First of all may I begin by thanking our hosts from MOLDATSA for providing the facilities for this important workshop on the Flexible Use of Airspace. I am very pleased to be here for 2 reasons:

Firstly in my capacity as the Chairman of the European Region Air Navigation Planning Group and in this category I am delighted that representatives from so many states are able to be with us for this event. Secondly as the person in the United Kingdom who has the lead for the delivery of the Flexible Use of Airspace Policy in UK airspace. I would like to share with you some of the experience we have had with FUA policy in airspace which is very intensively utilised both by civil and military traffic.

As the slide shows I am the Assistant Director Of Airspace Policy within the Directorate of Airspace Policy of the UK’s Civil Aviation Authority – we are an independent body charged with the regulation of UK airspace for all purposes. To do this we have a mix of civilian and military staff and the Director reports to both the Secretary of State for Transport and to the Chief of the Air Staff in the MOD. I started my time with the Directorate in 1999 as a Group Captain (a Colonel) on secondment from the Air Force – so I have the unique perspective of having done both of the Deputy Director posts as a military officer and as a civilian since 2001.

I am very happy to take your questions at the end of my presentation – I hope you will find the content relevant and interesting.
Our role in the Directorate of Airspace Policy is to take account of the needs of all airspace users and this might include all of the activities shown here.

• Commercial air transport is a significant factor, both in terms of domestic and international flights, and growth until recently was at about 4–5% per year. Last few months that traffic has been down by up to 10% in some places.

• Military aviation demands access to large volumes of airspace, in particular to meet the needs of highly capable aircraft such as Eurofighter Typhoon as shown top right here.

• Finally, and certainly by no means least, general aviation activity that ranges from balloons, hang gliders, and microlights, to gliders and powered aircraft. There are some 49000 licensed pilots about half of which are general aviation pilots. In addition, there are some 18000 aircraft on the UK register of which about 66% are general aviation aircraft.
I thought I had better try and give you a feel for what the UK airspace looks like.

This slide gives a simplified view of all of the air routes above FL195, together with the various Danger Areas (in red) and Temporary Reserved Areas for military training (in purple). Where each of the air routes crosses a Danger Area or a Temporary Reserved Area then there is an appropriate form of Flexible Use of Airspace mechanism to provide the flexibility to 'switch on' or 'switch off' the air route or the Danger Area or TRA or the Conditional Air Route that routes through it. In our terms neither the MOD or NATS as the civil ATC service provider ‘own’ the airspace. It is a national asset to be shared, under Flexible Use of Airspace principles in the most effective and efficient way to meet the overall needs of the UK.

As such air routes service international access to and from the North Atlantic (via the north-west approaches or south-west approaches depending upon the North Atlantic track structure in force). Most military training bases on the East Coast hence the larger TRAs over the North Sea.
Moldovan Airspace on the same scale

……and just to give a you a feel for the scale of what we deal with in the UK, this slides gives you a comparison between the size of the area of the airspace managed under FUA principles by the UK Airspace Management Cell and the airspace of Moldova on the same approximate scale.
So what might the military require access to airspace for in the upper airspace – well here is one example – military fast jet training conducted in the airspace above FL 195. Interestingly one of the prime training bases sits very close to one of the arrival routes into London Heathrow from the North Atlantic – so under FUA principles, the TRA that services this requirement restricts its operations on Monday mornings and Friday afternoons in order to minimise the impact of the TRA. Equally if weather precludes training in the area there are procedures in place for the military to hand back the airspace if they do not require it.
Or possibly as an island with a relatively large naval capability the requirement to fire surface-to-air or air-to-air missiles for testing, training or research and development.

One such range sits in the area to the south of London, over the English Channel and can extend upwards to 50,000 feet if the activity requires it and as such affect traffic flows to and from French airspace.

Through FUA principles the impact of this activity is minimised through joint airspace design and effective procedures for co-ordinating the use of the airspace to avoid busy times for commercial air transport traffic.
…..and **this results in a controlled airspace structure** that links all of the major airports and international routes as shown here.

This shows the **arrangements as they exist today** below 19500 feet – you have already seen the complex arrangement of military training areas and air routes that are above 19500 feet.

The **Airspace Change Process** is used to make modifications to this structure **and requires our approval** in the Civil Aviation Authority whether the request comes from the Ministry of Defence or from a civil ATC organisation.
I do not intend to spend a lot of time telling you how we use the ICAO Airspace Classifications, but for the purposes of this presentation, it is important to know that in order to meet the demand from a large and active military community and our large General Aviation population we make extensive use of Class G airspace below FL 195. Most airways and busy TMAs are Class A and most of our Control Zones are Class D. Danger Areas and Temporary Reserved Areas retain their background classification of the airspace within which they are embedded, although in some cases additional special rules apply.
There is a fully collaborative approach by CAA, NATS and MoD to the separate functions of airspace policy and planning, and ATS provision within all airspace above FL100 and controlled airspace below FL 100. We consider this to be very important and provides the basis of our successful use of FUA over many years.

In particular all parties recognise that:

• **Airspace is a joint resource** and each party has a perfectly legitimate right to request access in accordance with certain agreed priorities.

• With the exception of airspace segregated for safety reasons, **expeditious access to all airspace should be available to all users** all the time

• Subject to operational prioritisation and unless agreed otherwise, **ATS will be available on request from NATS and MoD units providing common services to the same standard.**
Flexible Use of Airspace (FUA) (1)

Through the Concept of the Flexible Use of Airspace:

- Airspace should be considered as a continuum and allocated according to user requirement

- Any necessary airspace segregation will be temporary, based on real-time usage within a specific time period

So how do we apply the Flexible Use of Airspace policy in the UK?

Firstly airspace is regarded as a continuum to be allocated according to user requirement. Under this principle, some segregation will remain such as busy TMA/airways, however in the main any segregation that may be necessary will be time based on real-time utilisation with an overall pre-planned time period. In other words if the activity is cancelled or completed the airspace is handed back for use by other airspace users.
Flexible Use of Airspace (FUA) (2)

- Level 1 – Strategic ASM
  Directorate of Airspace Policy (DAP)

- Level 2 – Pre-Tactical ASM
  Airspace Utilisation Section (DAP) & Joint Airspace Management Cell

- Level 3 – Tactical Airspace Management Cell & the Area Control Centres

CAA provides Level 1 national policy structure for FUA – DAP provides the policy sponsorship for FUA in the UK. The policy is laid down in Civil Aviation Publication 740 (CAP 740 – available via the CAA web site) and it is pleasing to see that that the Eurocontrol Institute of Air Navigation Services (IANS) ASM-ASM course staff frequently cite this UK as an extremely good example of FUA in action.

Level 2 – pre-tactical airspace management, the day-to-day allocation of airspace is carried out by the Airspace Management Cell (AMC), a fully joint civil/military organisation based at the NATS’ ATCC at Swanwick, and its co-located Military Airspace Booking and Co-ordination Cell - in close co-operation with the Airspace Utilisation Section (AUS) which is part of DAP and based in CAA House in London.

Level 3 – real-time use which is managed by AMC and the ACCs, against pre-arranged and agreed criteria as set out in the CAP 740 and other Letters of Agreement (LoA) or Memoranda of Understanding (MoU). The co-location of military and civilian controllers in the ATCCs provides considerable benefits here, as they are able to interface directly to resolve operational issues as they arise.
The UK Government has adopted the Single European Sky initiative, which is set out in EC Regulation 551/2004. This forms the basis of the Flexible Use of Airspace (FUA) Concept. The common rules for FUA are established in EC Regulation 2150/2005.

Whereas prior to 2004 there had only been the Flexible Use of Airspace Concept as published by Eurocontrol, we now have to consider the implementing rules and regulations that flow from the European Commission’s Single European Sky regulations.

Within this package there is a very specific EC regulation that is directly applicable in UK law and requires to adopt the principles and procedures that are set out in the regulation.

This was not an issue for the UK as we had already adopted the Eurocontrol concept in full.
UK Application of FUA

- Airspace Management Cell (AMC)
- Routine co-ordination (safety cases, etc), Military Users Airspace Co-ordination Team (MUACT), Joint Future Airspace Development Team (JFADT)
- Flexible Use of Airspace Policy Group (Airspace Strategy Steering Group)
- National Air Traffic Management Advisory Committee (NATMAC)
- Joint Air Navigation Services Council
- CAA Board (with MoD member in attendance)

The key issue for the success of FUA in the UK has been the joint, civil/military nature of the approach to airspace policy, design and utilisation.

This slide lists all of the institutional bodies, committees and groups that have an impact in terms of airspace design and planning. I do not intend to go through all of the bodies listed here, but they all serve to demonstrate the joint civil and military nature that is, in our experience, vital if FUA is to work in any volume of airspace. All of these bodies have civil and military representation, importantly, on equal terms, but at the end of the day the final decision on airspace design matters rests with the Director of Airspace Policy and both civil and military authorities are required, by law, to respect that decision.

To work this requires mutual respect, trust and a willingness to cooperate in order to deliver the most effective solution where there is simply not enough airspace to permanently segregate the airspace for one user or another.
Getting a little further into the detail of how we apply the policy and on what basis, we have published an Airspace Management Manual in 4 parts:

- The introduction and overview requires no further comment.
- The Airspace Management Cell process and procedures describes the how the arrangements work.
- The Military Airspace Booking and Co-ordination Cell (the MABCC) is co-located with the UK AMC and enables military requirements to be fully taken into account at the pre-tactical stage.
- And finally, but most importantly the requirements for how utilisation is captured and recorded to see if either TRA or CDR utilisation is producing the most effective solution for the UK as a whole. Sometimes TRAs are booked and not used and not handed back, sometimes CDRs are available and not used.

The ASSG holds overall editorial control of the manual which is issued as CAP 740 on the CAA website.
UK Airspace Management (2)

- Specifies which military activities require segregated airspace
  - Segregation is the minimum commensurate with safety
- Specifies military priorities to be applied by MABCC
  - Effectively profiles MOD bids so as to minimize impacts of activating segregated MDA areas

The Manual effectively specifies:
- Which military activities require segregated airspace – e.g., live air-to-air firing.
  - Segregation is the minimum commensurate with safety
- The Military priorities to be applied by MABCC:
  - Effectively profiles MOD bids in accordance with a pre-agreed set of rules, so as to minimize impacts of activating segregated MDA areas on particularly busy civil air routes at certain key times of the day.
Managed Danger Areas - Design Process 1

The next set of 3 slides gives you an example of how a Managed Danger Area over the North Sea (a Temporary Reserved Airspace) was jointly designed and constructed by NATS and the MoD as part of the re-structuring of the North Sea airspace that took place in 2001/2.

The MoD requirement was for large volumes of airspace extending from sea-level to Flight Level 460 which would accommodate large packages of aircraft such as Eurofighter Typhoon wishing to operate at supersonic airs speeds. These areas needed to be within easy access of the airfields from which the military aircraft would operate but be over the sea to facilitate the supersonic requirement.

The NATS’ requirement was to reconstruct the North Sea upper airspace route structure to optimise the flows to and from the UK and to the continent to create the most efficient (and shortest) route structure to service the major TMAs.

This slide shows the Central MDA, with its 3 sub-divisions which enable either the whole area to be activated or any combination of the sub-sections depending on the activity that is planned.
NATS then added the route structure that would be necessary to service the civil GAT demand when the MDA was active and this is what is shown on this slide in green.
…. And finally the Conditional Route structure (CDRs) was added to enable civil GAT to optimise their route structure when the military did not require either all or portions of the Central MDA to be activated. Equally, in some cases it is possible to cap the military activity at a specific flight level and permit use of the CDRs above a certain flight level. We have a buffer policy that we apply to this, just as we have a time buffer policy for when a route can be activated after the end of a period of MDA utilisation. These are all set out in CAP 740.
Managed Danger Areas - North Sea Design

.... and this is what the final design looks like once the Airspace Change Process had been completed and we had given our regulatory approval for the change to occur.

I am pleased to report that the arrangements work well and we monitor, on an annual basis, the military bookings versus the actual utilisation of the airspace alongside the actual take-up of the CDRs during the times when they are made available by civil traffic.
The need to grow capacity

❖ Demand will always grow to exceed capacity
❖ Future capacity needs must be modelled and measured
❖ Strategic capacity plan is then used to identify projects, with capacity grown by:
  - Airspace & sector design
  - Technology and controller tools
  - FUA used first to minimise waste, but now to maximise capacity (more civil routes)

Notwithstanding what is happening in the current down-turn in traffic caused by the global economic crisis, we anticipate that demand will continue to grow to exceed capacity in certain times and certain places in the UK.
Consequently, the future capacity needs must be modelled and measured such that we are ahead of the demand requirement.
This Strategic capacity plan is then used to identify projects, with capacity grown by:

• Airspace & sector design – improved efficiency
• Technology and controller tools – improved capacity allowing the controller to handle more traffic safely.
• In this context FUA was used first to minimise waste by removing large volumes of (in some cases un-necessary) segregated airspace, but now to maximise capacity (through the provision of more, or more direct, civil routes thereby reducing fuel burn and the quantity of emissions).
Future Joint Airspace Management (1)

- Automate processes and develop IT support tools for AMC/MABCC to:
  - Remove ‘human error’ opportunities
  - Store advanced details of segregated airspace requirements (major exercises)
  - Deliver manpower savings

For the future we need more tools to automate the process. We now have over 100 airspace entities that can be managed by the AMC and this results in a high degree of complexity and potential for human error. Such tools would enable us to maintain the necessary standards of safety by:

- Removing an element of the human error.
- By storing data on the future requirement, e.g., the 2012 Olympics, other major sporting events or political events or major military exercises.
- Making more efficient use of resources by reducing the amount of human input required to process airspace requests and deconflict them and issue an airspace utilisation or allocation message.
Future Joint Airspace Management (2)

- Automate and speed-up data flows
- Enable Enhanced Airspace Management (EAM) decisions to be made on an informed basis by AMC
- Facilitate promulgation of EAM decisions to all airspace users
- Enable re-allocation of airspace where pre-planned activities cancelled
- Facilitate full connectivity with ATC displays and flight planning systems

We also need to be able to:

• **Automate and speed-up the data flows** – for example is information available in sufficient time for an airline operator to be able to react to it and load the right fuel load to use the route.

• **Enable Enhanced Airspace Management (EAM) decisions to be made on an informed basis by AMC** – this will be important for the future of SESAR.

• **Facilitate promulgation of EAM decisions to all airspace users** – it is no good making the decision if the message cannot be passed efficiently to all those who need to know the information and then use it. In some cases this could mean General Aviation users, so the delivery mechanism must be robust or you must default to the lowest common denominator.

• **Enable re-allocation of airspace** where pre-planned activities are cancelled – in what timescale – how quickly can ATC or the airspace users react if an activity is cancelled or stopped sooner than originally planned.

• **Facilitate full connectivity with ATC displays and flight planning systems** by making sure that the right information is made available to the right people in as close to real time as possible.
Questions?