A speech by Air Chief Marshal Sir Andrew Pulford

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Title: Building the Best Force for the Next Century

Introduction

General Ünal, fellow air chiefs, ladies and gentlemen, thank you for your warm welcome. This is my first opportunity to support this event and may I just say what an excellent conference facility we are meeting in today to discuss our issues and share our thoughts. It is an honour to deliver this keynote address.

The title is self-explanatory but I wanted to reemphasise that this is a Royal Air Force perspective. Istanbul is a city that joins two continents and this conference brings together airmen who do not regularly meet during their normal business. But of course air power's nature transcends borders, regions and continents, and so I hope that all here today will find some personal relevance in what I have to say.

Numerous, complicated, instantaneous and unpredictable – these are some of the key adjectives which describe the challenges UK airmen face today; the future promises more variations on this theme. These challenges are of no greater magnitude than those faced by our forebears but they are different. My contention is that unless we recognise this fact and start to think long and hard about them now, then we will not generate the insights in sufficient time to overcome them. This is the thesis I would like to explore with you today.

My address is in two parts – *challenges*, to offer a view on the character of what it is we are trying to overcome, and – *solutions*, to identify some key principles and factors which seem to me to be on the pathway to success. I will speak for around 25 minutes to leave equal time for questions.

Part 1 – Challenges

It was quite straightforward once. The Cold War, a period where we could build an air force around a known enemy; we believed we knew his strategies and even his battle plans. Our squadrons, based in fixed locations in the UK and Europe, even had their missions for the first few days fully planned against known high value targets. Excellence in tactical execution was

all that mattered. But contrast that Cold War scenario with the air operations we are involved in today. Leading and building an air force in this World is not quite so straightforward.

Let me introduce those challenges. The first group are the World's challenges as they provide the essential context for us all. Critically, I have no control over them whatsoever.

The World's challenges today

The World's challenges are driven by an acceleration of globalisation. Globalisation is not new, it is centuries old and is certainly no stranger to this great and ancient city. However, today, people, money, information and ideas can move at near instantaneous speed. We are all connected at the speed of light, quite literally in some cases via fibre optic cable.

This 'brand' of globalisation is here to stay. States with latent economic power are starting to exploit their potential and act on the World stage. Meanwhile our economic interdependence grows.

The problem in this World is that clashes of values and interests are never very far away. And when they occur, they are confusing because nations may find themselves competing with a state, or even non-state actor, on one issue and cooperating with them on another, such is the complicated nature of this World.

In this World, new technologies proliferate rapidly across the globe. Non-state actors now have state-like ambitions and act in both the virtual and physical domains with increasing capability.

And I can do nothing about this context. So how does it impact on us today?

The RAF's challenges today

The 'certainty' of the Cold War was replaced by the 'certainty' of counter-insurgency. It means I have a Force which is combat hardened but only in a narrow experience field.

Since 1989 the Royal Air Force has been its most active outside of the World Wars. Our post-Cold War adaption has been done 'in contact' with the enemy.

This poses a dilemma – how to win today whilst preparing to win tomorrow? Our 'certainty' is being replaced by 'uncertainty' and we feel conceptually behind where we need to be.

As the World's brief unipolar moment evaporates, a new version of a high-end game is emerging; one that is based on old – but still perfectly valid – preventative, cost-imposing strategies such as anti-access, area-denial threats.

New forms of warfare are appearing: so-called 'lawfare' is now an omnipresent challenge[1]; so too the fight in cyberspace for access to information, whether that is obtaining it or keeping it; and, space warfare is now being openly debated, its consequences considered.[2]

The defence aerospace industry consolidates around us as governments place fewer orders for fewer numbers. Commercial products are increasingly adapted for military applications, not vice versa.

These challenges are no greater than Lord Trenchard, the "father" of my Service, considered in 1919 with a Royal Air Force that was just 18 months old. Or those of Lord Tedder in 1946 as the 2nd World War gave way to the Cold War. The 'uncertainty' has many similarities.

But I am suggesting that my challenges are different. And those differences require activity-based responses in minutes and hours, not days or months.

Today I 'fight' for people. Demographics and societal trends mean that I have too few suitably qualified and experienced personnel, and some of those I have are now arguably experienced in the wrong thing.

The Royal Air Force of today must do some hard thinking, like Trenchard and Tedder before us.

The RAF's future challenges

The future holds more of the same, but more numerous, diverse, complicated and unpredictable. Their effects will be instantaneous and the battle for information will be at its core.

Let me offer a few scenarios.

The Tornado, our first fly-by-wire platform, has a software dependency of 4%. Lightning II, our latest, will have a 90% dependency. This represents potential cyber vulnerability.

[1] For a detailed understanding see: *The Fog of Law*. Tugendhat and Croft (Policy Exchange, 2013). http://www.policyexchange.org.uk/images/publications/the%20fog%20of%20law.pdf accessed 22 Mar 16.
[2] For a comprehensive precis see: *The New Star Wars*. Lewis (Chatham House, 2016). http://www.policyexchange.org.uk/images/publications/the%20fog%20of%20law.pdf accessed 23 Mar 16.

From 2008 all Royal Air Force bombs have been capable of GPS-guided delivery.[3] Since then, our dependency on GPS for weapon-aiming and navigation has grown exponentially; that system is now potentially vulnerable.

In space, anti-satellite capabilities are real and tested. More sophisticated and less-attributable anti-satellite systems are regularly reported in the open press. The World depends on space, not just the Royal Air Force but one day it might become inaccessible or unusable.

As platform numbers reduce, each one effectively takes on *pseudo* high value asset status. But what if I need more, and in a hurry? How can I reconstitute capability – equipment and personnel – in times of crisis? What can Industry provide and what must I deliver?

The air and space operating environments are converging with the advent of hypersonic propulsion, sub-orbital space flight and the potential of nano-satellites launched from air-breathing platforms. A global impact anywhere within one hour is a concern.

There is also the blurring of the once comforting sense of *Home* and *Away*. In the UK, the Home Office and Police used to do problems at *home*, the Foreign Office and Ministry of Defence did problems *away*. This distinction is disappearing and I need a Force that can 'fight' both simultaneously.[4]

And we must regain some of our lost ground while pre-occupied elsewhere. Controlling the electro-magnetic environment is likely to take on a similar level of importance to the control of the air situation that we understand today.

I'll close Part 1 with a brief summary.

Airmen cannot change the acceleration of globalisation which is shaping our World but we can recognise what is happening and rapidly adapt to it.

A new chapter of air, space and cyber power in the post-Cold War era is beginning, at its core is a battle for information.

[3] Enhanced Paveway II (EPW II) and Maverick were introduced post Kosovo and before the 2nd Gulf War in 2003; Paveway IV was in service by 2008. It should be noted that both EPW II and PW IV can also be guided by laser.
[4] For the same message but from a policing perspective see this article in the Times by Director EUROPol: http://www.thetimes.co.uk/tto/news/uk/crime/article4720247.ece?shareToken=81c3b3a00163269386bf244d08df026c accessed 24 mar 16.

Our problems today are no bigger than those faced by our forebears but they are different and that requires some new thinking to overcome them.

Part 2 – Solutions

Churchill is believed to have once said to his War Cabinet: '*Gentlemen, we have run out of money and so now we must think*'.[5] He was not implying thinking had not occurred up to this point but that now they must redouble their thinking efforts. The Royal Air Force must do the same today, which leads me to Part 2.

Thinking will deliver the solutions to our current and future challenges. Before I offer examples of what we are thinking about, I want to explain how and why we feel the need to do it. My Part 2 is an articulation of a transformational journey that we have now embarked upon.

The Conceptual Component and Thinking to Win

I want to start by describing two lenses. They are *the* fundamental optics through which you should view what follows. The first lens is the Conceptual Component of Fighting Power.

Our doctrine describes Fighting Power as derived from the intersection of 3 Components – the Physical, Moral and Conceptual.[6] If we put aside the Moral which determines *why we fight*, it is self-evident that when the Physical – or *what we fight with* – is put under pressure, the Conceptual – the *how we fight* – takes on heightened importance. Put another way, it is the intellectual foundations on which the Royal Air Force is built.

We have investigated if our Conceptual Component is fit for purpose – the overwhelming evidence is that it is not. We seem to have forgotten how to think! And the root cause is Conceptual Innovation at the Operational and Strategic levels.

Along with the Principles of War and Doctrine, Conceptual Innovation is a subset of the Conceptual Component. Our evidence showed the first 2 were broadly fine but Conceptual Innovation was broken. We had stopped doing something we used to be good at.

To us this is: '*the creation and deliberate application of ideas, new to the RAF, that deliver a step change in power and performance*'. This is not about technical innovation. This is about prioritising and valuing the important tasks of thinking, the quality of leadership at all levels, and our quality of decision-making. It is therefore about the people who make Fighting Power real.

[5] This is often disputed; it is also attributed to the New Zealand physicist, Earnest Rutherford in the 1960s.
[6] See Joint Doctrine Publication 0-01 (JDP 0-01) (5th Edition), dated November 2014 (MOD) p25.

Thinking To Win is our transformation programme to deliver this improvement in condition.

Transformation of the RAF's Organisational Culture

The second lens is Organisational Culture, more specifically, its transformation.

Our people told us '*We do not have time to think*'. We saw our people confusing the urgent with the important, focussing on urgent Tactical activity at the expense of the important Operational or higher level issues. Our structures and processes have become barriers to innovation. Our culture does not yet appreciate that failure is not the opposite of success. We're going to change all that.

There is a paradox here. If this is about people, and people are part of the solution, you will recall they are also part of the challenge. By addressing the cultural issue, I am going to give the Royal Air Force the best chance of success in its people challenge.

I have invited my people to politely challenge at every level and expect good answers from their leaders. I need everyone solving our problems, not just a few. I want to set the conditions where people feel inspired, are developed to their full potential and led well; they could leave but choose to stay.

By being inclusive of all, embracing diversity of thought, welcoming challenge to our ideas, the culture I foresee will build the best possible Force for the challenges ahead.

Important factors guiding 'investment'

Viewed through these two lenses, I will now briefly cover four factors to offer insight to what we are thinking about. They are not exhaustive but representative of our likely conceptual 'investment'.

Synthetic environments

We may be on the verge of a quantum leap in synthetic technology and capacity fuelled by advances in computing science. These environments will be a big part of our future.

Modern aircraft are no longer difficult to fly. In contrast, employing these aircraft effectively in the complicated strategic context is becoming more difficult. More focus on the brain, less on the hands, is required.

Our Defence Operational Training Capability (Air) programme will offer us a blended solution of the Live, Virtual and Constructive. It will allow us to increasingly train in the complicated operational scenarios we envisage but either can't – or don't wish to – generate in the real World.[7]

Future emulation engines will emulate the real World, the social World, the World influenced by actions of myriad actors, where different outcomes can vary when the same execution decision is taken just minutes apart. This is the 'uncertainty' within which we must train.

This synthetic environment will be a powerful tool. Not just for training but for education, for test and evaluation, for concept assessment, for mission rehearsal. It will be vital for the training of our Air Generals and pilots alike.

New operating concepts

Thinking about how we might fight in the future, analysing the thinking of others, considering the disruptive impact of emerging technologies, is also important to me.

If we can't consistently come up with new concepts to confront new challenges; if we remain both rushed and reactive – in other words, '*too busy to think'* – then we will become less and less relevant and increasingly ineffective.

I desire a continuous stream of operational ideas drawn from across the entire organisation. Some we will reject but others we may adapt and test further. Remember, the goal is to identify ideas that we can turn into step changes in Royal Air Force power and performance. We cannot be wedded to our current approach simply because it works today.

And there is certainly a lot to think about. Some of the emerging technologies which we will discuss later[8] during this conference could certainly become instantly disruptive once technology breakthroughs occur. Hypersonic propulsion, quantum computing and sensing[9], highly automated swarming techniques and big data analytics to name just a handful.

Sometimes it is about re-employing *old* technologies in *new* ways that can offer competitive advantage. Consider a scenario where a maritime patrol aircraft could hunt for submarines

[7] See *Air Power Review* Vol 18, No 3. http://www.airpowerstudies.co.uk/sitebuildercontent/sitebuilderfiles/APRvol18no32015.pdf accessed 23 Mar 16.
[8] Session 4 of ISAW16 will examine *Emerging Technologies*.
[9] For an example of its potentially disruptive impact see this article in Popular Science by J Lin, P W Singer & J Costello: http://www.popsci.com/chinas-quantum-satellite-could-change-cryptography-forever accessed 23 Mar 16.

over a very wide area with a coordinated swarm of flying magnetic anomaly detectors launched in the same way as its sonobouys?[10] That would be quite disruptive.

But we must also be realistic. Gartner's *Hype Cycle* rightly offers a cautionary tale that we should heed.[11] The point I'm making is not about the technologies but that they must be constantly under active consideration for incorporation into evolving concepts.

Acquisition reform

My third factor is acquisition reform.

What can we do about defence aerospace industry? I would suggest that first we have to find a way to work equally well with what we've got – the traditional – and what is rapidly developing around us – the new.

Let me expand. Industry and its customer air forces must find a way of successfully supporting platforms that have an anticipated service life of 50 years as well as integrating new capabilities which may have a useful lifespan of just 5 days.

Longevity is easier if we build-in upgradability and spare capacity from the outset. This offers better value-for-money in the medium term but we must not erode it when we inevitably look for short-term savings. Spiral development plans - for the system, the aircraft or both - may offer us utility here.

For emerging technologies a '*Lead, Watch and Follow*' strategy may be the way ahead. For some, only the military can *lead* primary investment in order to achieve a disruptive effect. However, for the majority, Research and Development will occur independently and the military can *follow* these technologies in order to adapt and adopt related capabilities. But where there is neither a clear nor affordable exploitation pathway, we can continue to *watch* until the situation becomes more favourable.[12]

Get this right and acquisition itself could provide a significant part of the 'edge' we need.

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[10] See *The Inescapable Net: Unmanned Systems in Anti-Submarine Warfare*. D Hambling (BASIC, 2016). http://www.basicint.org/publications/david-hambling/2016/inescapable-net-unmanned-systems-anti-submarine-warfare accessed 23 Mar 16.

[11] See http://www.gartner.com/technology/research/methodologies/hype-cycle.jsp accessed 23 Mar 16.

[12] See *The Future Operating Environment 2035* (MOD, 2015). https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/484861/20151203-DCDC_FOE_35.pdf accessed 23 Mar 16.

Organisational re-definition

My final factor is Organisational re-definition.

Some will tell you that the Royal Air Force comprises around 31,500 personnel. But I 'see' around 58,000 personnel delivering Royal Air Force operational outputs on a daily basis.

I am referring to the Whole or Total Force approach. That is, using a combination of uniformed, reserves, civil servants and contractors to deliver Defence outputs. Manpower is expensive and there is much that can be delivered more efficiently using a non-uniformed, Whole Force, Total Force model. It is not how these outputs are delivered, but that they are delivered that is important.

We pursue this approach not just for affordability but because it reflects today's reality. When you open your mind and consider the Royal Air Force's challenges from a Whole Force perspective then a new range of possible solutions identify themselves for further exploration.

One brief example. The UK will soon purchase nine Poseidon P8 surveillance aircraft – our engineering support for these platforms will be exclusively contractor-led. Experience with the Voyager transport aircraft has given us the confidence this can work, and work well.

So conceptually redefining what your organisation is – in our case a 'Whole Force' Royal Air Force – offers an entirely new way for considering your challenges and identifying the best solutions to overcome them. That is *Thinking To win*.

Before closing, let me briefly summarise Part 2.

Nurturing the Royal Air Force's Conceptual Component and reinvigorating its Conceptual Innovation is the most important RAF 'mission' we face today.

Separating the important from the urgent is at the heart of a cultural transformation across the whole Royal Air Force.

Many factors (synthetics, acquisition, partnerships, operating concepts) will form the solutions to the Royal Air Force's challenges; none will be decisive on their own but all will have a part to play.

Conclusion

In conclusion, the Royal Air Force is now at a key point in its history.

Circumstance has meant that it has never been busier outside of total war and it continues to excel at the Tactical level on operations.

But that is not enough. The Royal Air Force of today must re-learn how to think at the Operational and Strategic level if we are to offer credible and affordable air power options to my Nation.

The 'certainty' in our World has gone. We live in a World with rapid changes in society, technology and our operating environment. This change is accelerating, bringing with it new challenges and new vulnerabilities. Change is not new but the pace of change is fearsome.

My thesis was that those challenges are no more demanding than those tackled by our forebears. But they are different; they will be more numerous, more complicated, have instantaneous impact and unpredictable outcomes.

To overcome them the Royal Air Force will again need to think deeply about what it does – that is the function of the Conceptual Component, and ours needs some attention.

Thinking To Win represents the most important mission we face today because it will define our next 100 years. This is a time of opportunity and we must act.

The Royal Air Force is 98 years old today and its people have been thought-leaders for much of that time but, almost imperceptibly, circumstance has put that thinking into a semi-dormant state.

The embers of the fire may have dimmed but my role is to re-stoke those embers because they need it. *Thinking to Win* is the fuel that will re-ignite the culture of conceptual innovation throughout the Royal Air Force.

Acting together, I am confident we will build the best Force for the next Century.

Thank you.