INTRODUCTION

When Peter Starkey asked me if I would be willing to give the Ronnie Shephard Memorial talk, I asked him what would be an appropriate subject.

I ventured the idea that something topical might be appropriate and after a short chat, we came up with a short list of three

- First, there is the recently published report on the UK's involvement in the Iraq War produced by Sir John Chilcot that includes an examination of the role of analysis in the decision making. The report is critical of both analysts and the quality of analysis leading up to UK's participation in the invasion.
- Then, there is the question of the analysis of Vote Leave campaign proposals and the claimed benefits, or otherwise, of UK's membership of the EU that surfaced during the recent referendum campaign, Or,
- Perhaps even more topical, how it was that Wales, with a population of 3 million people, produced a soccer team that progressed further in last month's Euro football tournament than England with its larger population of 53 million and so much more money.

With a choice like that, you will not be surprised that I have chosen an alternative subject.

I have a long standing interest in - *what makes analysis valuable?*

In tackling that issue there is the central point: <u>What makes a good analyst?</u>

<u>I have come up with 4 characteristics</u> that I believe are important in an analyst. They are not whether an analyst is numerate or can manipulate a computer or develop a model. I mean those characteristics that are needed to make a contribution to a decision through their analysis efforts.

<u>I will list the 4 characteristics at end of my talk</u> but I am going to introduce them by recounting a few examples of analysis that led me to choose those 4. Some of the examples show successes but others

illustrate problems, even failures. Failures often offer as much insight as success.

SWINGFIRE

My first example goes back quite a few years and concerns SWINGFIRE – a British designed and manufactured Anti-Tank Guided Weapon. By today's standards it was a simple system with manual command to line of sight guidance via a wire link and a large warhead and, by the early 1980s, in need of a long overdue update.

It was 1984 and was my first OA project assignment on return to my parent government organization, the Royal Armament Research and Development Establishment, Fort Halstead, after a posting in the USA. In my new role, I had transferred from the directorate in RARDE concerned with the R&D of explosives, warheads and ballistics to the other directorate responsible for guidance, target acquisition, systems design and operational analysis.

The question posed was simple: "Analyse whether it is more cost effective to increase missile hit accuracy or warhead lethality given a limited budget". At that time the Soviet Union was investing heavily in its huge fleet of tanks with emphasis on improvements to armour protection and sighting systems.

As a former member of the warhead directorate, some in the establishment were expecting me to favour lethality but others thought that, now, as a member of the electronics directorate I should be favouring guidance improvements. Although I had access to a whole range of computer models covering guidance, warhead penetration and system designs and so on, I am an experimentalist at heart. Consequently, I decided I would seek what data there was available.

Fortunately, it was in the days when lots of training rounds were fired and I acquired 7 years of SWINGFIRE range trials. I sifted through the data, addressing any inconsistencies, gaps or conflictions. I soon became intrigued that the data that appeared to fall into two distinct groups. One group showed good accuracy, and accuracy at a level that was at an acceptable. On the other hand, the other data group showed much poorer accuracy suggesting improving accuracy was an essential precursor to any warhead upgrade.

I also noticed the two groups of data corresponded closely with certain time periods and then followed the trail to observe that one data group strongly linked to firings by the Royal Artillery and the other to firings by the Royal Armour Corps.

For military operational reasons, the SWINGFIRE system had been switched from the gunners to the tank drivers and then back again. On consulting with my military colleagues they said it was obvious.

The Armoured Corps was focused on guns and although accepting of the decision that some units would be equipped with missiles, they had little interest in supporting or developing the necessary training. The Artillery had a more balanced view, in fact, had grasped the opportunity for a direct fire role, and gave over considerable time to missile training.

Thus my conclusion was simple – invest in training. A conclusion that satisfied neither of the directorates at my establishment, nor, the industrial companies offering solutions.

But the lessons were that analysis of data is fundamental, it can offer different conclusions from those you expect and, above all, the analyst must be remain objective.

ATTACK HELICOPTER

Later, at the end of the 1980s, the British Army was refining its requirement for an Attack Helicopter. This effort was underpinned with a range of System and Operational Analysis studies. At the time, I managed a division that undertook a number of these studies including one examining target acquisition and engagement from helicopters and of helicopters. We had developed a model with a good representation of helicopter and missile flight dynamics, including models of both our own and enemy surveillance assets, using classified intelligence sourced material together with our best representation of terrain.

We had worked closely with the Army Air Corps in the model development and were justifiably proud of our models. We seemed to be obtaining satisfactory results until a visiting analyst said “have you looked at the field trials undertaken by the Defence Operational

Analysis Establishment of helicopter movements in BAOR, West Germany?" So, not wishing to ignore data, we did just that but were crest fallen. Our models were based on a fairly linear representation of the battlefield but DOAE trial clearly showed that no battlefront is flat and there are multiple angles of surveillance owing to terrain and forces being dispersed into units with multiple lines of sight.

Thus, although helicopters even flying in terrain hugging mode may be invisible to forces immediately to the front, they are regularly exposed to forces on the flanks for long enough periods to enable them to be targeted. The lessons here are always to expose your studies to critics – the outcome will always be improved and recognise there may be deficiencies in your models.

The lessons learned were always encourage examination of your assumptions and models – it is to your benefit. And, once again, look for any harder data that may improve or test your analysis.

PTARMIGAN

Coming closer to the present day I was responsible for scrutinizing major project investments in the UK MOD. As part of that responsibility, I was an Approving Authority for OA studies submitted in support of the projects. Such studies were required to show there is "value for money case" for the investment. As a part of showing VFM, the introduction of new equipment should show a demonstrable increase in military battlefield effectiveness coupled with a robust examination of costs.

It was arranged for me to be briefed on a set of studies aimed at demonstrating significant military benefit from procuring a new communications system for Operational Headquarters that would replace the British Army's PTARMIGAN system. Despite excellent guidance available in the literature, the demonstration of the benefit of improvements to Communications Systems is notoriously difficult. So I was not surprised, although disappointed, that the studies did not show much benefit and even the benefits were based on weak assumptions.

Much effort had been expended and although sympathetic to the team of analysts I could not give my approval their study. So I enquired about the wider view of the two systems – its support, both

in manpower and equipment. They indicated they had not looked at this in any detail, so I expressed my surprise. Surely I suggested, "it should be possible to produce a value for money case based around comparison of the cost and manpower". The PTARMIGAN system required 19 truck loads of equipment with a significant investment in manpower to move, set up and operate with the time for establishing a network requiring hours of effort. Whereas the replacement system had 2 trucks together with commensurate reductions in manpower, and networks could be established in tens of minutes.

The lesson here was "don't lose sight of what is important and keep your eyes on the bigger picture". It is all too easy to get pre-occupied with a singular issue and lose sight of what is to the left and right. A really common mistake with analysis.

UAVs and AIRBORNE STAND OFF RADAR

Another analytical effort from the 1980s that influenced my thinking was the UK's evaluation of the military operational use and benefits from Airborne Standoff Radar and Unmanned Air Vehicles for surveillance. Many of the studies involved the use of war gaming to examine how such systems might be employed to best advantage. I managed a large war game at RARDE Fort Halstead that used to run for 2 months at a time with 25 military officers and a large, supporting analysis staff. During this period our scenarios were all centred on the North German Plain and the need to defend the NATO countries against a force advancing from the Soviet Union.

To this day, I remain a great supporter of war gaming but do recognize its limitation including the prospect of the military playing the gaming rules rather than operational realities and that any game structure can have deficiencies. So it was no surprise that the Commander of the RED, the Soviet forces, kept complaining that the information made available from the models of the UAVs and Airborne Stand Off radar enabled the BLUE NATO commander to cause havoc. So we revisited the Command, Control and Communications modeling, realized that our modeling of C3 needed adjustment which alleviated some of the advantage but then the RED commander still complained until he worked out that by advancing his forces from one town to the next in a series of pre-planned moves he could hide much of his force This caused consternation in the BLUE Commander's camp as he then lost his advantage. This toing

and froing between the Red and Blue forces continued for the duration of the study as we tried to refine our representation of the assets and importantly the C3 that stitched them together.

The studies did not offer an unambiguous case either way for the benefit of intruding UAVs and ASR. The study did highlight that the concepts we were trying to evaluate needed more work, most notably in C3 as well as the surveillance technologies. In fact, our analytical models represented a military capability that was not achievable in the mid-1980s. It was only through advances in a number of technical areas in the 80s, 90s and early twenty first century have enabled the benefits of UAVs, UCAVs and Airborne Stand Off systems to match and then jump way ahead of what we attempted to represent in the mid-1980s.

The lessons here are to recognize that any study needs that the representation of technology should match that of the systems under study as closely as possible and not over represent. BUT it is always worth revisiting studies when new and innovative military technology is available. Don't assume that everything will remain the same.

So bringing together the various threads from these examples (and similar experiences on other studies which cannot be covered here in the interests of time) I offer my 4 characteristics that an analyst must have:

- **A focus on key issues – don't lose sight of what is important amidst the confusion. Don't set out with preconceived notions of the answer**
- **Analysts need objectivity and ensure they provide an independent view. Analysis (and analysts) needs testing and challenging. Don't be too proud.**
- **Recognise that circumstances change, especially with regard to technology and how it is used.**
- **Above all analysts should have respect for the data – even if there is little of it. Analysts need to know both its value and its limitations**

DISAPPEARING GUN

To finish on a lighter note I thought I would offer an example of where different analyses can clash, especially when it comes to seeing the big picture.

Eight years ago I was on vacation in New Zealand, touring the Southern Island, spending a couple of days in Dunedin. One of our excursions from the city was to the end of the 20 kilometre long Otago Peninsula that borders a very picturesque bay and to a headland where there is a breeding sanctuary for a colony of Royal Albatross. But, in addition, on the site is a fully restored "Armstrong disappearing gun" and I paid for a guided tour.

Disappearing guns were popular in the late nineteenth and early twentieth century as coastal howitzers that were sunk into a casemate where they could be loaded under cover, then raised to fire with the recoil and counterweight used to bring them rapidly down under cover again making counter artillery fire very difficult.

Around the world few are still in place or in such good condition as this one. The gun emplacement had been carefully situated on a headland offering excellent coverage of the entrance to Otago Bay and clear sightlines for miles North and South along the coast. This gun emplacement was one of a number established to deter military support for the Russian whalers and seal hunters that came to that coast.

During my excellent guided tour I noticed that along one section of the casement's circular wall was a line covering a 30 degree arc and I asked my guide why it was there. He said that although the analysis leading to the positioning of the gun was excellent, other New Zealanders had subsequently analysed the overall dangers in the area, especially the rocks and strong currents near the entry to the bay, which impacted on coastal shipping. Consequently, a lighthouse had been built close to the entrance to the bay and the black line was to remind the military not to fire over that arc as it would destroy the lighthouse.

The lesson, <u>once again, was: keep the big picture in mind!</u>

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