly valued Mike's sense of perspective and his reassuring words and we shall all miss his wise counsel that we have been so fortunate to experience over the years.

At times like this the question of legacy arises, the first and most important of which must be Mike's family of whom he was immensely proud. His lifelong service to the public was simply breathtaking – in the armed forces, through the Police Authority and as a member of the Immigration Appeals Tribunal and the Solicitors Disciplinary Tribunal.

It is through his membership and leadership of the Police Authority that we can quantify some of his legacy – 15 consecutive years of crime reduction, not one unsolved homicide, significant reductions in anti-social behaviour and road casualties and the highest levels of public confidence of any police force in England and Wales. Mike's enormous contribution in ensuring that the Force had the resources it needed and experienced the scrutiny that it required was central to the joint endeavour between the Police Authority and the Force. And when Mike handed over the mantle of police governance to the PCC he did so as seamlessly as possible and I know that Martyn Underhill greatly appreciated his support.

I will personally remember Mike both for his positive scrutiny and his unswerving support when the chips were down – during a nine year murder investigation that cost a small fortune but it was the right thing to do, during the preparations for and delivery of the Olympic security operation and during a period of unprecedented cuts that had a huge impact of staff.

Mike was our dedicated and true friend, a man of the utmost integrity, someone who understood the true nature of duty. We will all remember him and we are all devastated by his untimely passing.

The New Director RSI

Lieutenant Colonel (Retired) Phil Osment has now assumed post as the Director of the Royal Signals Institution vice Nigel Harrison, the appointment having been retitled to reflect the increasing role of the RSI in Corps affairs. Phil is a history graduate of Manchester University, where he served in the Officers Training Corps. After six years in the TA, he enlisted in the Regular Army, was commissioned in 1984 and joined No 1 Troop Commanders Course at Blandford. He had regimental and staff tours in BAOR and Cyprus as well as operational deployments to Bosnia, Iraq and Kosovo. He finished his service last year after back to back tours as a Defence Attaché in the Balkans, based in Vienna and Skopje, and loan service with the Bosnia Hercegovina Army. Fluent in Serbo-Croat and German, he is an Army hockey player and still plays in goal for Salisbury hockey club. He is looking forward to the challenge of steering the RSI through what will be undoubtedly be 'interesting' times ahead and is grateful for this opportunity to serve on in a capacity that will look after the interests of the wider Corps 3R family; the Regular, Reservist and Retired members.

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Royal Signals Association – Phone 01258 482090 or e-mail rsa@royalsignals.org