RUSI of Australia Website Presentation Transcript

Leadership & Culture, Principles & Professionalism, Simplicity & Safety – Lessons from the Nimrod Review

The Hon Sir Charles Haddon-Cave, in conjunction with the Defence Aviation and Air Force Safety, spoke to the USI of ACT at the Australian Defence College on 9 April 2014

RAF Nimrod XV230 suffered a catastrophic mid-air fire whilst on a routine mission over Helmand Province in Afghanistan on 2nd September 2006. This led to the total loss of the aircraft and the death of all 14 service personnel on board. It was the biggest single loss of life of British service personnel in one incident since the Falklands War. The cause was not enemy fire, but leaking fuel being ignited by an exposed hot cross-feed pipe. It was a pure technical failure. It was an accident waiting to happen.

The deeper causes were organizational and managerial. This presentation addresses:

(1)   A failure of Leadership, Culture and Priorities

(2)   The four States of Man (Risk Ignorant, Cavalier, Averse and Sensible)

(3)   Inconvenient Truths

(4)   The importance of simplicity

(5)   Seven Steps to the loss of Nimrod (over 30 years)

(6)   Seven Themes of Nimrod

(7)   Ten Commandments of Nimrod

(8)   The four LIPS Principles (Leadership, Independence, People and Simplicity)

(9)   The four classic cultures (Flexible, Just, Learning and Reporting Cultures)

(10)   The vital fifth culture (A Questioning Culture)

INTRODUCTION

I would like to highlight a number of general points before turning to the *Nimrod Review.*

First, *Fukushima*, *Deepwater Horizon*, *Malaysian Airways* Flight MH370 are each a sober reminder of the catastrophic risks that the nuclear, oil & gas and aviation industries face every day. They can learn much from each other. The problems are common. The principles are the same. There are no new accidents. There are just lessons to be learned from the ones we have had.

Second, if you think process safety is expensive, try having an accident. What I am talking about today is not 'slips & trips' but how to prevent *catastrophic* accidents, which could cause major financial and reputational damage to your companies.

Third, is tempting to view risk and the 'safety' in terms of neat PowerPoints and statistics and something for corporate risk department.

Safety is, however, everyone's personal responsibility. And it starts at the very top – and should cascade right through the organization.

Fourth, to my mind, there are four states of Man: *Risk Ignorant, Risk Cavalier, Risk Averse* and *Risk Sensible*. I advocate in the *Nimrod Review* being *Risk Sensible.*

Fifth, in times of increasingly scarce resources and financial pressures, how do you get that balance right? Focus your time, energy and resources on areas which really matter in terms of *outcomes*. Don't be misty-eyed about safety. Be hard-nosed. Look at the stats and see what you most serious and habitual risks and target those in particular.

Sixth, whatever you do, keep it simple. The great economist, E.F. Schumacher, who wrote Small is Beautiful said: "Any intelligent fool can make things bigger, more complex, and more violent. It takes a touch of genius – and a lot of courage – to move in the opposite direction." I. e. Keep things simple.

Seventh, let me share this inconvenient truth with you: like it or not, we live in an instant media and internet age with an increasingly sceptical and informed public. Everyone with a phone is a journalist. Public opinion can turn on a tweet.

NIMROD XV230[1]

I have been asked to talk to you about *The Nimrod Review* following the loss of *RAF Nimrod MR2 XV230*1 highlight some of the hard lessons that have been learned from this painful episode in British military aviation history.

The Facts

On 2nd September 2006, *XV230* was on a routine mission over Helmand Province in Southern Afghanistan in support of NATO and Afghani troops. Within 90 seconds of completing air-to-air refueling from a Tristar tanker, the crew were alerted by two almost simultaneous warnings: a fire warning in the bomb bay and a smoke/hydraulic mist warning in the elevator bay. Within a minute the aircraft depressurised. Within two minutes the spy camera operator reported *"we have flames coming from the rear of the engines on the starboard side".* Emergency drills were carried out and a 'MAYDAY' transmitted. The pilots immediately diverted to Kandahar airfield. Faced with a life-threatening emergency, every member of the crew acted with calmness, bravery and professionalism, and in accordance with their training.

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[1] *Nimrod MR2* aircraft were specialized RAF reconnaissance aircraft

Six minutes after the first fire warning, however, a Harrier saw *XV230* explode at about 3,000 feet and crash.

The crew had had no chance of controlling the fire. Their fate was already sealed before the first fire warning went off. The fire had broken out in a part of the lower fuselage of the aircraft which was unreachable and not covered by an automatic fire suppression system. It was the biggest single loss of life of British service personnel in once incident in theatre since the Falklands War in 1982.

Inquiry – 2007-2009

At the request of the Secretary of State for Defence, I conducted a two-year inquiry from with a small military and civilian team, during which we studied 50,000 documents and cross-examined hundreds of witnesses. I also had valuable assistance from the US military, NASA, the HSE and the excellent Royal Australian Air Force.

I found that the cause of the fire was not enemy action but fuel leaking during air-to-air refueling or from fuel couplings being ignited by a hot cross-feed pipe. That is to say, it was an engineering failure. This caused a major shock both in the military community and with British public because pure 'tech' accidents simply should not happen.

These sorts of major catastrophic accidents with a long gestation are, mercifully, rare; but they are a golden, once-in-a-generation, opportunity to learn deep and important lessons, if organisations are prepared to submit themselves to rigorous, objective examination and a real measure of soul-searching. It was a hard lesson for the RAF and military but a free lesson for everyone else. The strapline of my report was: ***"A failure of Leadership, Culture and Priorities".***

SEVEN STEPS TO LOSS OF NIMROD

The genesis of the accident can be traced to the concatenation of the following seven 'steps' which fatally combined over 30 years:

(1)   **Poor design** and modifications from 1960s onwards gave risk to the risk of fuel coming into contact with 400 degree hot pipes in the bottom of the fuselage at any time.

(2) There was **history of fuel leaks** in 1970s and 1980s which did not ring alarm bells (and had become 'the normalization of deviance').

(3) There was an **increase in operational tempo** in late 1990s and early 2000s with the heavy use of Nimrod aircraft particularly in theatres such as Kosovo, Afghanistan and Iraq.

(4) There were increasing **problems of maintenance** of an increasingly aging aircraft, with its out-of-service date being regularly extended.

(5) There were meanwhile **distractions of major organizational change and cuts** in funding in the MOD in 2000-2005 following the Strategic Defence Review of 1998.

(6) There was the **outsourcing of the Nimrod Safety Case** in 2004-5 which produced a large amount of paper which said that the aircraft was safe – but it manifestly was not. The Safety Case missed obvious risks.

(7) And then on 2nd September 2006, following **air-to-air refueling**, the inevitable happened.

SEVEN THEMES OF NIMROD

There were seven big themes which struck me forcibly during the Inquiry:

(1) **Complexity and change.** The sheer complexity of everything. The organisation, the rules, the standards, the processes were of Byzantine complexity and were constantly changing. Complexity and change had become the altar at which senior management worshipped.

(2) **Management by committee and consensus.** I found more committees, sub-committees, working parties *etc*. dealing with safety related matters than in the UN.

(3) **Dilution of responsibility and accountability.** The immediate casualty of this web of complexity was a dilution of responsibility and accountability – and

often in inverse proportions to seniority. It was difficult to divine who was responsible for what.

(4) **Lack of challenge.** I found a distinct lack of challenge, *i.e.* a reluctance to ask awkward questions or to be seen to be challenging orthodoxy.

(5) **Migration of responsibility.** I found that there had been a migration of responsibility away from where it should have been to my mind, namely with those most directly affected by the decisions in question, *i.e.* Operations, to warm offices back home. This was accompanied by a mis-alignment of decision-making power, information and budgetary control.

(6) **Triumph of generalists over specialists.** I found a triumph of generalists over specialists. I found a lack of appreciation of specialist skills, especially engineering and too great a reverence to the 'well-rounded' (soft-handed) generalists (like me).

(7) **Drowning of Conscience.** I found that the still small voices of conscience were getting drowned out by the volume of background noise or paper-shuffling. Moral courage should not be in inverse proportion to rank.

TEN COMMANDMENTS FROM NIMROD

I next want to highlight ten particular lessons from *The Nimrod Review*:

First, it is important to look at the underlying organisational causes of any major accident. It is easy to blame the guy with the screwdriver or the joystick or the clipboard in his hand. But it is vital important to examine the fundamental 'organisational causes' of accidents. I found 12 uncanny, and worrying, parallels between the organisational causes of the loss of Nimrod XV230 and the loss of the NASA Space Shuttle *'Columbia'*:[2]

(1) The 'can do' attitude and 'perfect place' culture.

(2) Torrent of changes and organisational turmoil.

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[2] Chapter 17, *The Nimrod Review.*

(3) Imposition of 'business' principles.

(4) Cuts in resources and manpower.

(5) Dangers of outsourcing to contractors.

(6) Dilution of risk management processes.

(7) Dysfunctional databases.

(8) 'PowerPoint engineering'.

(9) Uncertainties as to Out-of-Service date.

(10) 'Normalisation of deviance'.

(11) 'Success-engendered optimism'.

(12) 'The few, the tired'.

Second, beware assumptions. It was assumed that the Nimrod type was safe because it had flown safely for 30 years. Big mistake. It was assumed the Nimrod safety regime was safe because there was a complex safety system. Big mistake. It was assumed that if you outsourced the Safety Case to the original Nimrod manufacturers you could relax. Big mistake. The SAS have a saying (which I will express is slightly less colourful language than they do): *"Assumptions are the mother of all [cock-ups]".* Piper Alpha was assumed to be the safest rig in the world, the day before it blew up.

Third, avoid change for change's sake. Change can become addictive - but can distract and disrupt people for doing the day job and be dangerous (as well as wasteful).

Fourth, avoid what I call the three 'comfort blankets' of complexity, compliance and consensus. There is a false comfort in complexity. Don't have a compliance culture. Don't surround yourself with people who tell you what you want to hear. Value dissent. Reward Mr Awkward at the back of the room always throwing the curve-ball.

Fifth, (as Lord Cullen said) Safety Case should be an aid to thinking, not an end in themselves. A culture of 'paper safety' had grown up. The safety case regime had developed severe shortcomings which included: bureaucratic length; obscure language; a failure to see the wood for the trees; archaeological documentary exercises; routine outsourcing to Industry; lack of vital operator input; disproportionality; ignoring of age issues; compliance-only exercises; audits of process only; and prior assumptions of safety and 'shelf-

ware'.[3] I recommended that Safety Cases should be renamed *"Risk Cases"* and conform in the future to the six Principles: **Succinct; Home-grown; Accessible; Proportionate; Easy to understand; and Document-lite.**[4] Like the Pompidou Centre in Paris, Safety Cases should have their workings visible on the outside.

Sixth, age matters. The age of equipment is important. Increasingly aging kit – and extensions of out-of-service dates – is an increasing problem.[5] Age matters, but it is not necessarily an insoluble problem. Older kit generally needs greater rigour, resources, and vigilance. But with the right care, 'legacy' aircraft can continue to fly safely for many years. It is a question of resources, priorities, and unrelenting attention to detail. Good collection and analysis of data, trends and patterns is vital.[6]

Seventh, the key any properly run organization is accountability – and this means having clearly identified and defined Duty Holders. The establishment of clearly identified Duty Holders was a cornerstone of the Nimrod report. Duty Holders must be clearly defined and accountable. Duty Holders should: (a) know who they are and what their roles and responsibilities are (and everyone else does too); (b) have the resources and support to carry out their duties; and (c) accountable for their actions and omissions and those responsible to them. Remember: 'Accountability' is the reciprocal of 'Responsibility'. There can be no real or meaningful responsibility if it is not accompanied

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[3] Many of these criticisms of Safety Cases were not new: see the *Ladbroke Grove Rail Inquiry* and the writings of Professor McDermid's Department at the University of York.

[4] The '**SHAPED'** Principles – Chapter 22 of *The Nimrod Review*.

[5] Problems of 'legacy' aircraft include: (1) Design to standards which would not be acceptable today; (2) Difficulties of access and maintenance; (3) Diminishing pool of skilled engineers; (4) Decline of 'corporate knowledge' and memory; (5) Dwindling spares; (6) Difficulties of incorporating modifications and new systems; (7) Different aging rates of systems and components; (8) Degradation of components.

[6] The advances in pre-emptive Human Factors (HF) reporting using Human Factors Maintenance Error Management Systems ((M)EMS) are impressive. The great advantage of HF M(EMS) is that it encourages a pro-active reporting and trend analysis culture which focuses attention on the 'below the waterline' near-misses, which, if openly and honestly reported in sufficient numbers, provide valuable information and visibility of potential issues *before* an incident or accident occurs. This changes fundamentally the approach of hazard management from reactive to pro-active. (see Chapter 18 of *The Nimrod Review*).

by the knowledge that that person will ultimately be held responsible.

Eighth, value engineers and engineering and technical skills. There was a steady downgrading and under-valuing of engineering skills at all levels in the MOD during the period 2000 to 2006. This was exemplified most starkly by the abolition of the headline post and title of Chief Engineer (RAF) and a 'glass-ceiling' and decline in numbers of RAF engineers reaching the top echelons in the past ten years.

Ninth, if you have to outsource, it is important not to outsource your thinking and to remain an *'intelligent customer'*. Large organisations and government departments have increasingly become hooked on the heroin of outsourcing. Outsourcing has many short-term attractions but it can quickly become addictive.

Tenth, it is not what you can see but what you can't see – that lurks below the surface – that often matters the most. Beware plain sailing and being caught by something unexpected just below the surface. Good, regular data collection and analysis are vital to safety.[7] Only in this way can you analyse trends, patterns and hidden dangers. Hazard management should be pro-active not merely reactive.

Way forward

In summary, in the *Nimrod Review,* I advocate three things in particular:

- **a return to a focus on, and belief in, core values and technical skills**
- **a tightening of lines of responsibility and the clear identification of Duty Holders**
- **a rolling back of the comfort blanket of procedure and simplifying process.**

THE 'LIPS' PRINCIPLES

It is vital to identify and promulgate the right principles and stick to them. Franklin D. Roosevelt said, *"Rules are not necessarily sacred, principles are"[8].*

In *The Nimrod Review,* I highlighted four principles which I regarded as of paradigm importance:

Leadership, Independence, People (not just Process and Paper) and Simplicity[9]

✓ Leadership: **Principle of *Leadership*: There must be strong leadership from the very top, demanding and demonstrating by example active and constant commitment to safety and risk management as an overriding priorities.** As Lord Cullen said in Ladbroke Grove Rail Inquiry Report (2001) *"[T]he first priority for a successful safety culture is leadership".[10]*

> *"When a 3-Star is interested in safety, everyone is interested in safety."* (Junior RAF officer, 2009)

> *"There was no doubt that the culture at the time had switched. In the days of Sir Colin Terry you had to be on top of airworthiness. By 2004, you had to be on top of your budget, if you wanted to get ahead". (Former Senior RAF Officer, 2008)*

> *"Generally speaking, organisations behave and teams behave in the way that their management, immediate boss, does, this dictates culture. So if you have a boss in a bank who likes to take risks, his staff will take risks. ...And you end up with a culture of risk."* (Witness L [QinetiQ], Safety Engineer, 2009)

✓ Independence: **Principle of *Independence*: There must be thorough independence throughout the regulatory regime, in particular in the setting of safety and risk policy, regulation, auditing and enforcement.** As the Legal Advisor to CAA, Rupert Britton, said to me and I quote in my Report, *"It is important that that regulation is truly independent of operation."*

✓ *People (not just Process and Paper)*: **Principle of *People*: There must be much greater focus on People in the delivery of high standards of Safety and Airworthiness**

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[7] *E.g.* Human Factors (HF) reporting using Human Factors Maintenance Error Management Systems ((M)EMS).

[8] Franklin D. Roosevelt (1882-1945)

[9] Chapter 20, *The Nimrod Review.*

[10] Ladbroke Grove Rail Inquiry Part 2 Report (2001), Chapter 1, paragraph 1.11.

(and not just on *Process* and *Paper*). Whatever elaborate Processes and Paper requirements are in place, it is People who ultimately have to ensure they take care, pay attention, think things through and carry out the right tasks and procedures at the right time and exercise caution where necessary. As Defence Nuclear Safety Regulator, Commodore Andrew McFarlane, said to me and I quote in my Report: *"Safety is delivered by people, not paper".*

✓ Simplicity: **Principle of *Simplicity*: Regulatory structures, processes and rules must be as simple and straightforward as possible so that everyone can understand them.** A safe system is generally a simple and stable system. As Martin Anderson of the HSE (who now works for Woodside) memorably said to me: *"NASA was so complex it could not describe itself to others."* Simplicity is your friend. Complexity is your enemy.

SAFETY CULTURE

It is vital to foster the right safety culture and maintain it – every day, every week, every month. A strong and effective Safety Culture[11] is vital to reducing accidents. It is often said but easily forgotten. There is much to be learned from the work of NASA and the US Joint Planning and Development Office who have adopted Professor James Reason's four-part approach to creating an "Engaged" Safety Culture which includes four elements:[12]

- **A Reporting Culture:** an organisational climate where people readily report problems, errors and near misses.
- **A Just Culture:** strikes a sensible balance between a 'blame culture' and a 'blame-free culture', *i.e.* between holding people properly accountable for their acts or omissions and ensuring the right lessons are learned for the future.

- **A Flexible Culture:** a culture that can adapt to changing circumstances and demands while maintaining its focus on safety.
- **A Learning Culture:** the willingness and competence to draw the right conclusions from its safety information and the will to implement major safety reforms.

Fifth Culture

To the four NASA cultures, a **Reporting Culture, a Just Culture, a Flexible Culture, a Learning Culture,** I have added a fifth – and I believe vital – element: **A Questioning Culture:** It is vital to ask *"What if?"* and *"Why?"* questions.

The keystone of a strong Safety Culture is, in my view, however, is this vital fifth element, namely a *'Questioning Culture'*. At all stages of the safety pilgrimage it is vital to ask questions such as *"What if?"*, *"Why?"*, *"Can you explain?"*, *"Can you show me?"*, *"Can you prove it?"*. As a presaged earlier, Questions are the antidote to assumptions, which so often incubate mistakes. It is important always to think.

POWERPOINTS

I recommend in my Report: *"The ubiquitous use of PowerPoint should be discouraged. It can lead the audience to watch rather than think".*[13] But, since you have been such a good and attentive audience, here are a few which you may find useful: Imagine an ice-berg – and plain sailing around it:
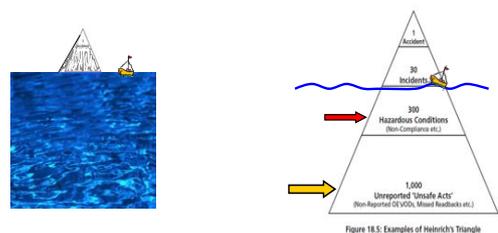
Figure 18.5: Examples of Heinrich's Triangle

HEINRICH'S TRIANGLE

But it is what lies beneath the surface that really matters.

Heinrich was clever and inspired. His analysed a series of 1920s industrial accidents and drew *"Heinrich's Triangle"* showing the relationship between low-level deviations and accidents.

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[11] *"Safety culture is that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, safety issues receive the attention warranted by their significance"* (International Nuclear Safety Advisory Group).

[12] Professor Reason's composite approach has been adopted by NASA and the US Joint Planning and Development Office (JPDO) in its NextGen project to account for a three-fold increase in air traffic by 2025.

[13] *The Nimrod Review,* Recommendation 28.2

Ratios of 600:1 are often reported. The example above illustrates data reported from air traffic management about the number of low level Operational Errors (OE) and Operational Deviations (OD). Whatever the precise ratio in any given field, the key point is to capture and understand these low level errors and deviations before they conspire to cause an incident or accident. It is important that errors and 'near misses' are reported to accident investigators.[14] Mine the data from the bottom. Avoid having to learn from your own headline accident.

Accident theory

It pays to have an understanding of Accident Theory, particularly in the context of managing safety in relation to high-risk technologies. I recommend study of the work of the leading academics in the field such as James Reason, Charles Perrow, Scott Sagan, Diane Vaughan, and Karl Weick.[15] There are two main Accident Theories: *Normal Accident Theory* and *High Reliability Theory*. Their proponents share the same goal, *i.e.* effective safety management at both an individual and an organisational level.

Normal Accident Theory: 'Normal Accident Theory' holds that, when technologies become very complex and 'tightly coupled', accidents become inevitable and therefore, in a sense, 'normal'. This theory takes a pessimistic, but not defeatist, view of the ability of organisations and individuals to manage high risk technologies.

High Reliability Theory: 'High Reliability Theory' argues that organisations responsible for operating high risk technologies can successfully compensate for inevitable human shortcomings which would normally lead to catastrophic failures. Proper design, management and training are seen as important requisites for being a highly reliable organisation.

Both sets of theorists share the same goal, *i.e.* effective safety management at both an individual and an organisational level, but differ about the degree to which it is ultimately possible to avoid errors, incidents, accidents, and catastrophes.

Both strive to achieve the 'dynamic non-event' that represents 'reliability' in high-risk technologies. It is 'dynamic' because processes remain within acceptable limits due to moment-to-moment adjustments and compensations by the human operators. It is a 'non-event' because safe outcomes claim little or no attention. The paradox is rooted in the fact that accidents are salient, while 'normalcy' is not.

In my view, there is value in both philosophies, but neither has a monopoly on veracity. The pessimism of Normal Accident theory must give way to rigorous and pro-active safety management during one's tenure of responsibility. The optimism of High Reliability must yield to human fallibility and the truth that *"…the one hazard for which there is no technological remedy: the insidious concatenation of latent human failures that are an inevitable part of any large organisation."* (James Reason, *Human Error*, 1990, page 250).

THE *'SWISS CHEESE'* AND *'BOW TIE'* MODELS

I am sure that most of you will have seen or heard of the Swiss Cheese Model. Professor James Reason's inspired way of illustrating how accidents occur:

Applied to the Nimrod story, the 'Swiss Cheese'

Figure 18.1: Classic 'Swiss Cheese' Model from Beyond Aviation Human Factors (Ashgate Publishing

model looks like this (and gives you a clear idea of the long gestation period that this sort of catastrophic accident can have):

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[14] As Professor John McDermid of York University has pointed out, there are many 'low-level' errors which are precursors of, and hence warnings of, impending accidents. He emphasises, *"Good safety management identifies these low-level issues and feeds them back to reduce risk"* (JA McDermid, PHD, FREng, University of York, *Through Life Safety Management: Some Concepts and Issues, 2007*).

[15] Chapter 18, *The Nimrod Review*

Figure 18.2: 'Swiss Cheese' Model as applied to XV230

Figure 18.4: 'Composite Model'

You may also be have seen the *'Bow Tie'* model which elegantly distinguishes between the two distinct categories of defences, preventative and ameliorating measures.

Figure 18.3: Classic 'Bow Tie' Model

H-C's COMPOSITE MODEL

In order to aid understanding of accident theory, I have combined Professor James Reason's classic 'Swiss Cheese' and the 'Bow Tie' models to form a composite 3-D model which may prove a useful tool in illustrating how the various layers of defences and the 'hierarchy' of preventative and ameliorating measures may be logically placed. It can also be a valuable management and teaching tool to help explain to those tasked with particular responsibilities, where they sit in the chain and why their particular role is important in the overall preventative scheme.

AGE MATTER

It is important to remind oneself regularly of the trusty 'bath curve'. Age is no bar to continued success – but the older kit gets, generally the greater vigilance, maintenance and resources is required to keep it up to scratch. It is a question of resources, priorities, and unrelenting attention to detail.

Figure 23.1 The 'bathtub' Curve

In the late 1990s, the Nimrod fleet was already beginning to be described as *"old"* and reaching the end of the 'bathtub' curve. The generic problems in relation to some aged and 'legacy' aircraft include:

- Design to standards which would not be acceptable today;
- Difficulties of access and maintenance;
- Diminishing pool of skilled engineers;
- Decline of 'corporate knowledge';
- Dwindling spares;

- Difficulties of incorporating modifications and new systems;
- Different aging rates of systems and components; and
- Degradation of components.

COMPLEXITY and SIMPLICITY

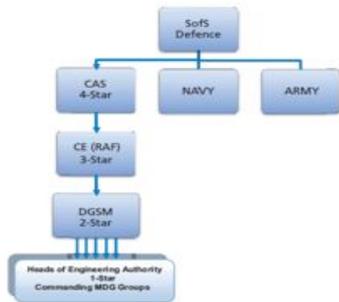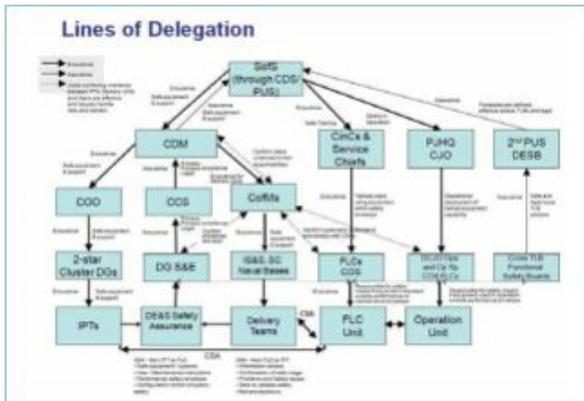In 1990s the organizational structure of the MOD looked like this:

Figure 13.4: Chain of delegation for airworthiness in 1990s

By 2005 the organizational structure of the MOD looked like this:

FIFTH CULTURE

My final slide illustrates the four NASA cultures, a **Reporting Culture, a Just Culture, a Flexible Culture, a Learning Culture,** to which I have added a fifth – and I believe vital – element: **A Questioning** Culture. As I have said, it is vital to ask questions such as *"What if?", "Why?", "Can you explain?", "Can you show me?", "Can you prove it?"*. Questions are the antidote to assumptions, which so often incubate mistakes. It is important always to think.

Figure 27.1: Engaged Organisation and Safety Culture

I wish you every success.   Thank you.

Biography:

The Hon Mr Justice Haddon-Cave is a British judge who serves on the Queen's Bench Division of the High Court of England and Wales. Sir Charles was appointed by the United Kingdom (UK) Secretary of State for Defence to conduct The Nimrod Review into loss of RAF Nimrod MR2 aircraft XV230 in Afghanistan (2007–2009). This review; colloquially known as the Haddon-Cave Report identified weaknesses within the UK Ministry of Defence (MOD) which weakened the MOD's safety and airworthiness regime.