Foreign Affairs, Defence and Trade References Committee	Dr Peter Eichinger
	16 October 2015

Dear Parliamentary Committee Members,

I am writing wrt the following:

FADT References Committee inquiry on the capability of Defence's physical science and engineering (PSE) workforce, with particular reference to:

a. the importance of the PSE workforce to Defence projects;
b. the current PSE capability within Defence, OMO and DSTO;
c. the potential risks of a skills shortage in the PSE workforce and a decline in Defence's PSE capability;
d. the ability of Defence to have relevant PSE capabilities to meet future technological needs;
e. the ability of new technologies discovered by the PSE workforce to be incorporated into Australia's defence capability planning;
f. the effect of project outsourcing on Defence's PSE capability;
g. the ability to attract and retain a highly skilled PSE workforce in Defence, DMO and DSTO; and
h. other related matters.

Australia has undoubtedly already lost science and engineering capability. Part of that is the culture of the DSTO, and the fact that many employees consider themselves above natural justice. Lots of slackers were and still are in the organisation. In some respects management should have the right to select who leaves, rather than have only those who *chose* to leave, or on contracts are let go. For the miniscule time, I was at the DSTO (Edinburgh, SA), I heard many people say to me that they can't get rid of me because it will cost them too much and government policy means they can't force me out.

Firstly, let me say everything I am going to describe has been said before. For example, I developed a method for separating uranium isotopes before and it was sold by the Australian government (Department of Innovation , Industry and Science – I have made numerous complaints to parliamentary figures and ministers to no avail) to China. It is in my opinion ***infinitely*** better than the SILEX method.

The items described in this submissions relating to DSTO publications are taken from ***unclassified*** DSTO documents freely available on the web. The item on management culture is from my own experience and includes that of an acquaintance now living in WA. I have names included in this document and will have a no=names version as well.

I know colleagues who have become part of the DSTO system. They have mostly drifted in more or less straight from university. For them, they have never worked in a different work culture and environment and I hate to say it but some have been indoctrinated with the worst aspects and a sense of entitlement that pervades parts of the public service. For an extremely short time, I had the misfortune of being a contractor at DSTO at Edinburgh. On infrequent occasions, I have looked up and come across papers from the DSTO (In the public domain).

Part of what I am going to say that based on what has been written in the unclassified papers (or at least not written) I am very saddened. I am not sure if my former colleagues have just fallen into a dull stupor based on the toxic Defence force culture, or due to massive budgetary constraints, or a combination of both. It definitely appears that the latter is the case, but there is no imagination or rigor inherent in the work. The reason I say this is simple. I am a chemist with a Ph.D. If I can pull holes in a paper after just a few glances, then a Chemist in the defence area should know better and if it was a "competitor" they would see the "lack" of capability of DSTO based on the omissions and inclusions. You may suggest that the omissions are part of a strategy to mislead our enemies and having worked at a company that was involved in deceptive patenting, the ones who do it are generally those who fool themselves. If you are wishing to sell any IP, then this strategy is counterproductive as it makes the authors look very pedestrian and incapable of identifying important discoveries anyway. A colleague of mine who worked at an agrochemical company, which included a research group regularly "tore apart patents" and publications and they were brilliant at finding holes and potential flaws. In the case of my colleague that allowed the company to market an agrochemical that the patent holder had either missed or had tried to keep hidden. At one company I worked a similar strategy was employed and they were able to invalidate a patent because of its flaws.

Surface Modifications and coatings

Field Guns

Cracks and damage caused by high powered propellants on barrels. I doubt the assessments based on the types of data they are using. They should have an extremely accurate picture of the temperatures in the barrel, and outside and should know exactly the composition of the gases. A basic knowledge of combustion processes is needed and in fact I know in the US some enthusiasts have used Titanium Chromium Nitride (you see the gold coloured coating on some high speed drill bits) using CVD or a very high temp evaporation technique to add the elements. To say nothing can be done is simply not true.

If you contract an outside agency (even a university) you should be able to develop a coating which is highly refractory and with sacrificially react with carbon monoxide and nitrogenous compounds and be applied retroactively to the inside of the barrel. The composition of the metal will affect the strength and reactivity and there will be limits to how much can be achieved.

TATP and DADP Testing

Many years ago there was concern about volatile easily made explosives like TATP used in the infamous London train bombing. TATP (**T**ri**A**cetone **T**ri**P**eroxide) and related compounds are never going to work with a gas chromatography- mass spectrometry (gc/ms) apparatus. I was amazed when a scientist (NAME 1) at DSTO showed me a paper which at first he wasn't certain he could show me. After the briefest of glances I had to laugh. Since when has the DSTO been stamping a publication in the public domain (As I recall from JACS – Journal of the American Chemical Society), published by Dr Graham Cooks from Indiana University (a lifelong friend of Professor John H Bowie, Adel Uni) as SECRET! I think DSTO lost a lot of credibility in my eyes that day! I had already read the article and it was pretty clear that it wasn't going to work. There were a few modifications that could be considered, but realistically they wouldn't be useful at any low level analysis. I haven't seen any "magical" methodology demonstrating a different approach should work. Even LC/MS using ESI or APCI are definitely the wrong technology for low levels of TATP or DATP(closely related compound) for that matter.

You can get down to low levels if you use **C**avity **R**ing **D**own **S**pectroscopy (CRDS) as that provides a light beam which is reflected to give an effective path through the sample of up to 20km. This would require a research grade instrument and use of chemometrics to perform the analysis. While it may be expensive it is not a dedicated tool. It could be adapted to be used remotely to measure various volatile pollutants in real time. Specialised dedicated CRDS have been made for field use to determine greenhouse gases, which have ***stable*** calibrations and thus can be used in the field unattended for a long time (*ie* months). The CRDS could also be used for any number of other explosives, ranging from RDX, TNT or anything in between, and non-explosive volatile residues. In fact, it has been used on TCA (trichloroanisole) found at ppt levels in the headspace of corked wines. I would expect it would be possible to measure simultaneously TCE and other chlorinated compounds, and volatile organic hydrocarbons in air from your remediation sites. This would give real time data. I am surprised that you haven't investigated a THz CRDS since you make a fuss of the work of Prof Tanya Munro, now at Mawson Lakes (UniSA).

Long Term stability of Munitions

This follows from the previous section. I was recently asked by an employment agency (NAME 2) to send them an application to do testing on explosives used in munitions, in particular nitrocellulose. In part I wrote:

"I have already had experience analysing nitrocellulose, although not as a propellant. Many years ago (about 25 years ago) I analysed this using HPLC using one of the first LC instruments commercially available. It was used for the pharmaceutical industry and before it was used in the lab we developed a stability indicating assay, as typically used in the industry. Broadly speaking, we treated nitrocellulose with acidic, basic, photochemical and oxidation conditions aiming to get at least 20% decomposition. The assay had to resolve all decomposition components to be acceptable. This was far more of a challenge then as the detectors and media were considerably inferior to those available today.

Having worked extensively in Analytical Chemistry, let me say I am surprised that DSTO have not chosen to augment HPLC by using DSC-IR (or DSC-MS by coupling a DSC to a MS which I have done) and/or CRDS (cavity ring down spectroscopy). I presume you are measuring water (eg by Karl-Fischer) and metal salts which affect the degradation rate. Within ordinance, the casing material or

primary fuse can react to form metal salts. Depending on the casing material different metals can be chelated to the propellant or explosive and that will affect degradation rates. We encountered similar things for storage of nitrocellulose for the pharmaceutical grade material."

If the explosive is simply in a container, then you could measure the nitrogen oxides using CDRS and that would be a simple non-invasive measure of the stability of the stored material. I find it hard to believe that their approach is any more than a waste of time (and money).

Explosives Test Kits

Any years ago, while I worked at the Chem Centre(WA), I was asked to evaluate a KTECH test kit for "nitro" explosives. I was the "acting" supervisor of the Residues Section at the Chem Centre(WA) – the pay wasn't. We evaluated the test kit with respect to many nitro containing compounds, which we were able to do because we had many analytical standards. We also had many agrochemicals containing the nitro functional group.

I cannot recall who asked for the testing, but it was obvious if we had many samples we would need to know if the tests were sensitive enough and if they showed unacceptable cross reactivity and interferences. As you might expect, the test was subject to interferences. Some perfumes contain nitro moieties so they will cause problems. In addition, some shoe polishes contain nitropropane and thus cause cross reactivity. The same happens with agrochemicals. Fortunately, while there are some problems agrochemicals are, by and large, less volatile and the volatile compounds are not interfering. That's not to say that you couldn't hide an explosive in agrochemical shipments if you knew what to target. And if you see someone with shiny shoes you might be wary and have to do a physical check. Also, the number of nitro containing perfumes is very small and if you have the "nose" you could readily identify the perfume. Fortunately, most nitro containing perfumes are being phased out.

However at the DSTO I was told, noone has evaluated the test kit! I had at the Chem Centre (WA) and was prepared to ask them to supply a copy of the results, but was blankly told NO we didn't! What an absolute MORON. I was asked why would we want to look at anything else (agrochemicals, polish, etc)? They said it was going to be used by Customs as I recall and as they couldn't specify where it was going to be used I found this rather puzzling! If customs finds a shipment of fluazinam it would test positive! This indicates that the people involved must be either incompetent, lazy or plain stupid. So you pick up someone at an airport and take him away because his shoes are nice and clean!!!!! That sounds like a great way to open yourself to lawsuits.

Use of Energetic Binders in Munitions

In a recent publication on the use of energetic polymers (in place of simple binders), the synthesis of polymers derived from a nitropropylene oxide was described by NAME 3. Of itself, you may ask so what? It doesn't say much. However, he bemoaned the fact that they couldn't get a long chained polymer (maximum ~3000). This naturally begs the question of why in a long chained polymer important? Is it purely for the physical properties and its ability to be molded. Is it going to affect

the stability and/or propagation properties? Were they considering “spinning” the polymer, like they do with polyaramid polymers like kevlar?

Is he going to do something more with it? If the polymer of a long chain is so important, then why didn’t he use a better Lewis acid catalyst, or try a different method? He described the use of aluminium chloride, which is hardly expected to be great in this circumstance, as this and boron trifluoride etherate would react with the oxygen present , leading to a high branching ratio and hence short chained products. There are a lot better Lewis acids for these types of compounds. If you have a much longer chained material the properties will change and it will no longer be suitable as a “binder” which is what you claim to be investigating! It would not be as malleable and thus could not be shaped easily either.

Secondly, he doesn’t say much about the effectiveness of this substitution for unreactive binders. There is a great paucity of data in this publication, which doesn’t inspire anyone. For an unclassified document you wouldn’t expect explosive performance or other factors to be published but there are many other things he could have commented on. It suggests a very qualitative/subjective cursory assessment. He has omitted any reference to processing of the polymer to alter its characteristics. Commercial UHMWPE (ultra high molecular weight polyethylene) fibres like Spectra™ are used for body armour and it is much different from (LDPE) polyethylene bottles. Spectra™ a simple polymer is which all of the chains are lined up instead of being in a random scattered “mess”. [This is very basic polymer chemistry – atactic, syndiotactic, etc. are morphological attributes.] This has an effect on many properties of the material. In the case of the explosive, you would expect a dramatic effect on the propagation rate and the energetics of the decomposition. It would affect the temperature of the final explosive and the composition of the products. It would also affect the sensitivity of the material to various shocks. There is no comment on the polymer morphology on stability and thus one can only conclude it wasn’t done or recognised as a factor affecting stability. Whoever has vetted this report doesn’t inspire. If I was a competitor nation, it would not induce fear and trembling!

Defence Site Monitoring and Environmental Remediation

I worked at CERAR which had contracts to do testing on samples being treated from defence sites. This was woeful, but I also hold Defence as having failed on numerous points.

Analytical Chem. and Remediation

If you don’t believe that I have made these claims, then speak to NAME 4, Former Minister NAME 5 and your own Defence Environmental contact at Defences environmental heritage website. If you ask the ORGANISATION MEMBER (NAME 6) he will undoubtedly put an interesting spin on why he left.

I will repeat what I stated in numerous complaints to UniSA, while at NAME 7.

1. The methods were not validated and in no way met even the most primitive level of NATA accreditation. I validated some on arrival although that was impeded by management.

2. The levels of TCE reported where farcical. The standards run on instruments were from 5-50ppb, but they reported to 7500ppb, well outside of the linear range. There was NO evidence of any dilution or any attempt to reanalyse samples to be within the working range. I check all of the data files.

3. I have serious misgivings about the organotin assay, used for remediation at places like Garden Island (Sydney) to degrade organotin compounds originally used as antifouling agents. I have written to the Sydney Council regarding the testing. The total tin is very likely correct, but having performed these assays myself using a gc/aed, the method of extraction using strong acid alone degrades the organotin and leads to incorrect levels of alkyltins. The reported levels become very low if not none existent. It makes the remediation method look extremely good, but the reality may be somewhat different. When they analysed a proficiency standard they purchased, they claimed "the organotin's standard" must have expired or faulty, but didn't investigate their method. The standards are from certified proficiency standard providers who test everything including the life of the product and the organotin standards I observed in the lab were not expired. The reason the labs can't get the right result is because the method is not fit for purpose.

4. Several different methods were used for PAH, and TPH testing, NONE of which were documented. On testing for light hydrocarbons, the students would evaporate a solvent down under vacuum. This particularly depleted the level of low molecular weight hydrocarbons (C8 – C11) giving incorrectly low levels of TPH's.

5. Defence has never sent in "blind" proficiency samples and thus has no way to ascertain that the methods and results being delivered are acceptable for any regulatory process. This should be a part of the due diligence and is routinely done by mining companies when I was at Chem Centre(WA). In the case of foreign companies it was common for a proficiency sample to be sent for analysis "to assist in qualifying" the lab.

6. In no instance has there been an audit of the labs or due diligence by Defence. Internally, I was told we had to supply NATA accredited results. CERAR did not have NATA accreditation. NATA Accreditation, or of ongoing proficiency results or of validation/verification documentation. It is a farce.

7. Please ask the Environmental Remediation at Defence what standards were applied?

> Ask them to specify what was the standard, what legislative document was used and so forth.
>
> What is any actual remediation standards specified in their contracts.
>
> Ask them to specify the actual specific testing level requested, the units and the specific standard that is applied.
>
> What proper auditing was performed and what checks were made.

Management Culture

I went to an interview at DSTO (Edinburgh) several years ago. The FIRST thing I was told I was a liar, by "NAME 8"!

Just because you have morons in the DSTO doesn't mean I have to put up with that bullshit. I stated for example that I used a bomb to make a particular compound. NAME 8, being the complete

moron he is, started I couldn't have and I was lying. I tried to point out that a bomb was a high pressure reaction vessel, but he just wouldn't listen and just was obnoxious. Clearly, had never done synthesis! I said that I had made mustard gas (a synthetic intermediate used to make some of the compounds I made for my studies). It was written in my Ph.D thesis. Again, the "prime moron" called me a liar and clearly had no idea what he was talking about. This clearly shows that he was neither competent no did he bother to check his facts. If you have lying corrupt idiots running the place, it doesn't mean that I (or other) with respect that or are going to put up with it. If you want "fucking cunts" (a term he used for me) running the place believe me you will destroy the reputation and goodwill in place mighty quickly. Foul Culture *esp*. by Management – my experience with "NAME 8 contact NAME !10 (DSTO). By all means contact NAME 10, but be warned there is a lot of very unparliamentary language contained therein and you will have my opinion about what a corrupt toxic organisation it is... And NAME 10, did NOTHING about it. Another piss poor cover up and I still consider I am due an apology for this moron.

My acquaintance, who is a brilliant chemist and has been developing gene tech (on his own) is far less complimentary. He has vowed never to have anything to do with Defence and has developed products that I am certain would be useful, but is flogging them overseas. He has moved into gene tech as he considers it is easy to do. For example, he developed a gene therapy as he calls it based on ideas from a US neurosurgeon in which augments the ability of the body to rebuild levels of ribose and other chemicals important for cell energy and recovery. He has tried it (initially on himself) and as I had been doing a lot of exercise and had data on recovery and km ridden, *etc*., I volunteered. My personal experience (as someone who is almost 60) is that I could easily ride twice as far and recover very quickly. [He did say it would only last a month or so and it could kill me] How many 60 year olds do you know who can go to the gym and ride twice a day for 100mins each time (at Level 6). In addition, my pulse rate dropped from 140 max per session, to <100bpm, at a higher level of effort. He has used this on dogs (I think greyhounds) successfully. Clearly, it would be something that could not be traced. I asked about horses, but didn't get a verbal response – just a smile. It wouldn't be surprised if he managed to place a small wager or two on the outcome.

I believe it could be extremely useful for patients who have heart problems, soldiers who need to be able to recover quickly and even athletes. [Don't be at all surprised if in a few years an unknown athlete suddenly does remarkable times in a long distance event, or Tour de France/Giro d'Italia has a new super athlete.]

I might say he has expressed concerns about gene drives and Crispr as gene methodologies. In the US, a "mad scientist" (funded by a US defence contract) claims to have developed a gene therapy (FunVAX) against religious extremism and religion itself (*i.e.* fundamentalism vaccine). The methodology to validate his ideas is highly questionable and in my opinion deeply flawed. However, it can be made outside of a "proper" lab and the idea of a gene drive is that it is designed to spread across a population. My colleague has done all of his work outside of a "proper" laboratory and has never had difficulty getting anything he needs. I suspect that the quality is comparable to that from a clandestined mixing lab compared to amphetamine made in a *bona fide* synthetic chemistry laboratory.

Strategic capability of Iran and other to make a nuclear bomb using depleted uranium

Preparation for uranium and nuclear effects

I am certain the Iranians have plenty of Fusors and they would not be operating them as the typical mode is described on say the Atlas device (US commercial). You must be aware that Iran has the capability to get tons of deuterium. They have a research grade "heavy water" reactor.

Use of a Fusor to Transmute Elements

[This was in the methods to separate isotopes which the Australian Government, through the Dept. of Science, Innovation, *etc* sold without my permission to China] I haven't performed this experiment. I merely designed it and others have subsequently performed it successfully. It doesn't only produce neutrons, but was envisioned to produce a controlled neutron cascade, as a conventional Fusor only produces a few neutrons and thus isotopic transmutation is too slow.

A fusor is a device which takes hydrogen ions (*e.g.* protium, deuterium or tritium) and accelerating them to at least 200kV and colliding them with a hydrogen gas. A mass spectrometer breaks down molecules in a similar way but using much lower energies, in a process called collision induced decomposition (eg 8kV).] A stream of neutrons are produced (*ca* 3×10^{13} neutrons for deuterium; about 1.5×10^{14} for tritium at 300kV) in the Atlas Fusor. I believe the neutron production from the ANSTO Opal reactor is reported to be about 2×10^{15} neutrons (thermalised). Unlike a conventional Fusor, in my design uranium is placed within a solid matrix of lithium deuteride (or tritiide) to generate neutrons. It is vastly more efficient in terms of producing neutrons and utilisation of deuterium.

The plate is backed with a neutron mirror. When a conventional Fusor design is used, neutrons generated cannot be conveniently focused or used. A neutron mirror can be used, but it is like comparing a laser to an incandescent bulb focussed by a car headlight. In this design the deuterium ion beam is "focussed" onto the plate and can be rastered across the surface, by moving a tray assembly within the vacuum chamber. It has many advantages in that the neutrons are produced in a very close proximity to the material being transmuted. The probability of neutron production is increased very significantly. Now contrary from what your experts may say, it is a simple task to make a multilayered edge-on composite. Indeed, the simplest method involved taking a sheet of material and then coating it with lithium (one of the isotopes) and then exposing it to tritium or deuterium. Lithium reacts with nitrogen to form a bluish gray coating of lithium nitride which is useless, so all of the processes need to be conducted under an inert gas like argon. To get lithium in place talk to an old organic chemist! A simple, but by no means the only way, is to dissolve lithium in liquid ammonia (used in a Birch reduction). Personally, I would recommend making it concentrated so you have lithium as an electride. In low concentration, lithium is solvated and looks blue or purple, but at high concentrations it has a goldish appearance. Lithium can then be easily applied and the solvent (eg liquid ammonia) allowed to evaporate off and trapped. If you do t wrong you will end up with lithium amide. Cut and assemble the elements. Alternatively, you can make a metal foam or a powdered metal/powdered lithium hydride compressed "pellet" a bit like Infra-red plates. I might say you can also use other metal hydrides (in principle) like NiH (used in batteries) or Titanium hydride. However, the titanium hydride will decompose very readily being a thermally labile compound. A massive amount of heat is generated, and can lead to the uranium glowing red hot. This and lattice defects in both the metal and the hydride from neutron production and absorption need to be controlled.

Now having said this, the simple concept can be applied to making an X-ray bomb. Neutrons are absorbed relatively easily because they have no charge and are not repelled by the nucleus. This is a highly simplified version (or to paraphrase former Prime Minister Paul Keating might have said ”the broad brush strokes”)

I informed the local Israeli Embassy that I believe the Iranians have used several Fusors (I don’t think I spelled out the details, but they have probably worked it out themselves). They are using Russian designed Fusor capable of producing a high neutron beam by having an accelerating voltage of 4-600kV, which from memory is slightly higher than commercial instruments from the US produced by Atlas.

Neutron hardened protective gear.

The UK is building neutron hardened suits for soldiers (using a specific boron isotope, fabricated into a neutron absorbing material). How is the Australian defence going to respond! I suppose well pay the Chinese to do it because it is cheaper and they keep the IP! No matter what I can’t see a simple cheap method to enrich boron, but then again, I am sure someone as. (I would use isotopically depleted water – can get tons from the Israelis I’m sure) to make a borate which I would separate. Iran has developed new treatments for uranium poisoning and the US had reportedly been stockpiling uranium therapy agents. There are no approved methods for removing uranium of other heavy metals from the body. Typical treatments like sing EDTA (a common chelating agent) or DTPA (closely related) are quite ineffective.

What is the Defence capability to protect Australia from the affects of an incident involving a nuclear platform. India has nuclear submarines and last year they had a fire in one at dock. Imagine if they were off the Australian coast and were damaged? Who are your go to experts in Defence on these issues??

“Nuclear pumped” X-ray bomb designed.

Think of a rocket nozzle or a shaped explosive and something similar can be achieved with an X-ray bomb. (6-9 months with a decent computer). How the original atomic bomb was designed without use of a computer is mind boggling) My design goal was to generate a “ton” of neutrons and have them collide with an appropriate nucleus that releases excess energy in the form of X-rays. Having a simple explosion leads to a moderate yield of X-rays going everywhere. If you “shape” the X-ray source, you can direct a large proportion in the direct you want. The greatest time is the time to set up the “model” itself. Running different configurations still takes time and unfortunately I don’t have data to validate an X-ray bomb. All I can do is validate against reported yields from a Fusor. The energy can (in principle) be varied by selecting different nuclei. But, not all nuclei emit X-rays as a result of neutron capture and the yields are quite variable. Plus, the cross section for neutron capture varies with isotope and with energy. I looked at one known X-ray emitter and the energies expected and as revealed in a study on a Fusor, show energies of 1 – 4 MeV depending on the transitions and the nuclei involved. It is not shaped like a Vircator or running on the same premise, although I did consider how to use a shaped neutron reflector to do something similar.

Now, all of this is easy. So, please explain how the Iranian enrichment program has been stopped by the US sanctions and the halting of the Uranium centrifuge program? You have experts at the DSTO/ANSTO do you not! Using a Russian high current 600keV Fusor they could have made sufficient fissionable material for at least 1 bomb in 6months.

How are you going to protect assets from a "nuclear pumped" X-ray bomb?

RISKS

GOVERNMENT POLICY OF DUMPING USEFUL GOVERNMENT ASSETS

Several years ago the Australian Government sold off a valuable asset which provided testing of components and "platforms" against vibrations. It may sound simple, but many components fitted to aircraft and submarines need to tested and the new or replacement prototypes and prefabricated components need to be" validated" before installation. When simpletons make the suggestion that cheap off the shelf components are used they generally poo-poo the costs associated with producing, testing and installing them and the fact that while an off the shelf product may have numerous vulnerabilities that are not inherent in a custom made part. CPU's are just one. Consider a rack built for a submarine. Or an avionics platform for an aircraft. The tolerances and stresses are high. While it may be popular to imagine that a pilot is the key component, all parts have to take the same stress – in fact quite often a lot more. In a submarine, part of the requirements are to maintain stealth. If a rack "rattles around" it won't be any good. If the circuitry isn't hardened it may fail prematurely rendering some functions unavailable. The circuitry must be modified to account for stresses eliminated in the expensive custom chip, but now have to be duplicated in a less efficient way! So now where do we send them? Submarine parts go to Spain to get tested. Then that will be more expensive due to long haulage costs and packaging of sensitive components. Then as these are not consumer items, the design requirements will be quite specific. They have to be translated into Spanish. An average translator will have difficulties as they are not engineers or scientists (and probably not have clearances anyway). Furthermore, if the tests show anomalous results, they need to be retested or a modification may be needed. At each stage you have delays and added cost.

And some moronic minister can be guaranteed to complain about cost! You, the government have butchered the process. What happens if the submarine is a Japanese design? Do we send it to Japan, because even if some other country could provide a better and cheaper service, the Japanese or whoever are unlikely to want to have their IP compromised.

There is a joke that basically goes along the lines:

Some workers are given a task and they think it's a load of sh*t. It doesn't work. But as the task is described and made more palatable for the management it gets subtlety changed sh*t becomes "that which promotes growth", until eventually the CEO hears about it and it's described thus: "the workers say it's essential to promote growth of the business". That is the defence bureaucracy and government syncophants.

And as the Australian dollar goes down, the cost of all of these tests and offshore services will rise as they are almost always denominated in a foreign currency. On the positive side, politicians will get more overseas photo-ops (Yes, that is sarcasm!)

Narrow Focus on National Security

On the one hand we treat the US as having all the answers and blindly follow them to whatever conflict they engage in. We have some interests that are localised. However, we have not considered the contingency of a major conflict and the impacts that it will have on us. Australia's actions are likely to bring us into conflict. Putin has moved into Syria and now the Chinese have positioned a boat at a Syrian port. All at the invitation of President Assad and thus perfectly legal under international law. Contrast this with the US and the allies who claim a war on terror but do not have any "invitation" from Syria.

A number of years ago, I wrote online about a nuclear EMP over China. The blog members were on about "nuking" North Korea and beating the drums of war. I had already done an analysis of the effects of an EMP delivered by a specialised nuclear weapon. If Nth Korea felt abandoned by China and under imminent attack, I stated that they could launch and EMP over the China Sea. The strike would have the effect of destroying commerce around the region including China, Taiwan, Japan and South Korea. In effect we (Australia) would have lost capabilities in almost every part of our economy. We would have difficulty communicating with them. The Chinese would have major problems with the population and transporting them. Goods and food sold from China would dry up, and that includes all important items such as technology goods.

If there was a major war, unlike world war 2, we would have nuclear fallout and the oceans would be radioactive as a result of damaged nuclear powered vessels and any nuclear weapons discharged. Even the utilities we use are highly vulnerable.

EMP over China (calculate using "over the horizon" data which in term allows you to detect upper atmospheric water and easily "ionisable" bands used to carry a charged current)

Susceptibility of Australian Utilities to an EMP and to terrorism/arson or deliberate malicious damage.

Dr Daniel Bilusich Complex open systems have a powerpoint presentation on the web listing threats and complex interactions. I think it is flawed and indeed the fact that the DSTO system makes people disgruntled proves that point. If you have managers who can engender such complete disdain and disgust , then you have a perfect way to create people who will not only fight the system, but know how to fight it.

Uranium on air force bases and the risks

I recently went to Mawson Lakes in SA for a lunch near a Subway store. The small shopping mall is near the Edinburgh base, so there are infrequent visits from uniformed defence personnel and DSTO people.

The following paraphrases what I sent to Leon Byner at 5AA radio station: A uniformed person, who I assume came from Edinburgh was talking to a colleague and laughing, tossing around something souvenired from an overseas posting. It was clearly very heavy and small. They knew exactly what it was – depleted uranium from some of the reported 375tons of depleted uranium used in Iraq. It is extremely toxic. I don't care if they have souvenirs but they should be told to keep it sealed otherwise they risk poisoning themselves. I ask him to forward the information to the base. (I didn't tell it on air although I would have been happy to repeat it there!) In Iraq there is a huge increase in Childhood cancers claimed to be from depleted uranium. I might say that in the regional press whom I assume you have monitored, the Iranians (via the Shiite population) have collected lot of Uranium ordinance. I think it could be said this is not purely a humanitarian activity, as they could use the material in their own weapons amongst other things. They can also convert U to soluble forms and pollute water supplies etc.

I rang up the Department of Defence contact number. The lady said I had to contact the base but didn't give me a number! Your website gives NO useful information. If a civilian saw a terrorist walking on site with a shoulder mounted rocket launcher, heaven knows how the public they would pass on the information.

Quantum Chemistry

I have reviewed several publications related to decomposition pathways of explosives. I am sorry but even the most rudimentary assessment shows the Quantum Chem. Calcs., produced by DSTO were utter rubbish. Firstly, the calcs. are for room temperature and for the most part are for the neutral stable species. Guess what! In a bomb the temp. is a lot higher and depending on the explosive. When TATP (used in the London bombings) explodes the blast wave is a lot colder than most nitro explosives for example, but it's still above room temperature! This reflects the amount of energy released. The pressure wave will also be a lot lower as the pressure is a function of the amount of material and the temperature of the products. Many of products formed are not the neutral species! Who did this is either lazy, incompetent, or hasn't been given the relevant information. Does anyone understand what a branching ratio is, or know the differences in different basis sets? Still if they only get to do calcs on a kindergarten computer there is not much they can do. My PC at home is "underspecced", but is still a hexacore processor with 48GB of ram and had several TB of storage, although still better than what Adelaide Uni gives on provides students on the "Aquila or Corvus" supercomputers which they configure as underperforming PC's. I suspect the boss (DSTO) has made very specific demands, but then finds theoretical results don't agree with some undefined experimental result and then says its useless. What you'd expect from "Bill the bullshit artist" and perhaps the culture there! The data would be useless if you want to determine the propagation rate of an explosive through any material , the maximum heat output/temperature or explosive yield. It would do better using simple enthalpy tables. Back to cutting edge 70's chemistry!

If you want to use the calculations to model IR or UV-Vis spectral measurement, then this would not provide any useful information, because you need to choose the appropriate model, know the temperature and the species causing the emissions.

Let's suppose, I wanted to do some damage using safe materials. What could teflon and calcium silicide do and where might I use it?

Concluding Comments:

Inappropriate Staff

How many of the physicists at DSTO can derive $E=mc^2$? I had an old friend who did it at high school in 2hours from first principles! I would love to meet anyone at DSTO or other defence organisations who can do that! It wasn't a requirement to pass and he was a matriculation student (equivalent to yr 12) and now about 40years on and he can still do it. I am a chemist and back in the "good old days" our matriculation teacher gave us this as a challenge (along with plenty of assistance). I was a crappy student having limited interest in the theoretical stuff on offer, but somehow managed it.

Yes, at DSTO, you are likely to have a mathematician running a Chemistry project with NO idea what they are talking about and care less about whether it makes sense.

When you employ staff, let me make this analogy. If I want a good car driver, I need to consider the tasks involved. Sebastian Vettel may be a wonderful driver and if I need someone to race around a track, he would be an excellent choice. But if I want to be taken home by taxi, the skills are somewhat different, even though formally they are "just" drivers. Vettel would not have any idea about where to go to drive to my home address and 99% of his skill is wasted. You are doing the same thing with the pay and employment structures at DSTO. You can't just swap them between jobs!

A physics Ph.D. and a Chemistry technician are not interchangeable, even though they may be scientists. A chem. tech is seldom able to develop new projects especially when it involves new methodology and or equipment. My experience has been that job descriptions are becoming more specific and detailed, for the simple reason that the project leaders are incapable of doing the tasks they set and incapable of analysing the data. There seems to be an idiotic notion that when a scientist says a task should be straightforward that he needs no resources. Yet, if you surgeon said a procedure was relatively straightforward, you wouldn't expect his to use a carving knife and a shoestring to achieve his results. You don't swap out an ear and nose surgeon for a gynaecologist or heart surgeon do you? You expect better results for scientists ignoring the fact that to achieve equivalent results overseas, the equipment is provided or can be accessed. It doesn't happen. Because we have arbitrary changes in policy and management, there has been a gross misallocation of resources to meet some new trend's promising area.

While you may well be offended by my tone and comments, I do not resile from any of my statements. I have had parliamentary dignitaries try to bully me before because I haven't spun the line they want to hear. I have worked for bosses who have belittled foreign regulators and dignitaries, to the extent that it has affected the business. I know of people who are extremely capable in their area of expertise but have been shuffled around to such an extent they feel totally wasted and outside of their area of competency. They get annoyed as they see someone else slotted into a job they could do well and dismay at the utter disaster that ensues. I've heard terms

like half-baked and incompetent a lot. All management wants to hear is YES. If you say No because of your experience you are being negative. If you say a lot of publications point to the approach being wrong, you are negative. If you can prove the supposition is wrong you are negative. So people go ahead and you end up with the oft heard "Who could have foreseen that" or that was unexpected. …And everyone is happy. Even the politicians who are lead to believe the approach was sound and was explored to its fullest, knowing that in a few years they will be moved on and the politicians will have too. In the meanwhile, if they get someone in on a short term contract who actually proposes something they can use, they will let the contract expire and resurrect the ideas as their own. I've had that happen to me and I've heard of that happening to others too.

The other thing is a that if you don't have permanency a feel like your will get dumped once your job is done, you're more likely to keep a bit of insurance in your pocket. Thus, once you leave, your ideas can be exploited for your benefit, rather than a corrupt superior who claims it (and promotions) for themselves. Worse still, they will sell ideas to anyone willing to pay. If you work for a corrupt/incompetent boss and on a short term contract, you keep your mouth shut just to get the money and bugger the outcome.

In this instance you may well undermine Australia's defence capabilities. By failing to get proper advice, you leave communities (defence and civilian) susceptible to unintended outcomes ranging from exposure to toxic chemicals through to unprotected risks.

Or one of the first Public Service Bosses [Dr John Hoskings, Director of Chem Centre (WA) as reported to Mr Philip Pendall , MP for South Perth] had said to me "I don't give a "sh*t" what's on your contract, your job is to make the minister look good no matter what, and I won't be made to look anything less either." I probably have the tape somewhere still and can upload to You Tube.

AGEISM AND FITNESS

All parts of society are supposed to be removing barriers to employment based on age. While it may well be appropriate to have front line soldiers having superior levels of fitness, I most other positions I doubt this is a legitimate requirement. I know a colleague who swims 1.5km three times a week and works out on a rowing machine (or an actual surf boat) 6 days a week. He maxes out all the setting on the rower and goes at 38rpm level 20. Most people going to a gym, (even the so called fit ones) cannot keep up with him for more than 5-10mins. He's 60. But we know from reports in the press that there are soldiers who cannot be deployed because of their level of fitness. I would deploy them anyway, although I guess you would have concerns that it might tie up more resources when they get injured than it is worth. It would send a message that their fitness or a lack of it will affect their survivability and wouldn't be a way of ducking out of service.

The defence force is said to be unable to fully man the current submarine fleet. In many jobs on boats and subs, there is no need to be able to run tens of kilometers per day. Many older people would be happy of such a job and would be happy to be retrained into the positions. I personally think having a mix of ages would help to reduce turn over. Having said that, I know most people hate the idea of being stuck in a "can" underwater. They view it as being positively horrifying. I for one couldn't care less.

PATENTING AND IP

If you want to expand the patenting of potential new ideas the current system is useless. I lived in the US years ago and the system may have changed. However, the academics (paid only during term time) are expected to find funding for the off time. They also offer almost free patenting of ideas and most of the returns go directly to the academic – not the institution. Having said that most academics who have profited from the system, do donate to the institution. It takes a long time to write a patent and most people have not been involved in the process. Invariably under the current system people either exploit the position or the managers like to claim unwarranted credit and demand the job be done in your own time, *etc* claiming a bonus for their non-existent input.

Some time ago I applied for a job at SA Water (SA government instrumentality) as a Mass Spectrometrist / Analytical Scientist. I had developed a method to desalinate water using a variation of the old SIROTHERM resin, using carbon dioxide to displace metal salts from the resin. I did a lot of work in my time and resources to develop the project. They demanded I assign all rights to them without offering anything in return. No money, no permanency (contract specified 2 weeks notice) and no guaranteed return at all if it was commercialised. I told them to (expletive) off. They had the audacity to demand my IP even after that and in spite of the fact that SA Water had not contributed even 1 cent to my efforts or ever had me on the payroll! If you expect people to contribute, then you have to offer a lot more in return than abuse. I will say that many people have experienced a similar thing from the DSTO. Even to the extent of having legal demands placed on them after being "let go" from the organisation.

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