



RUSI

## Is NEC Dead?

### An Analysis of Industry's Perspective on the UK's NEC Programme

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## FOREWORD

Officials within the Ministry of Defence (MoD) have recently expressed surprise at rumours from industry partners that its Network Enabled Capability (NEC) programme was 'dead'.

This paper aims to review Industry's views on the state of the NEC programme. It will highlight the concerns that might underpin these rumours and assess whether or not it is, indeed 'dead'. This is by no means an exhaustive analysis. However, contributions to this paper have been drawn from across the community which supports C4ISTAR<sup>1</sup> including representatives of primes, sub-contractors, Small to Medium Enterprises (SMEs)<sup>2</sup>, consultants and academics. All contributions are presented without attribution, explanation or bias. The paper is not designed to be merely a list of complaints; all contributors accept that the MoD is currently working within severe budgetary and operational constraints. Instead, the paper examines areas of concern and puts forward proposals to remedy the situation in order that NEC may be more successfully moved forward.

### *Methodology*

The report opens with the question 'Is NEC dead?' This section forms a brief introduction to the project and the subsequent sections. The paper focuses on six areas:

- Structure of both within the Ministry of Defence and the defence industry;
- NEC Architecture of coherence of C4ISTAR programmes and system structure;

- Finance of affordability of the NEC programme;
- Acquisition;
- People and training;

The paper finishes with a short summary and a list of recommendations.

It is hoped that the issues raised in this paper will help to prime discussions within the sector. Some of the issues were discussed at the RUSI C4ISTAR conference on 17 and 18 October 2007 and a number of solutions were put forward by the MoD.

Feedback to this paper is welcome. Please contact Elizabeth Quintana at [elizabethq@rusi.org](mailto:elizabethq@rusi.org).

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<sup>1</sup> Command, Control, Communications, Computers, Intelligence, Surveillance, Target Acquisition and Reconnaissance

<sup>2</sup> Small to Medium Enterprises are termed here as those numbering fifty employees or fewer

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### A) Structure

#### *MoD Structure*

A large majority of participants thought that the Ministry of Defence was not effectively structured to manage NEC. Without a formal enterprise architecture, a senior Chief Information Officer (CIO) and an associated NEC organization to oversee its implementation, NEC would inevitably fall victim to other pressures within an overcrowded Defence Equipment Plan (EP). The nomination of Lieutenant General Andrew Figgures, Deputy Chief of Defence Staff (Equipment Capability) as the NEC Senior Responsible Owner was a good step towards managing the process, but he is also required to look after the rest of the United Kingdom's (UK) equipment capability and therefore cannot devote his time fully to NEC. Regarding implementation of NEC standards, the Integration Authority has had some success in moving Integrated Project Teams (IPTs) towards a systems engineering approach but has not, until recently, been considered to be sufficiently rigorous in ensuring coherence across all programmes.

Industry believes that a lingering Single Service mindset pervades the EP and it is this that drives the need for a CIO. The different rates of NEC development within each of the different services and the priorities of individual services for service-specific platforms are hindering programmes such as Dabinett that would otherwise enable the joint effort. The fragmented approach to the acquisition and use of UAVs<sup>3</sup> epitomizes the service divides in this area. The more cynical participants expressed doubts that the Single Service Chiefs of Staff were fully signed up to a joint NEC concept, bearing in mind the current financial constraints and looming personnel shortages. This was not a widely held view.

Contributors contend that there are too many scrutinizers who are able to criticize or stop a programme's implementation. Even when a solution exists and has support by decision-makers, it still has to be checked against numerous case studies to ensure that it addresses the broadest range of objectives. This process is counterproductive as the future strategic environment will inevitably be unpredictable,

making much of this effort redundant. Industry commented that the armed forces are very good at adapting existing equipment to new environments.

#### *Industry Structure*

The primary challenge within the C4ISTAR sector is how to maintain such a large and diverse community with so few contracts on the horizon. Some of the traditional defence primes have already begun to look to other markets and there will inevitably be fewer players. The MoD does not appear to be too concerned about rationalisation at present but it will be another matter if major IT<sup>4</sup> organizations leave the defence C4ISTAR sector. It has been suggested that the sector would work better if it was divided up, however industry felt the NEC integration challenges are great enough without introducing further divisions.

The UK's NEC programme is currently riddled with stovepiped systems. Competition for contracts offering proprietary solutions will only aggravate this situation. Appropriate collaboration would provide the customer better value for money and would help to speed up acquisition processes. Partnering will be necessary for a larger part of the C4ISTAR sector and those companies that are already well positioned will benefit most. The MoD has already indicated that partnering, particularly for its future core networks, will allow it to rapidly exploit emerging technology. It will however need to be carefully managed and contracting options explored more fully to ensure maximum benefit to both parties. The primary concern across the industry is that organizations outside a winning consortium will be excluded from the project for the duration of the contract. This approach would certainly not benefit the MoD in the long term as it would stifle innovation. The BOWMAN BCIP 6 upgrade programme is cited by SMEs as a welcome solution to the problem. In this case the Prime discussed the upgrade with the whole community in order to find the best solution, rather than rely on existing partners or subcontractors.

#### *SMEs*

The update to the MoD's Defence Industrial Strategy (DIS v2.0) was originally rumoured to

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<sup>3</sup> Unmanned (or Uninhabited) Aerial Vehicles

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<sup>4</sup> Information Technology

favour the SMEs<sup>5</sup>. The agility inherent in small organizations which allows them to quickly deliver niche capabilities under Urgent Operational Requirements (UORs) is very attractive to the MoD. While many accept that SMEs are unlikely to be able to have a big role in the long-term acquisition plan (the time lines and risk associated with traditional defence procurement are unsuitable to many SMEs), their contribution to this sector is important. Generally, the way primes treat SMEs needs to be reviewed. Primes spend a great deal of effort keeping their customers happy whereas suppliers are often mistreated and in some cases have been blamed for problems that had nothing to do with them. When the MoD seeks advice on a specific area, it tends to engage with the primes rather than the SMEs who can often offer better expertise in niche areas<sup>6</sup>. This is understandable as the MoD only has limited capacity to seek advice. What is less excusable is that primes very rarely engage their subcontractors in these discussions, often block access to the MoD and will only involve SMEs in a project once the requirements are about to be set, which is too late. Finally, the paucity of contracts has led large- and medium-scale organizations alike to keep as much business in-house as they can in order to maximize profits. The end-product will always suffer. In summary, SMEs should be properly recognized for their ability to allow primes to advise intelligently and ultimately to win contracts.

In the United States (US), a percentage of research and procurement contracts are awarded to SMEs. Most of the contracts are relatively small but in 2001, Arrowhead Global Solutions won a \$21 billion US Department of Defense (DoD) contract<sup>7</sup> for a satellite system with traditional primes playing a supporting role. The company's success and subsequent expansion means it no longer falls under the SME category but it proves that the scheme can work. This suggestion was dismissed by the more established players as it would run counter to the

rules of fair competition. But although the MoD commercial policy group states that it is not there to prop up companies<sup>8</sup>, DIS clearly proposes special treatment for certain sectors. Some of the smaller contractors believe that the C4ISTAR sector would benefit substantially from this scheme.

### *Improving Working Relationships*

The US defence community has also adopted a new incentive-based scheme where a portion, say 50 per cent, of the contract is given to the contractor /subcontractor on completion of the project and the remaining 50 per cent is awarded in increments as the project progresses, pending the contractor's ability to meet certain criteria set by the customer. These criteria can include helpfulness, trust, working relationships, innovation, etc. They are generally based on softer issues and have been shown to improve working practice along with the chances of project completion. A similar scheme could be adopted by both MoD and primes to encourage a closer working relationship with their respective suppliers.

## B) NEC Architecture

Industry believes the UK NEC programme currently lacks a coherent, detailed and overarching structure. This is one of industry's biggest concerns. There is a lack of clarity within the MoD concerning the implications of NEC. Without more direction on the NEC roadmap and an empowered body to enforce standards across IPTs, participants are worried that equipment will continue to be stovepiped and that NEC integration will become increasingly difficult.

### *Information Management*

Following a series of recent UORs, the UK armed forces are now well-equipped with ISTAR collection assets. These have provided quick wins for deployed forces but the overarching information management (IM) layer has to be prioritized for NEC to be properly realized. While the importance of IM has been recognized by the MoD, industry believes that it is not being taken sufficiently seriously. The Reaper<sup>9</sup> programme, for example has already diverted a

<sup>5</sup> Lord Drayson's recent departure from the MoD may reduce the drive for transparency across the supply chain

<sup>6</sup> Even without this, it can be very difficult for SMEs to engage with the MoD simply because they do not have the time or resources to understand the MoD structure. Furthermore changes in MoD personnel can mean the hard work of getting their name known to an IPT or within a particular sector has to be reinitiated every two years.

<sup>7</sup> The contract was awarded by the Defense Information System Agency for Defence Information System Network (DISN) Satellite Transmission Service-Global (DSTS-G)

<sup>8</sup> Defence Industrial Strategy, page 1

<sup>9</sup> Reaper is the UK programme which has acquired 3 Predator B UAVs. There has been talk of extending the total number of UAVs to 9.

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large chunk of money away from the Dabinett<sup>10</sup> programme. In addition, industry is sceptical about the recent move to divide the Dabinett programme into four sub-contracts, leaving MoD as the integrator. The Lead Systems Integrator for the US-equivalent programme almost broke its back over this contract. The integration aspect is notoriously difficult to achieve and industry are concerned that MoD is taking on too much. There must be more analysis to understand properly the information each platform needs to share with other platforms (its key and/or unique contributions to the force mix), and what information each platform needs in turn from other platforms (what it needs to fulfill its role within the force mix). In addition to the issue of IM software, industry indicates that there should be more training at the tactical level so that operators understand that spending a little more time managing their information will benefit the next user down the line.

### *Information Security*

For years, the integration of the various UK information systems has been resisted. Now, as forces strive to communicate and work with multiple systems (UK, NATO and coalition) and multiple caveats, officials are focusing on easing the burden at the front line. The current air gaps between systems in theatre cause extra work and add to the risk of data corruption as information is transferred manually between systems. Some participants proposed that ensuring the right people have all the information they need should be considered to be part of a senior officer's duty of care. Adoption of this principle would certainly force a rethinking of traditional views of information sharing. Secure, partitioned systems are already in use for other sectors (eg financial) and could very easily be adapted for the military. Recent advances in cryptography would further enhance the security of such systems.

### *Integrating the weapons*

Although the UK military speak about ISTAR<sup>11</sup> and not ISR,<sup>12</sup> participants felt target acquisition was not being properly addressed. As a result, the end-to-end aspect of the effects-based

approach is not being fully developed. One of the key drivers of NEC is the potential for the better prosecution of targets through collaboration of battlespace actors.<sup>13</sup>

### **C) Finance**

Funding for NEC was highlighted by participants as one of the greatest hurdles to its implementation. Oddly, when asked directly if there was enough money to implement NEC, most responded 'yes' however, the programme needs careful management. If the benefits of NEC are clearly identified and delivered through a coherent approach, contributors see no problem with achieving the aspirations of JSP 777.<sup>14</sup> It will, however, take time and will need a core team to minimise changes in requirements (and the potential for spiraling costs). It may also mean re-prioritizing programmes so that money is available for the more important issues of integration being the biggest priority and terminating programmes that are significantly late rather than extending funding and timescales. As the MoD's finances are tight over the next few years, there is an incentive for companies to keep existing contracts going to sustain income streams that are barely sufficient to meet very tough targets. This has been cited as one of the reasons why NITWORKS and other collaborative projects are unlikely to produce the results that the MoD desires.

More positively, NEC has the potential to save the MoD money in the long term, particularly in logistics. If these benefits were articulated clearly, it would be relatively simple to obtain the necessary funding, as the US Army and US Marine Corps have done. Their analysis of the financial benefits gained by new systems more than justified the costs, even though these were initially very high. Indeed, data provided by the Through Life Capability Management (TLCM)

<sup>10</sup> Dabinett is designed to provide a deep and persistent ISTAR capability to UK forces. It is however, seen as the primary programme for NEC integration.

<sup>11</sup> ISTAR stands for Intelligence Surveillance Target Acquisition and Reconnaissance

<sup>12</sup> ISR stands for Intelligence, Surveillance and Reconnaissance

<sup>13</sup> Some confuse weapons integration into the network with automatic-fired weaponry. Currently, the only reason to opt for automation would be in the maritime environment, where the reaction times needed for ship protection are very short. In urban operations, a terrorist group looks and acts very much like a CNN team of 3 people with equipment in a car, driving erratically - this means, for the foreseeable future, there will always be a human in the loop

<sup>14</sup> JSP 777 is the Joint Services Publication 777 of Network Enabled Capability. It was developed by the Joint Doctrine and Concepts Centre (now Development Concepts and Doctrine Centre or DCDC) and is the UK MoD's definitive doctrine on NEC

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initiative should help capability managers to develop business cases for these systems.

### D) Acquisition

There has been a tendency within the MoD procurement community to over-specify what the solution should be. Many in the Ministry already recognize that they do not have the manpower or the expertise for this and that it slows the acquisition process. Participants emphasized the need for the MoD to trust their experts to provide the best solution and to continue to work closer together.

*Through Life Capability Management (TLCM)*  
TLCM and NEC should go together, as they will both provide structure to the whole equipment procurement process. TLCM also has the potential to significantly improve NEC in the UK, particularly if systems are procured that have growth potential and are easily maintained. The ability to measure, compare and adopt new practices will have a huge impact on current procurement decisions and in the supply chain. It also offers the opportunity to consider disposing of systems with a limited future at an early stage and to replace them with ones that will match platform capability growth into the future. Participants feel that the mechanisms of TLCM are poorly understood. There need to be improved methods and metrics for assessing when capability has been delivered, benefits realized and changes implemented. TLCM will need to include definition of overall capability, how it is responding to changing threats, how cost effective it is and, therefore, what capability will be required for the future to sustain operational effectiveness. An enterprise architecture will help TLCM of C4ISTAR assets for NEC.

### *Urgent Operational Requirements (UORs)*

*"For Operation TELIC 1, there was a requirement to put in place new infrastructure, information services, computing and telecommunications to support operations, operational planning, intelligence and logistic activities. Some of the equipment delivered was an extension of existing capability but much of it was new. The UORs were in excess of £20m, procured very quickly and deployed straight into the field to support Contingent and Component Headquarters and down to Deployed Operating Bases, Brigade Headquarters as*

*well maritime platforms. Unfortunately, the benefits of these systems were impaired by a lack of time to train with the systems. It is estimated that only 25-35% of the capability was exploited. While even this increase in capability made a significant difference and did enhance situational awareness, it fell far short of an NEC baseline."*

This anecdote encapsulates the benefits and problems of UORs. Over the last five years, UORs have brought many improvements by introducing planned capability early and have caused problems where the introduction of a basic capability has prevented the introduction of a full capability. There are a number of reasons for the latter: some systems provided reasonable capability (the 80% solution), and in some cases, the capability was fitted on systems that will be handed back after the conflict.

Industry generally considers UORs to be too short term. Insufficient attention is given to the other Defence Lines of Development and they will inevitably introduce additional costs after the end of the operations for which they are specifically acquired & currently approaching £600 million for C4ISTAR assets alone. There is, needless to say, also concern that the money spent on UORs will directly or indirectly affect the budget for the EP.

### *Speeding up C4ISTAR Acquisition*

Unsurprisingly, most participants thought that an increase in funding was the answer. But speeding up acquisition will also require the MoD to accept greater risk. All government departments tend towards a deliberate approach, but long procurement timelines add to the overall cost of the equipment, negating the benefits of scrutiny. Industry pointed out that improved problem scoping at the outset and an adoption of analytical tools & metrics would allow the MoD to procure more intelligently. Without a common data set, it is very difficult to promote best practice or identify and address projects that are in trouble. Participants also proposed that a wider UK framework to help industry advise MOD on end-to-end NEC capability would help to speed up some of the decision-making for the MoD.

In addition, industry stressed the need for rapid prototyping. As one contributor pointed out, one of the benefits of UORs is that their shelf life is

more in line with that of the commercial CIS<sup>15</sup> industry. There has been some attempt to make the UOR acquisition process more workable. The MoD is now developing Operational Capability Demonstrators (OCDs) and Concept Capability Demonstrators (CCDs) which introduce early versions of core programmes into theatre. These will help to reduce risk on the projects and allow operators to test, and learn to utilize, a basic capability ahead of in-service dates. The programmes also allow some of the other Defence Lines of Development to be addressed.

Several contributors suggested that competition is not always the smartest way to procure, especially if a system has already been procured and has been proven to work.

Finally, industry believes that the MoD also needs to be serious about early disposal of equipment. The C4ISTAR sector moves too fast to think in terms of 25-30 years. There is a real incentive to buy rapidly if equipment is only going to last five years!

### **E) People and Training**

#### *People*

The biennial change of personnel within MoD is seen by many in industry as a hindrance to the delivery of NEC because there is a lack of stability in senior management. Large-scale change programmes typically depend on strong personalities to push them forward. An Enterprise Architecture programme, built on a similar scale to the NEC programme, within a large private firm, would typically take two to three years to implement. But in the MoD, a complete change of almost all the one-star general officers will have occurred within three years. This rapid turnover of all senior managers means that expertise and momentum is often lost. Delays are inevitable as new managers are familiarised with programmes and/or take different approaches to the same problem. Others dismissed this argument, pointing out that short-term assignments often mean more is achieved in the same time frame, provided there is adequate support and direction from managers. The recent formation of an acquisition stream within the Ministry of Defence, which allows servicemen to advance their careers within the acquisition community, has led to a growing number of

personnel with the right acquisition expertise. A similar scheme adopted for the C4ISTAR sector would allow greater continuity within the programme and the development of staff expertise. This idea is gaining traction within the MoD.

#### *Training & Doctrine*

Industry highlighted a serious lack of training with C4ISTAR assets, partly due to historical reasons, but increasingly driven by the high operational tempo. This is counter-productive, as it hinders the exploitation of assets in theatre. In addition, the armed forces are now beginning to lose a great proportion of the knowledgeable engineers and technicians that provide this service at formation level as personnel leave the services. Information management, which is at the heart of NEC, is particularly dependent on skills retention. This is one skill that the MoD cannot afford to lose at a time when operations and job cuts mean mounting pressures. Given that operations in Afghanistan look to extend to the mid-term, it would be prudent to expand on-the-job training initiatives using online resources and contractors or independent experts (both during pre-deployment training and in-theatre), to enhance the benefit of equipment bought through the Urgent Operational Requirement (UOR) process.

Industry also asserted that doctrine and concepts were being developed too late, often only after equipment had been in theatre for a number of months. More could be made of the platforms if their use had been thought through before deployment. Tactics, Training and Procedures (TTPs) will always evolve with use and with the changing environment but commanders would benefit from better guidelines at the outset.

#### *Acquiring and Developing Expertise*

Industry has estimated MoD/Intelligence services short of 400 image analysts and this situation will only be aggravated as ISTAR assets increase. Owing to the time needed to properly train an image analyst, if the MoD does not deal with the problem in the next twelve months, the next five years of data will simply not be processed and intelligence will be lost. Some of the problems could be resolved by centralizing the management of analysts and allocating the existing expertise to departments on demand. Others indicated that automatic recognition tools would be essential to help handle the ever-increasing amount of imagery.

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<sup>15</sup> Communications and Information Systems

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This is just one example of the impact that NEC can and will have on the staffing structures within the MoD. As the equipment becomes more technical, industry wondered if the services will be able to recruit, train and retain the right people?

To meet this demand, the MoD is currently investing in the education of future young officers through a variety of schemes, including bursaries for university courses in science and engineering and the Welbeck Sixth Form College. However, in-service training and education has fallen away. This is particularly true for officers without formal science or engineering backgrounds and is preventing some very talented individuals from contributing to the area. Interestingly, around 50 per cent of all Chief Information Officers and Chief Technology Officers in private companies do not have a scientific background. It seems it is just as if not more important to understand the market economy and have a good business sense in those positions. Given the pace of change within the IT sector, it is difficult to understand why in-service education is being squeezed. The command staff courses have cut science training from three months to two weeks and mid-career breaks to study an MSc are rare across the services, compared with those taking an MA in international relations or military sciences. In addition, ex-serving personnel with specialist skills in, for example, engineering or the intelligence corps, felt they had not been empowered to take senior positions that would have maximized the use of their skills.

In response, industry suggested increasing the number of embedded industrial specialists within the MoD and expanding the Career Partners scheme, which allows service personnel to spend a year with an industry partner.

### Summary - Is NEC Dead?

The vast majority of interviewees said no. The move to digitization of the armed forces and, by extension, the battlespace, is inevitable given the potential advances in capability and the inherently digital nature of Western society. The benefits of digitization are already visible in all branches of the armed forces and there would be many more advantages in terms of cost savings and improved capability in the future.

Equally, contributors believe NEC is central to today's Counter-insurgency (COIN) operations. While NEC was sold on its benefits for high intensity operations, the best NEC campaign to date was Northern Ireland. A complex series of networked collectors allowed the military to track all police officers and known terrorists, take troops off the streets and remain in overwatch. But it took fifteen years to put everything in place. It will therefore be important for the MoD to develop suitable C4ISTAR force packages which can be rapidly deployed to future small, medium and high intensity operations. Different kinds of C4ISTAR force packages would also be needed to account for urban and under-developed environments.

Industry claimed there was no common understanding within the MoD of what NEC actually is, and how it should affect the various acquisition programmes. A similar problem afflicts the C4ISTAR industry and the solutions they provide. This is aggravated by sketchy details regarding the MoD's short- to mid-term objectives for the key NEC programmes. Industry needs to be able to properly plan and develop products accordingly. Without this, their Return on Investment (ROI) will remain low and it will be increasingly difficult for some to continue to offer products in this sector.

Those who did argue that NEC was 'dead' contended that there was overemphasis on equipment. The programme needed redefining or perhaps refocusing so that all Defence Lines of Development and their impact on the overall military capability were properly balanced. People, training and doctrine need particular attention.

The author asked if the MoD should pare back on its aspirations for NEC. Just over half the participants rejected this suggestion. A few others asserted that current aspirations for NEC did not go far enough. They maintained that if the UK wants to continue to work with the US and remain in the top division militarily, nothing in the current programme could be omitted. Failing to continue with the current plan could mean that UK forces would be reduced to playing a secondary role in theatre or borrowing US equipment in order to maintain interoperability. The latter solution would be

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problematic owing to the ITAR<sup>16</sup> and would also kill off any domestic industry in this sector.

Some thought the UK's NEC programme was too ambitious given the cultural impediments (stovepiped structure and fixed ways of thinking) within the MoD. Others thought that the desire to be interoperable with US forces was compelling the MoD to commit to an unrealistic procurement plan. They pointed to Europe, where a number of countries have opted for a simpler structure and are already further down the road towards NEC than the UK. In particular, the French have taken a more pragmatic approach to interoperability, opting to buy equipment from overseas where it would help increase interoperability with key allies and sourcing the rest from its national industry. Finally, some suggested that the MoD's commitment to UK industry is creating unnecessary hurdles. Deploying UK-specific equipment requires more negotiation on standards with allies and work-arounds in theatre, all of which slows down the acquisition process. In addition, UK crypto is very expensive.

A number of participants recognized that supporting industry would also need to change to better integrate SMEs and improve collaboration amongst competitors. But a few observed that NEC may soon be 'dead' as far as their organization was concerned, citing insufficient money and stability in decision-making timelines to keep them in the market long-term. Other contractors said that they were struggling to meet the expectations of their work force and to satisfy their shareholders. Time lines for winning and delivering defence contracts were too long compared with other sectors and defence contracts had diminishing returns. All stressed the need for solid commitments to contracts along all three axes: finances, timelines and specifications/ capabilities in order to maintain the current market.

In summary, NEC as a concept is achievable if the capability (and the capability road map) is carefully defined, if acquisition is sufficiently agile to respond to advances in the commercial sector and if appropriate balance is given to all Defence Lines of Development.

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<sup>16</sup> ITAR is the US International Traffic of Arms Regulation and covers the export and import of defence-related equipment