The Future of Safety in Air Traffic Management
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Maintaining a high level of safety, while also fulfilling demands for efficient use of airspace capacity, has underpinned air traffic control (ATC) – and now branded as Air Traffic management (ATM) - services since their origins. The presentation was in four parts : (1) it reviewed the tasks that challenge NATS (National Air Traffic Services) as a service provider, with a focus on safety in operations, (2) it looked into the obligations required of the provider, (3) it outlined strategies that have been adopted to harness the potential to use information and data streams better as they have increased in quality and quantity and (4) illustrated concepts for linking theory to the practice that relate to current operations.

(1) NATS as a service provider, with a focus on safety in operations.

NATS provides area airspace management over the UK from Centres at Swanwick (between Southampton and Portsmouth) and Prestwick (Scotland), local ATC services at 15 airports in the UK and has responsibility too for airports in Spain. The presenter used a NATS video to illustrate the UK's 2.2 million movement per year traffic demand, which graphically stressed the diversity of operations (helicopter oil/gas rig support, general aviation, military training, etc., plus commercial airline operations with overlapping demand peaks between continental and inter-continental services). The NATS 24H video is on-line at the following web address:

https://www.youtube.com/watch?v=a8CQ29yWvZI

(2) The obligations required of the service provider

A number of 'safety' definitions, used either generally or specifically in aviation, were introduced and discussed, and the speaker commented on their general content as supporting the traditional view that safety is expressed by the probability of its absence.

The 'linear theory' approach used in traditional safety management analysis ranks perceived failures on a matrix (failure effect categories and failure probability ranges) with each combination having acceptability attributed, and analysis requiring that ordained necessary outcomes shall be ranked as 'acceptable.' It was pointed out that this would not have foreseen events such as the 'Überlingen' accident (1 July 2002 – a collision of two aircraft over southern Germany), or a situation with 'organisational issues' (6 March 1987 – capsize of the 'Herald of Free Enterprise' ferry – at Zeebrugge, Belgium) and "complex interactions" (3 December 1999 - Mars Polar Lander loss, attributed to a software/hardware failure).

The challenge that faces NATS (and all current ATM service providers) is to address safety issues more widely. NATS is already a complex organisation. Additionally, their operations reside now in SESAR (Single European Sky ATM Research): an environment arising from an on-going European project which has passed through definition and development stages, and as of 2014–2020 is regarded as is in 'deployment'. This will result in controllers handling more complex '4D' ATC clearances (3D position and time-tagged – applicable at multiple

points over continental airspace regions). Managing the changes in prospect has required NATS to conduct a root and branch review of its safety strategy.

(3) Strategies addressing high quality/quantity information and data streams

The speaker called for a 'broader approach to safety.' Traditional safety processes do not analyse and corroborate the complexity of decision-making that will use information and data streams generated in a global network, and that influence decision-making at local levels. The NATS strategy aims to define an approach that will assure the local operator that they are able to reconcile necessary safety attributes and essential capacity outcomes.

To achieve this he advocated a 'safety intelligence' approach. This analyses the outcomes from influences in justifiable support processes, and that transfer readily into operational process and procedure support. The technology attributes need to make this as transparent as possible to the controller or user, and not to limit their scope for applying best practice.

(4) An example linking theory to practice, and related to current operations

A potential strategic tool, to assist an operational controller, was illustrated. The interim Future Area Control Tools (iFACTS) examples he showed were clearly addressing issues on which controllers can hope to find support. But a static display of a research implementation out of its operational context, whilst it was explained well, was the source of some issues raised in the Q&A session. The presentation did insist that

- the tool is not to replace human judgement
- it is not limited to investigating 'one-off' events (i.e.: it will examine how a conflict resolution can propagate to other traffic)
- above all, it was stressed that it would leave the operator to decide what criteria to apply, and thus to uphold their own 'best practice' beliefs.

Also, he exemplified associated work with a graphical presentation of minimum separations between aircraft in a large traffic sample. This showed how 'successfully' controllers work close to, but rarely breaching, the 1000ft vertical a 5nm horizontal separation minima. It is possible that by assisting in maintaining these separation minima, but giving controller the confidence to work closer to them, more efficient use of airspace will occur, and potentially in will bring significant capacity benefits with no deterioration of safety levels.

This was an uncompromising look into the future, and gallantly taken on, given the breadth of interest in the audience and the inevitable fact that practitioners do not easily warm to the edicts of a modern scientist. Questioning was led by some controllers present, whose concerns on the potential impact of the developments underlined the caution necessary when applying new policies. More topical issues broadened coverage too, some asking what NATS could do to protect aircraft against 'drones,' and others questioning how ATC staff competences will be monitored. These were in depth insights from the 75 or so strong audience who had been given a perspective that is rarely in the public limelight. It enlightened everyone to work that will impact every future operation served by NATS.

Lecture notes by Mike Hirst