# AVIATION SIG - BRAIN STORMING FOR SILENT BARN STORMING

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We are all familiar with the need for quieter passenger aircraft, both within the cabins and on the ground. Noise seems to be the greatest obstacle to be overcome regarding airport development and expansion and the need to increase the number of flights to meet rising demands.

Of course there are other topical obstacles to face such as air pollution from hydrocarbon fuels but that is another story.

It is well known just how much the "Industry" has invested in the noise reduction field, particularly the aero engine manufacturers. Many of you out there (a decreasing number) will remember the noisy Boeing 707s, Vickers VC10s, etc., not to forget our beloved Concord. Some may remember major airlines boasting that their aircraft were fitted with "Hush Kits". These did actually give a measurably lower noise output at the expense of performance efficiency.

Not all "noise" is emitted from the engines. We, as regular air passengers, will be aware of the extra noise during take-off and landing phases, emitting from the extended wing surfaces necessary at low airspeeds and from the lowered undercarriage.

Back in November, 2003 The Silent Aircraft Initiative (SAI because the aviation industry loves acronyms) was launched. SAI is being steered by a joint UK / USA venture, Cambridge University and Massachusetts Institute of Technology. The two concerns, together known as "CMI", have been set up as a UK government-sponsored joint venture as a tool to find new ways in which "Academia and Industry can work closely together and exchange knowledge to advance technology in areas, such as aerospace". The "Silent Aircraft" community comprises airframe specialists, engine manufacturers, airport and airline operators, air traffic control agencies, regulators and noise measurement specialists.

Much of the SAI work is being focused on the integration of airframe and engines. This is where the biggest advances can be made. The Operations team is also focused on ways to reduce noise by changing take-off and approach procedures and the economists are in there somewhere, whereby the regulatory scenarios will enable to airlines to meet their business cases. Another group is looking at the benefits to the UK economy.

Current conceptual CAD models have come up with a radically different design approach which is following the old 1950s "Flying Wing" configuration. Quieter engines are mounted towards the rear, within the upper surface. This gives a seamless blend of fuselage and wings for quieter air penetration and overall aerodynamic efficiency. The engine positioning will have the significant effect of reflecting any engine noise upwards.

To be able to reduce the noise at take-off, the exhaust gas velocity must be reduced with a consequential reduction in available thrust. The SAI team is looking at engine exhaust areas of up to three times those of conventional jet engines. Current engine designs use variable area exhaust nozzles and different bypass ratios that can be set for the take-off, cruising and landing phases of flight.

It is believed that some form of vectored thrust will be deployed to compensate for the necessary lower exhaust velocities.

By designing the engines to be embodied into to the upper structure of the aircraft, instead of hanging off pods on the wings, ensures lower drag and radiated noise levels. Furthermore, the proposed longer engine inlets and exhaust ducts could have special acoustic liners to absorb more engine and air flow noises. Surface roughness from rivets and other fasteners, has a accumulative effect on overall noise emitted, both externally and internally.

Rolls Royce allows the research team to use its design, performance and noise evaluation tools to examine new ideas. Further industry partners, such as Boeing have made available their facilities and others have been a source of help and advice to review the emerging design concepts.

It is clear that noise increases with speed so work is also directed at designs to give much lower take-off and landing speeds. However, such things are require higher lift wing designs associated with drag and more noise at higher speeds.

So, where is all this going? Within all this super, high tech. stuff, they have to squeeze in as many passengers as possible, baggage, freight, fuel for long hauls and fit all the necessary entrance and exit doors to comply with current regulations. All at an economic price or none will be sold.

Apart from the new aircraft design, the Operations Team is working on a new advanced form of a Continuous Decent Approach that could allow today's current aircraft to gain immediate benefits. The Team hopes to test and demonstrate this new idea at East Midlands Airport, later this year. I am sure that we look forward to successful trials.