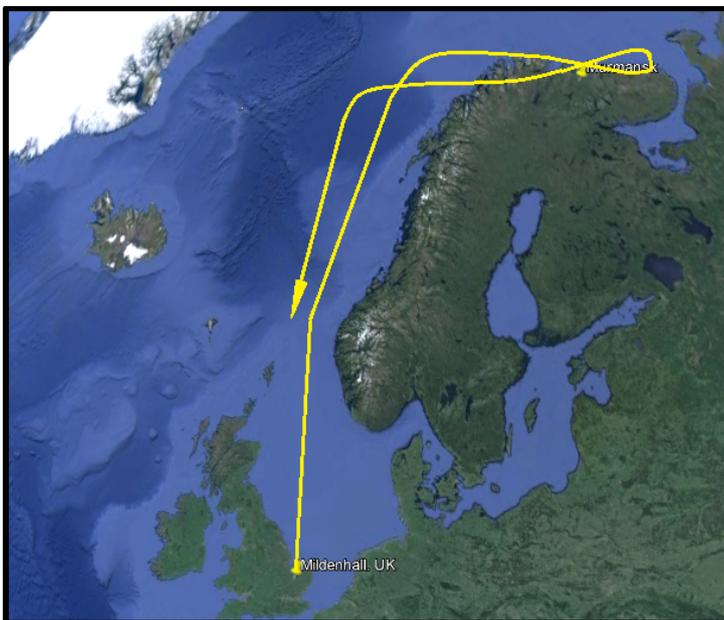


Flying the Lockheed SR-71 - RAF Mildenhall to Murmansk
Col. Richard Graham (USAF Retd)
15 March 2016

This was the tale of an out-and-back flight. There was no specific date but the elements were specific enough. This was a typical peacetime mission in the 1980s. The instructions were to head over an a potential adversary's most secretive naval base, collect data and images, expect some hostile reaction, and fly back again. Dangerous? Yes. Simple? No.

Presented by a speaker who had regaled a bumper audience at the first presentation in our 2014/15 programme, the 225 seat venue was packed again, and this time he carried everyone on the timeline of one of his 'typical' missions. There was excellent illustrative support, so pictures that can convey more than a simple explanation are also used here.



The SR71 mission profile was not precisely detailed, but this is roughly the route described from Mildenhall to Murmansk. once overflown, the aircraft turned to overfly the 'target' again in the opposite direction, and then navigated back to base over the North Sea. Total distance covered would have been in excess of 3,300n.m.

21:00 – day previous (08:00hr take-off planned): crews rested after general medical checks. (There was always a primary and stand-by crew in case of a medical test failure).

05:00 – crew (pilot and Reconnaissance Systems officer) woke up and dressed in basic flight-suits.

05:30 – crew men had breakfast – high protein/low residue: typically steak and eggs.

06:15 – commenced briefing at detachment operations. This involved the full team – both crews, representatives from maintenance, mission planners, tanker operations staff, meteorologists, etc. Missions were planned to be conducted in total radio silence. One person essential to this was the 'tower officer' (ex-SR71 pilot) who attended the briefing, and was the only person in the ATC tower who knew details of the mission. He would inform ATC staff of when the aircraft needed particular taxiway routes, and access the runway: there was no radio communication even at Mildenhall. Additionally there was 'mission monitor,' an officer who throughout the flight was in a 'secure' office, and who used stop-watch and maps to follow the crew. They had no choice but to adhere to the pre-planned routing and profile, so that in the case of any emergency the flight's location would be known and communicated rapidly.

06:45 – the primary crew received a final medical check and were fully-suited.

06:50 – in full flight gear the crew laid on recliner chairs for suit-inflation checks. The suit (50lb (27kg) mass and worth \$230,000) was inflated during a flight in emergency only. The helmet was pressurised with oxygen and was closed (visor down) throughout the flight.

07:15 – the crew would arrive at the aircraft. The stand-by crew would have completed checks up to the engine start sequence and have assessed any issues with the ground engineers, thus allowing the primary crew to enter the cockpit (they had two separate compartments) to slip their boots 'stirrups' into leg restraints, and to be strapped into the ejection seats. Limited mobility in the flight suits required ground crews to conduct the majority of system connections.

07:30 – the crew suit visors were closed, and would not be opened again until after landing. Visor 'heat' was adjusted to minimise visor condensation. Engines were started. The stand-by crew were in a 'mobile' car and in radio silence led the aircraft towards the runway. The car looked for debris on the taxiways as the 400psi nitrogen inflated tyres were sensitive to damage. (A centre-tyre change on the three-wheel gear took around 4 hours).

07:58 – the 'mobile' car entered the runway, drove the full length, and once it was declared to be debris free the aircraft could line-up.

08:00 – navigator would conduct a count-down to the take-off time: engines throttles would be pushed to take-off setting 3 seconds before brakes-off: acceleration was brisk.



Take-off rotation occurred at 180kts, and lift-off at 210kts. The aircraft accelerated to 400kts, and reached 25,000ft altitude after two minutes. The aircraft was allocated airspace and had no need to request routeings on the radio. It received the highest priority.

Mach 0.9 was established and course set to rendezvous with the KC-135 tanker which was awaiting them over the North Sea, in an area west of Norway. Timings were not detailed hereafter, but the rendezvous was 'silent' with low-power navigation systems in both SR-71 and KC-135 providing heading and distance navigation to each as the aircraft closed.

The pilot flew the SR-71 to hold station below and aft of the boom operator's position and the refuelling boom was flown into the aircraft's refuelling receptacle.

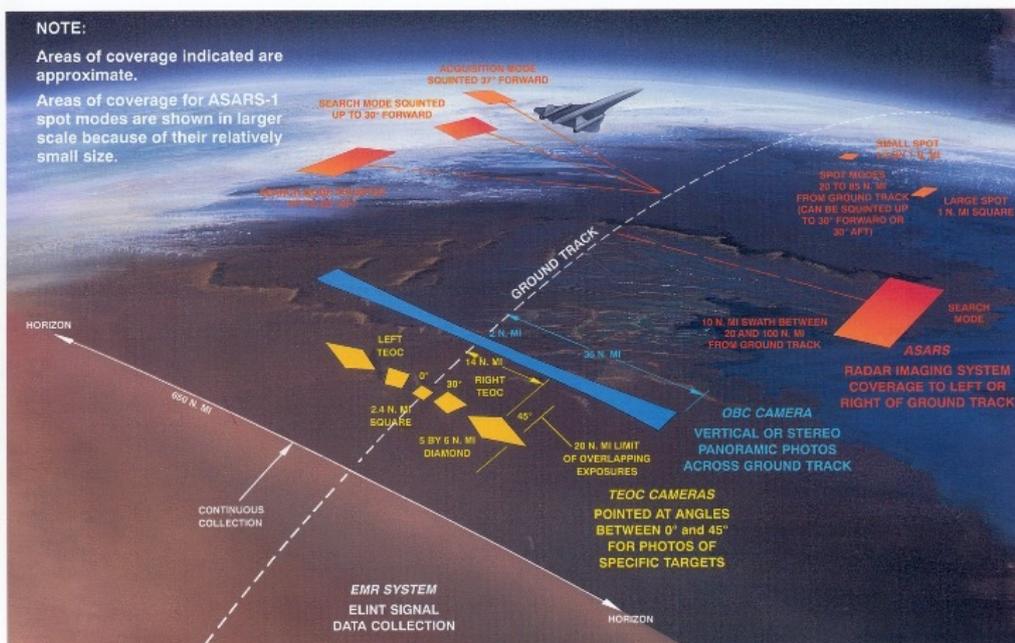


The aircraft used high-energy fuel (JP7) and had a team of dedicated tankers which used this fuel exclusively. Over some 15-20 minutes around 80,000lb (36,300kg) of fuel was transferred from the tanker.

The climb was conducted at a constant 450t IAS, reaching Mach 3 at about 70,000ft altitude. The route curved north of the Scandinavian peninsula towards Murmansk. Almost from the time of leaving the tanker up to when the aircraft would decelerate on its return the aircraft would be under automatic flight control. The pilot could adjust the flight-path by gently scrolling small pitch and roll trim wheels on the right-hand console. Once in the cruise phase the aircraft maintained a 'cruise climb' with about 200ft/min climb rate, and would cruise and manoeuvre at between 75,000-80,000ft over the target area, using reheat power throughout. Fuel consumption was about 21,000lb/hr through each engine. By this stage the airframe was heated by air-friction and the skin temperature in some areas reached 600°F (316°C). Col. Graham recalled that their 'food' which came from a tube of baby-like food, had to be sucked through a tube which had a special aperture on the helmet, and that he would 'warm' his favourite meal by placing it adjacent to the cockpit windows for a few minutes.

An on-board astro-navigation system tracked at least three stars and would maintain 'the black line' (the pre-determined flight path) without pilot intervention to within $\pm 400\text{ft}$ ($\pm 120\text{m}$) as the aircraft entered what was referred to as the 'sensitive area.'

Sensor Data Collection (Terrain Coverage at 80,000 Feet)



This sensor diagram was used in the presentation to illustrate the kinds of devices used, and over what distances they could gather information.

Time in the sensitive area was critical, to limit the possibility of an interception attempt. (Col. Graham said that on one flight he observed three MiG-25s climbing to attempt an intercept: he recalled them struggling to maintain a trajectory and speed that would have allowed an interception). Meanwhile the array of photographic and electro-magnetic detection systems were recording data from the ground below the aircraft. After overflying the area from east to west the return track was followed, staying at high altitude and after passing the tip of Norway heading more southerly towards Mildenhall. It was possible to refuel on the return sector, but this was not always necessary.

The descent profile was conducted at a steady 365kt IAS. Over 15 minutes the aircraft came down to subsonic speed, and was levelled out 2,000ft below the refuelling aircraft (it was always there) with about 40n.m. to run. At this stage the decision to refuel or continue on internal fuel was taken. The aircraft proceeded to the base, and when it was about 30n.m. away the 'tower officer' would

give the ATC tower crew their first indication of the aircraft's return. Again, the airspace was cleared and the recovery was conducted in radio silence. The mobile crew again searched the runway for debris, and the aircraft meanwhile commenced the approach: closed-in at 180kts, and touched-down at 165kts.



The aircraft used a drogue chute to decelerate and would turn off at the runway end, where the mobile crew was waiting to guide them along taxiways to the apron/ramp area so that the crew could shut-down the engines. Opening the cockpit and breathing fresh air was welcome, and especially a drink, as most crew were dehydrated. There would be a foot-of-ladder de-brief and the crew would have time to shed their flying gear before entering an intelligence de-brief: this would be 10-20 minutes normally, prolonged only if anything unexpected had occurred. The aircraft was towed into the hangar and maintenance crews could, if necessary, have the aircraft ready for an equivalent mission within 24 hours.

Col. Graham recalled that he had described a typical mission: the detail was always different. He quoted SR-71 operations between 1968 and 1990 having totalled 17,294 sorties. The audience was delighted with his account, and they generated a flow of questions followed by a resounding show of appreciation at the end of the session.

Lecture notes by Mike Hirst