



Spaceport-1 Outer Hebrides Scotland Airspace Requirements

Workshop on New Entrants

Integration in the NAT Region

Presentation by: Paul Brundle MBE MSc MCGI

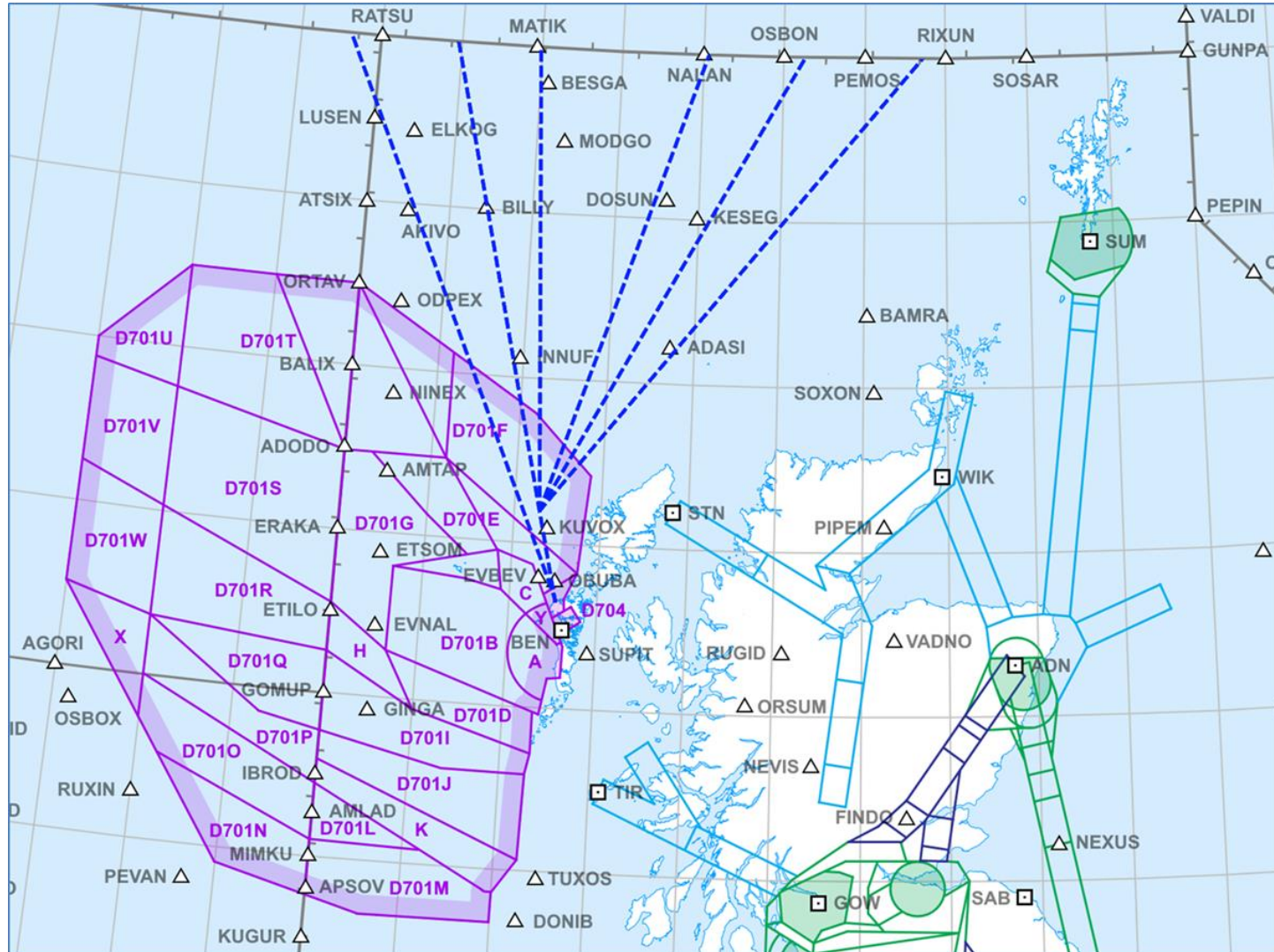
QinetiQ - Airspace Change Sponsor



Spaceport-1 (SP-1) Location – Scotland Outer Hebrides



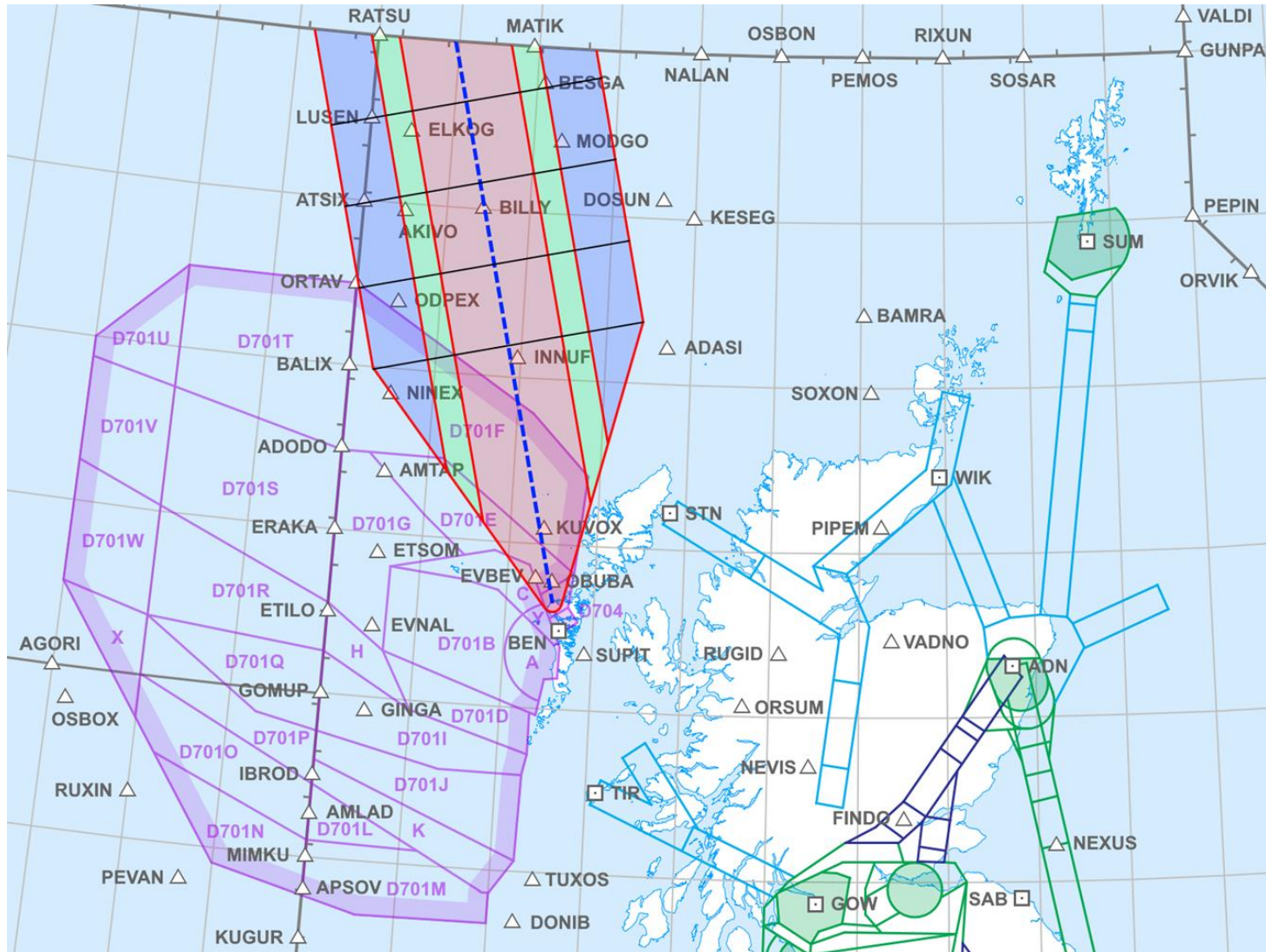
Original Concept - Orbital and Sub-Orbital Rocket Launch (latter just using EG D701)



Hypothetical Orbital Launch Trajectories

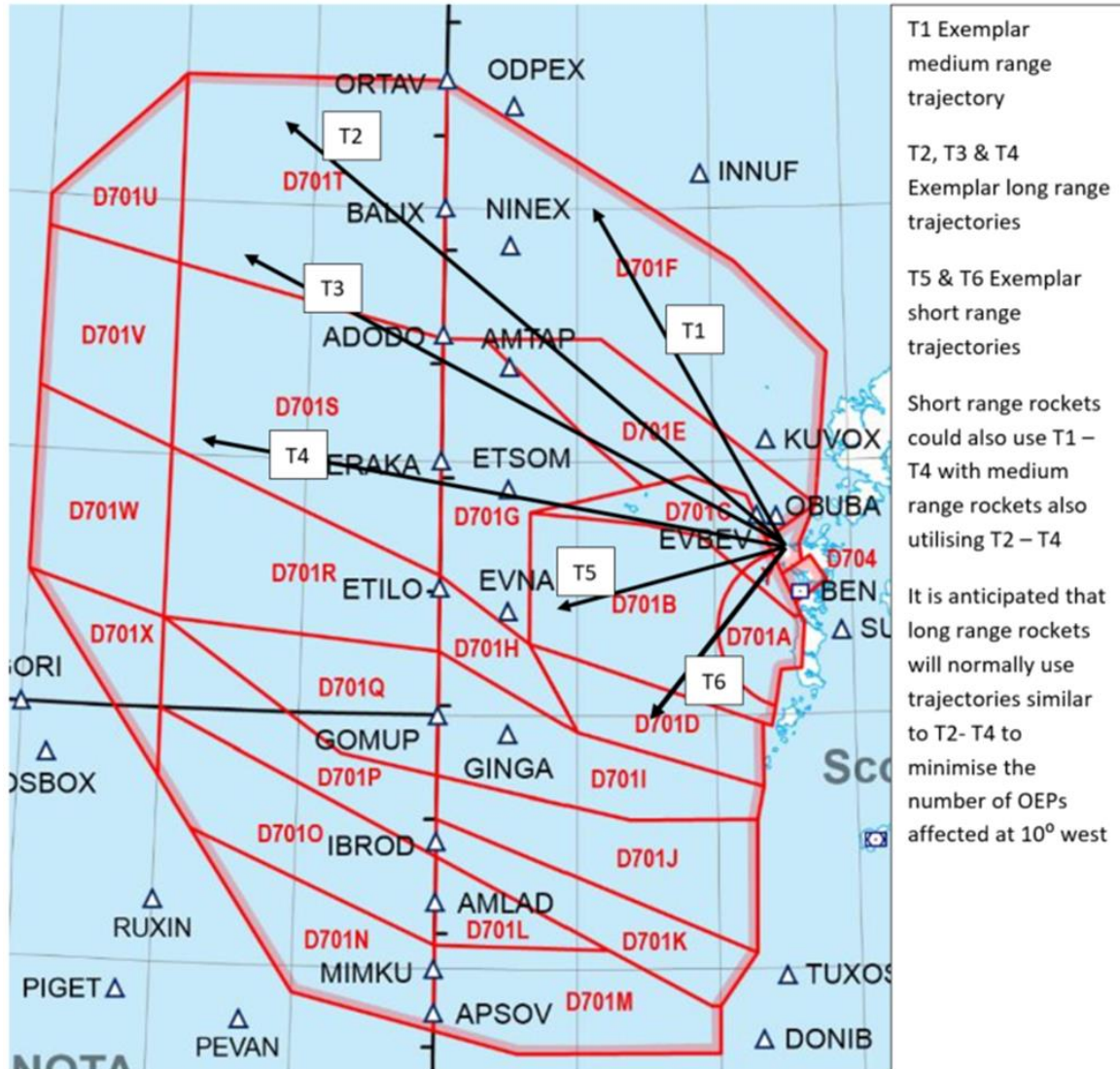
- Potential to have six different launch profiles, three sun-synchronous and three Polar orbit trajectories
- Each would need a safety corridor, the size of which would depend on rocket maturity, capability and payload.

Hypothetical Launch Profile and Airspace Requirements– Exemplar Sun-Synchronous Launch Profile



- It was anticipated that a variety of airspace solutions might be necessary to meet the varying safety trace of each rocket type
- For a mature small rocket system the red shaded area may have provided sufficient protection in the event of catastrophic failure.
- An immature larger rocket system might have needed the red, green and blue shaded areas.
- It is further surmised that the ‘corridors’ would have been sub-divided laterally as once the rocket reaches a certain altitude it will no longer pose a risk to aircraft below

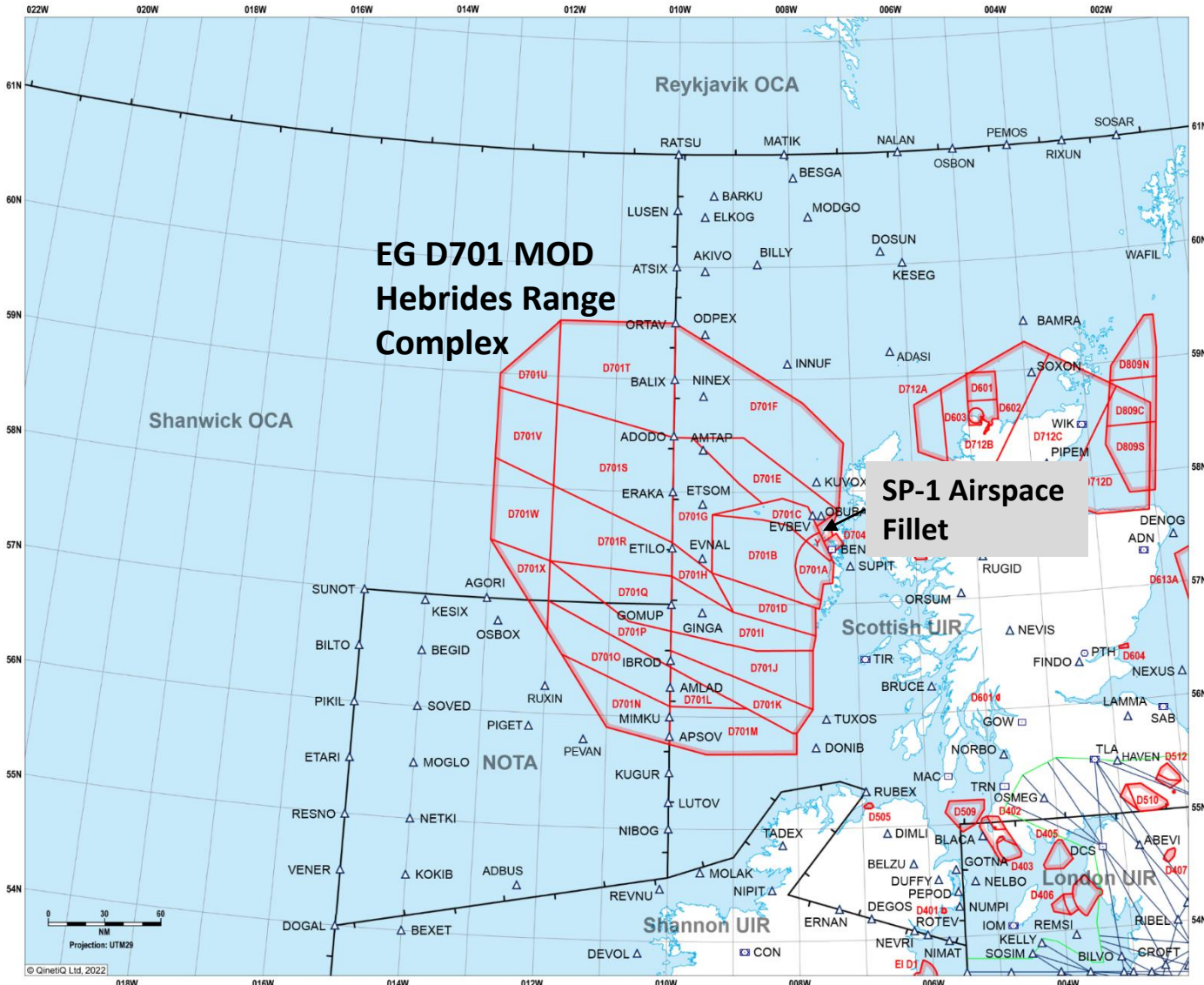
SP-1 ACP De-Scoped in 2022 to Remove Orbital Launch Requirement



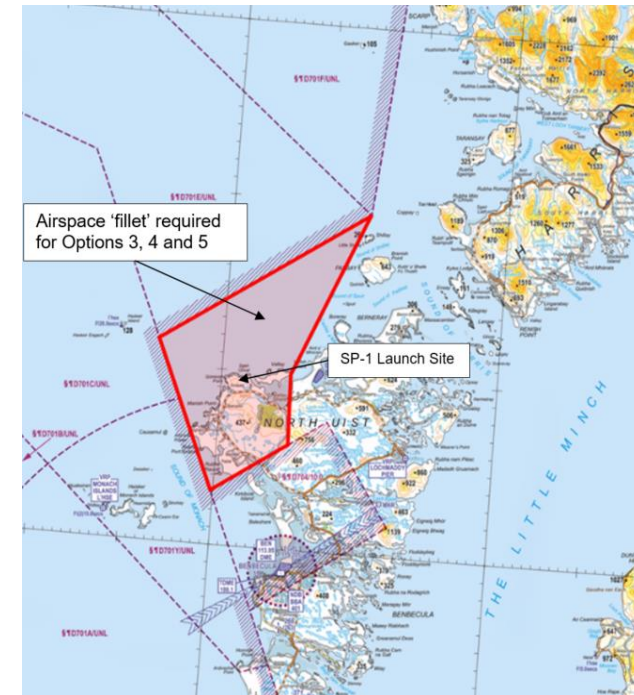
Issue 1.0

- Initial consideration was to ‘future proof’ the airspace however business model and planning application was based on sub-orbital sounding rocket launch only
- **Airspace Change was de-scoped removing orbital requirement entirely**
- Trajectories will be within the sector 225° to 315° will aim to minimise North/South as this can cause more impact on the NAT – **All trajectories contained within EG D701**

Spaceport-1 (SP-1) Location

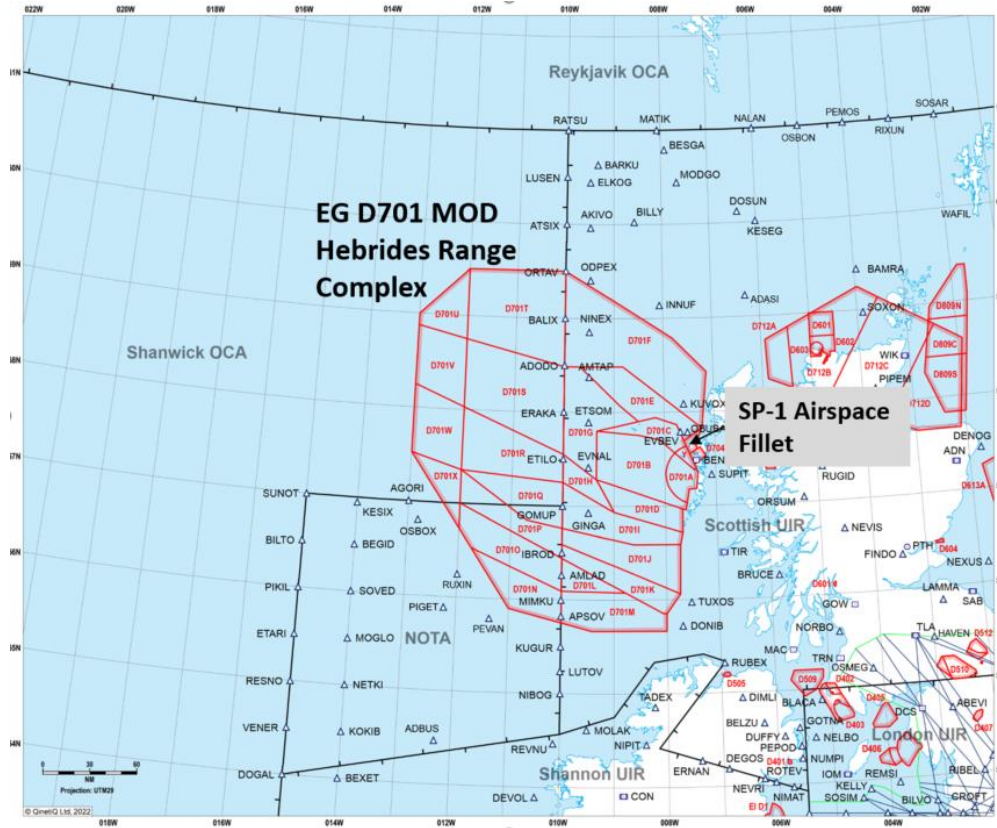


- Location in relation to the QinetiQ managed MOD Hebrides Range Special Use Airspace Danger Areas (DA) EG D701 complex
- Only a new small fillet of airspace required to provide connectivity to the existing DA airspace structure

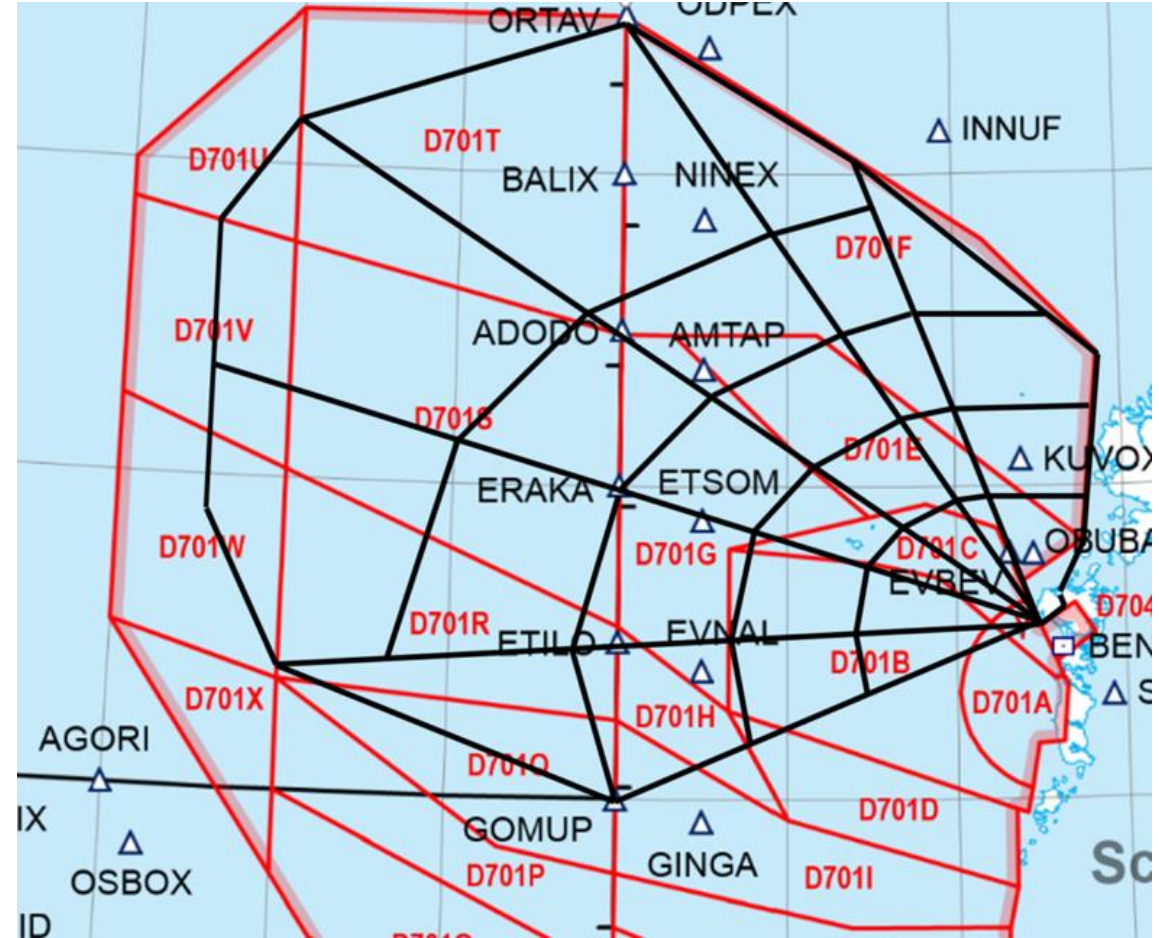


Short Listed Airspace Options

Options 0, 1 & 2 discounted – not meeting SoN



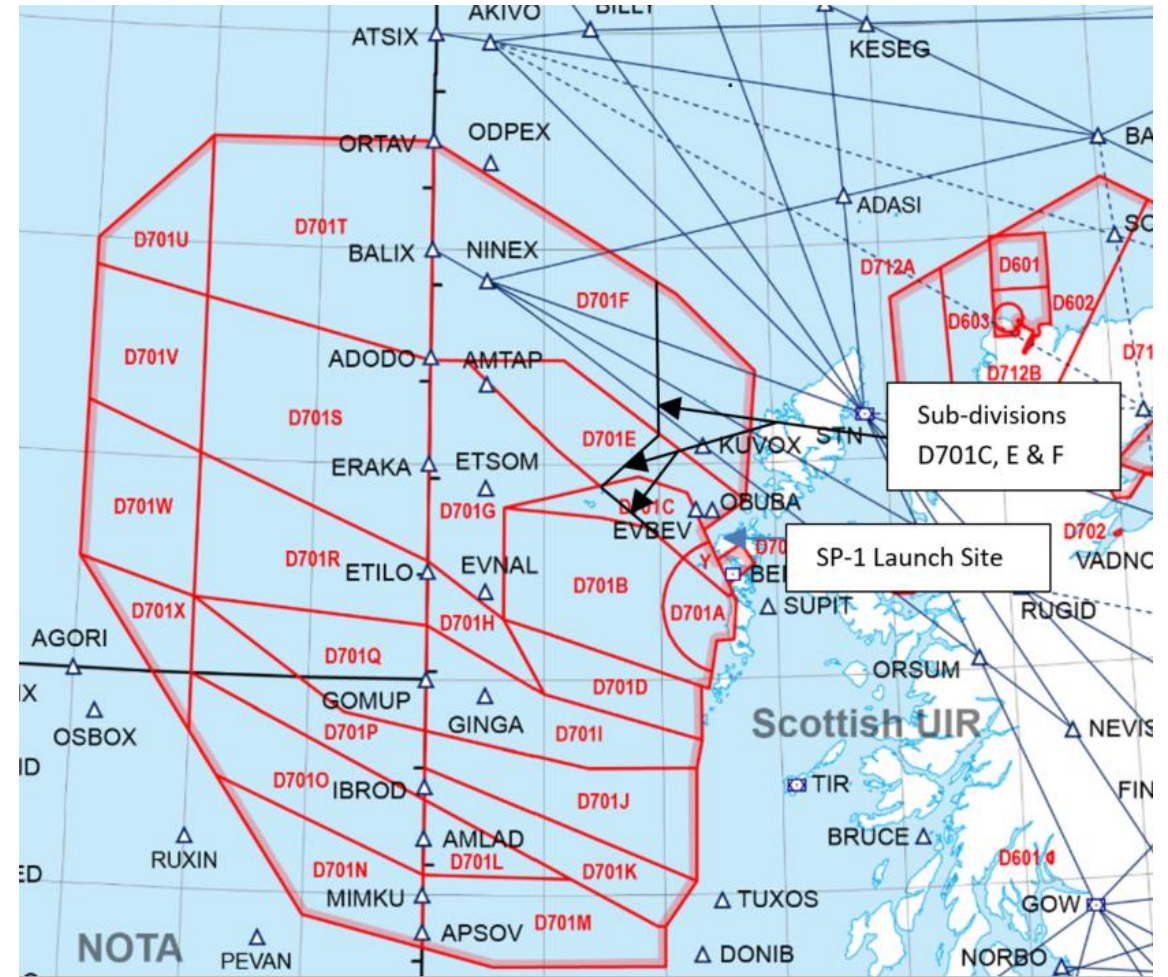
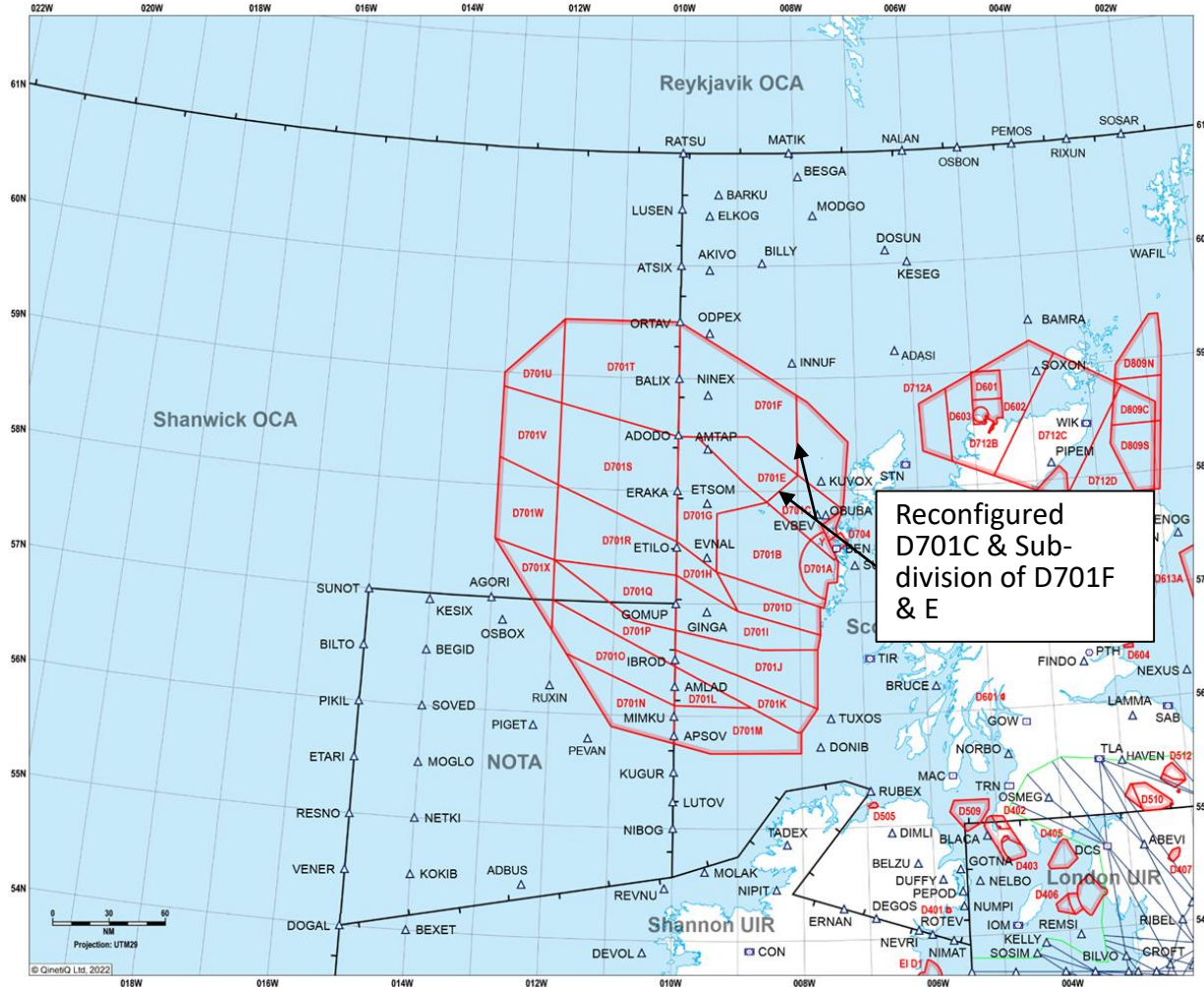
Option 3 – (Preferred Option) New Airspace Fillet Providing Connectivity to EG D701 Complex, Maximising use of Existing Airspace Structure & ASM Procedures



Option 4 – Design New Bespoke Airspace Structure including Airspace Fillet

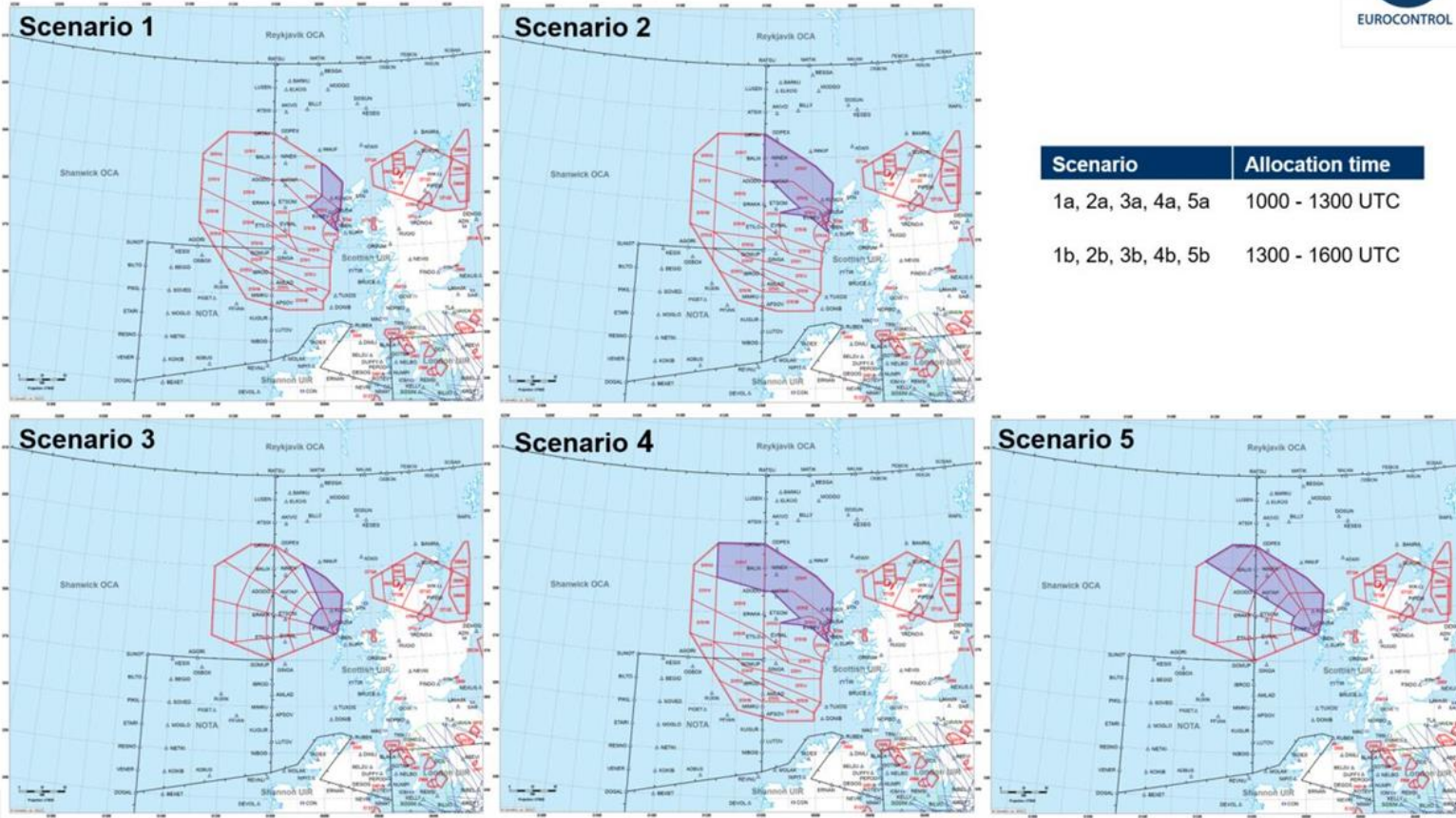
...and overlaid on existing EG D701

Short Listed Airspace Options



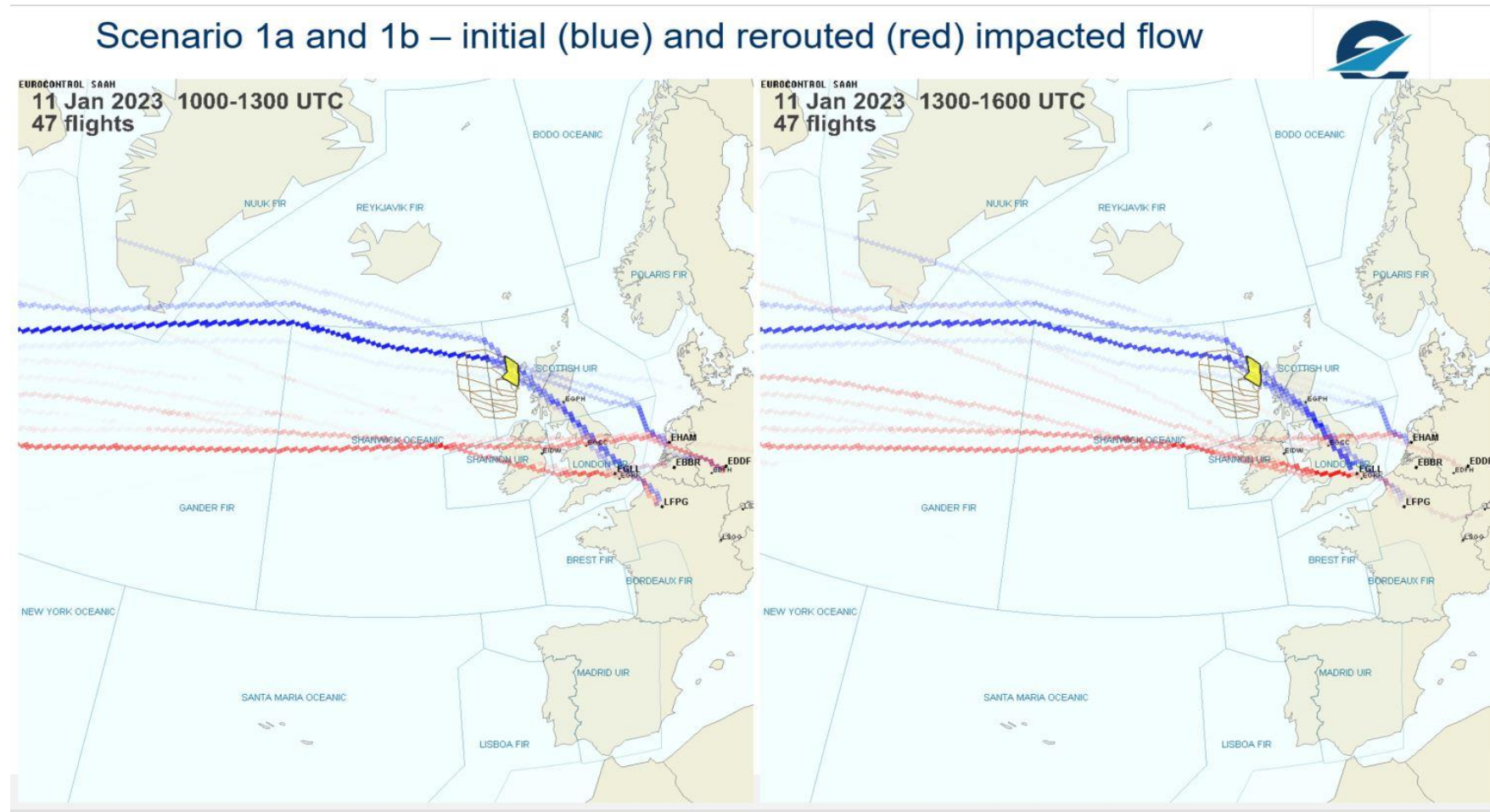
Option 5 – New Airspace Fillet Providing Connectivity to EG D701 ‘Modified’ with either New Sub-Divisions or Reconfiguration of Inner Areas (potentially benefits short range rocket launch as uses less airspace)

SCENARIO DEFINITION



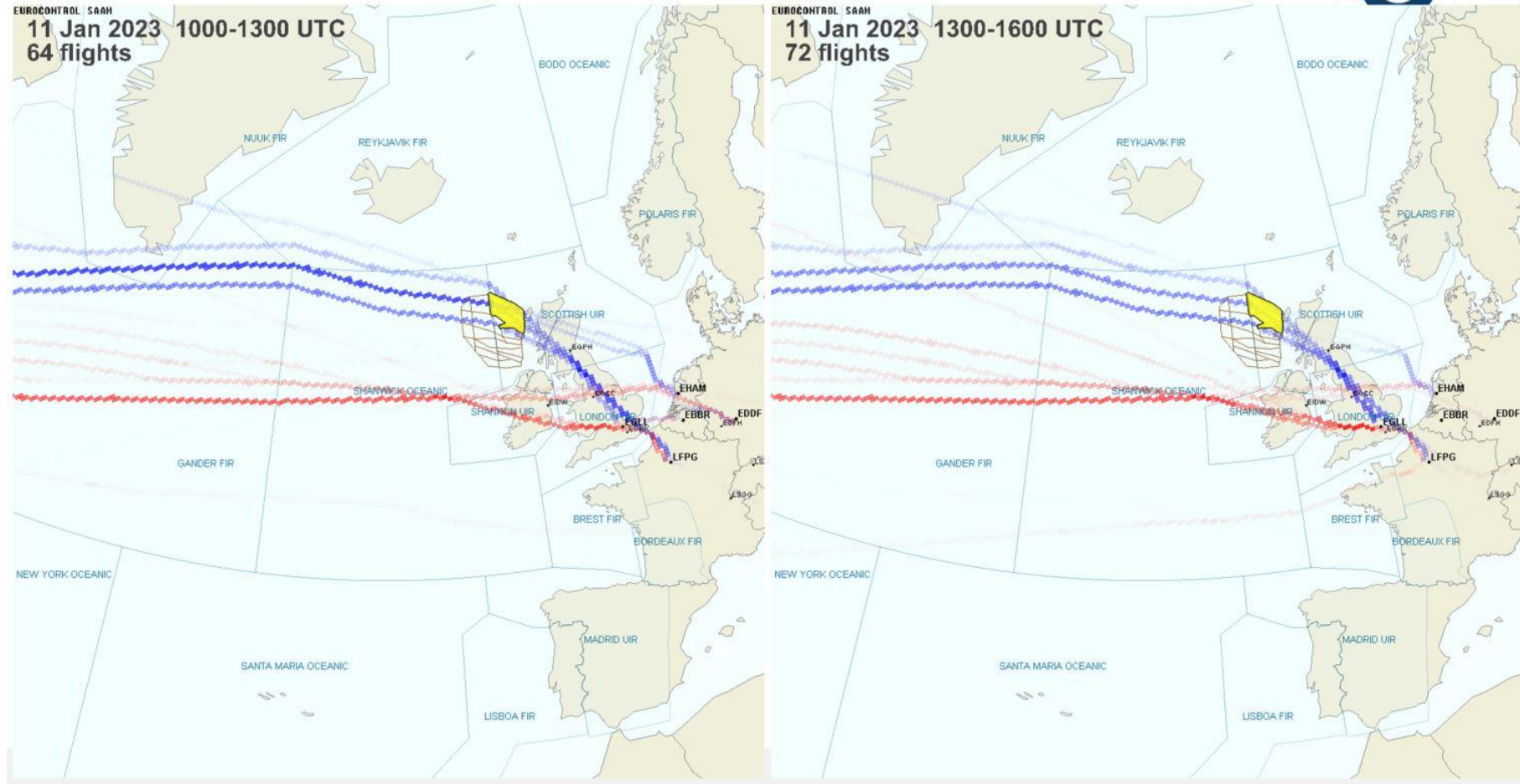
- EUROCONTROL were tasked to consider the 3 Options for both short and long range rocket launch, providing traffic impact assessment for each.
- Using 2023 data for busiest day 11th Jan
- Scenario 1 is Option 5 (re-profiling EG D701)
- Scenario 2 & 4 is Option 3 (use EG D701)
- Scenario 3 & 5 is Option 4 (new bespoke)
- Each scenario considered for two windows 1000-1300 and 1300-1600

EUROCONTROL Analysis of Short Listed Airspace Options



Scenario 1a & 1b shows Option 5 (EG D701 'Modified' with either New Sub-Divisions or Reconfiguration of Inner Areas) short range rocket launch

Scenario 2a and 2b – initial (blue) and rerouted (red) impacted flow



Scenario 2a & 2b shows Option 3 (utilising existing D701 areas) for short range rocket launch

EUROCONTROL Findings

Scenario	Total number of flights	Length (NM)		Fuel (kg)	
		Nb flights	Total	Nb flights	Total
1a	47	45	1751.921	20	9992.51
1b	47	37	1007.908	12	6023.64
2a	64	45	1784.305	20	9992.51
2b	72	37	1007.908	12	6023.64
3a	48	46	1786.479	20	9992.51
3b	48	37	1007.908	12	6023.64
4a	69	45	1784.305	20	9992.51
4b	83	42	1435.055	16	8968.93
5a	73	49	2027.348	23	12401.91
5b	89	52	1880.241	19	11346.03

Evident that north/south expansion of D701 or bespoke areas has far greater impact than any westerly extension

For Short Range Rocket Launch:

- Despite scenario 1a & 1b (Option 5 - modification D701) affecting less flights than scenario 2a & 2b (use existing D701), the number of flights required to fly additional miles is the same for both
- The same applies for scenario 3a & 3b (Option 4 - new bespoke areas)

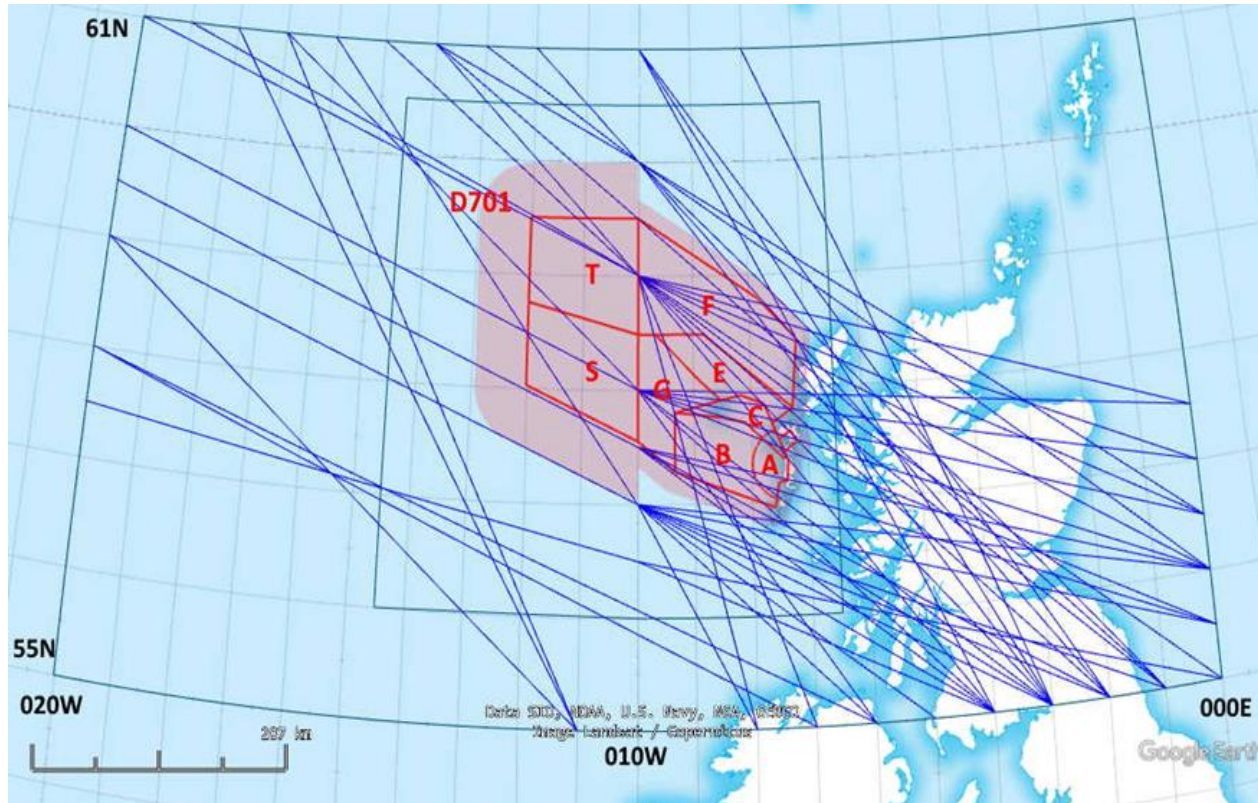
For Long Range Rocket Launch:

- Scenario 4a & 4b (Option 3 – use existing D701) and scenario 5a & 5b (Option 4 – new bespoke areas), the number of flights required to fly additional track miles largely the same – no advantage to use Option 4

Conclusion:

- Option 3 preferred option as:
- Smallest change, to maps, charts, equipment, training, processes and procedures. Known, understood, tried & tested. Considered the safest option

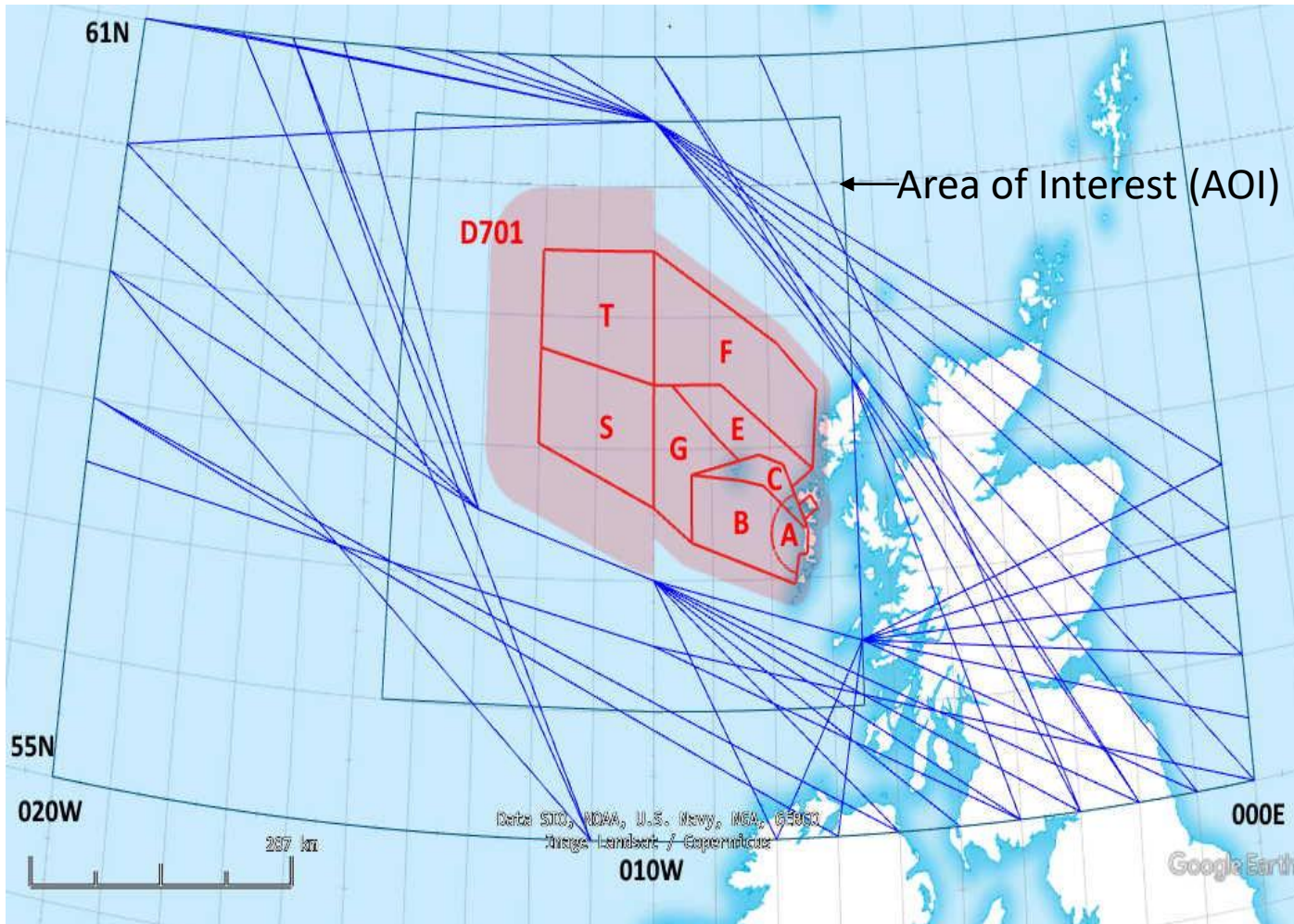
Traffic Impact Analysis – Option 3



Assumptions:

- SP-1 limited to a maximum of 10 launches per year
- One contingency day per launch = 20 airspace activations
- Jetstream in summer favours NAT track southerly flow circa 2 days every 3. Reversed in winter months
- 6 launches expected in summer (12 activations) of which a third likely to impact NAT tracks = 4 airspace activations
- 4 launches in winter (8 airspace activations) of which 5 airspace activations likely to impact NAT tracks
- Circa 9 airspace activations will impact NAT tracks per annum
- Activations likely to consist of 6 long range rockets & 3 short range rockets (based on a ration 2:1 in favour of long range)
- Most common aircraft type B777 all variants burns 9.61kg per km flown

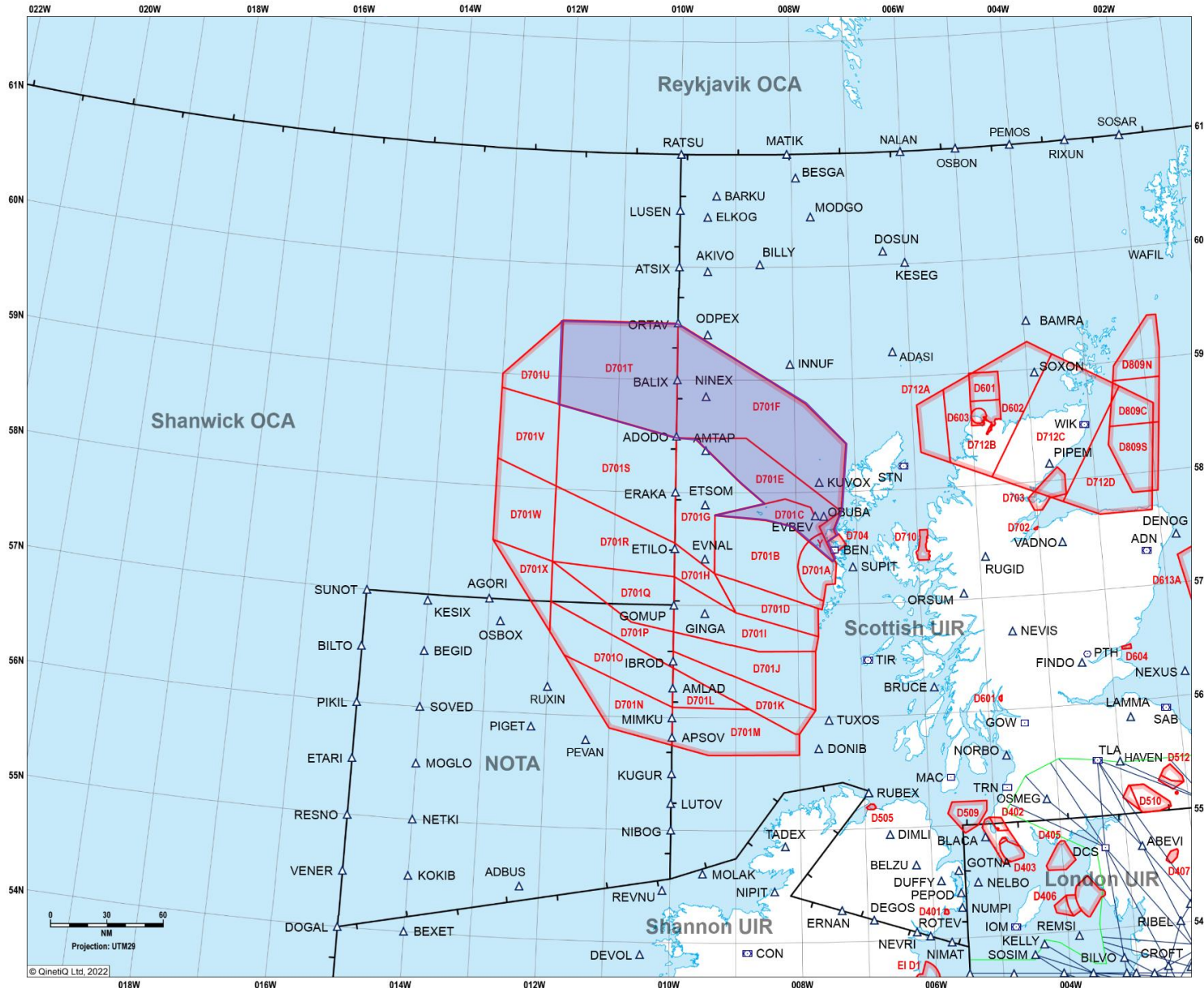
Traffic Impact Analysis



Findings:

Analysing 12 months data (2019) of actual tracks across the AOI (green outline) gave following:

- Using the busiest day 29th Sep 2019
- Period 1300-1600 (launch window) 113 flights affected for long range rocket, average flight deviation 22.8 km
- 71 flights affected for short range (same deviation used)
- $(6 \times 113) + (3 \times 71) = 1011$ affected flight = 23,052km extra/year
- Equates to an additional 221.5 tonnes of fuel burn
- Consider B777 Dubai to Houston flight, extra fuel burn about 0.17% of total
- NOTE: Analysis assumed track deviations at Scottish FIR boundary – in reality deviations can be made much earlier



Exemplar Long Range Rocket Launch

- An example of the EG D701 areas needed for a long range rocket launch at steady state (not immature system) using Option 3 (preferred option)
- Might use more airspace than the other two options but as EUROCONTROL analysis shows, there is little or no difference on impact to NAT traffic
- Analysis suggests extension to the west has little impact on NAT traffic while expansion north/south has a significant impact

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