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MR TRANSPORT

Hydrogen fuel?

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SE OF HYDROGEN as a possible substitute for hydro-carbon fuels has received publicity of late, and the Langley Research Centre of the National Aeronautics and Space Administration has developed three possible con-figurations for hydrogen-fuelled airliners based on the size and performance of the 747.
One carries the liquefied gas in an upper-fuselage lobe, another in tanks slug beneath the wings. In a third design the passengers are carried in pods beneath the wings and the fuselage becomes the fuel tank.
Lockheed has a US Government-financed contract to study the implications of hydrogen fuel on a 400-pas-senger airliner, and eventually the company wants to con-vert two C-141 military transports to hydrogen power, it is reported.
One estimate is that within ten years the cost of the potential new fuel could have fallen to only about double the present cost of kerosene in terms of heat output. The obvious problem with liquid hydrogen is its highly inflammable nature. The second is low-temperature stor-age both at airports and in aircraft. Furthermore, its pro-duction from the electrolysis of water requires vast amounts of electricity; but, on the positive side, engines could be adapted relatively easily to run on it.
In terms of heat energy per lb, hydrogen is nearly three times as good as kerosene, but its low density poses volu-metric problems which in turn would lead to higher air-frame weights and possibly aerodynamic problems caused by the larger structure. This effect would be most marked on long-range aircraft. There might also be a structural weight increase caused by reduced wing bending relief from the lower fuel weight.
One accepted method of measuring the usefulness of a fuel for aircraft is to relate its output per unit volume and per unit weight to that of kerosene. The so-called performance index is found according to the following formula:

(Btu/lb) (Btu/gal)
PI=
K

where K is the product of Btu/lb and Btu/gal for kerosene. The latter obviously falls as 1-0 on the resulting scale. Hydrogen comes out at 0-7.
Of other possible fuels methane registers at 0-6 on the scale and boron at 5-4. Theoretically the latter might be used as a powder or in kerosene as a slurry in which case it would have a performance index three times better than kerosene by itself. Pumping and abrasion problems have forced most work on boron to be concentrated on its hydrides which occur in both liquid and gaseous states.

Pentaborane liquid has a 90 per cent higher performance index than kerosene. Boron compounds are expensive and difficult to produce, however, and produce toxic exhausts. Under intensive development for US military applica-tions in the 1950s, boron fuels faded out of the picture in the early 1960s after military contracts were cancelled. Of all the kerosene substitutes it seems that methane (natural gas) may be one of the better fuels. The supply is obviously exhaustible, just like that of oil, but reserves may not be used up as quickly. Methane is easily stored and transported. For a given weight it has a slightly higher heat output than kerosene, though its performance index of only 0-6 indicates its lower density.

SCOTTISH OIL EXPANSION

THE coming year will see a continuing expansion of North Sea oil-related aviation activities in the so-called boom areas of Scotland. Aberdeen Dyce and Shetland Sumburgh airports have continued to be prime centres for this activity, with both reporting significant increases in air-craft and passenger movements. British Airways has had to provide considerable extra capacity on its Aberdeen-London and Aberdeen-Shetland sectors, with One-Eleven 500s introduced for the first time on the extremely profit-able former route. Both scheduled and charter services to Sumburgh have been badly hit, however, by impossible weather conditions during the year.

The oil-related charter market has separated out into two levels—the first is concerned with the provision of regular weekly or daily relief services for oil-rig crews from Dyce to Shetland, Bergen, Stavanger, Esbjerg, Ham-burg and Rotterdam. The major operators in this field are Air Anglia (F.27 and DC-3), Loganair (Trislander), Peters Aviation (Heron), with occasional British Airways and Bristow S-61N positioning flights carrying passengers. Both helicopter operators have had a busy year.

Despite the fuel problem, oil-related aviation in the north and north-east of Scotland is poised on the threshold of further major expansion. If British Airways plans materia-lise, additional capacity will be made available on most of its north Scottish routes, and a decision is expected soon on the long-awaited Viscount replacement for routes to Sumburgh. While this is widely expected to settle on the HS.748. other types in view include the F.27. F.28 and VFW 614. There are reports of major improvements to Sumburgh, involving either a new runway or the con-struction of a new field at Dunrossness. The Civil Avia-tion Authority's report on the future airport needs of Scotland is expected within three months. It is also antici-pated that the long-delayed announcement of the transfer of Aberdeen Dyce from the CAA to the British Airports Authority will take place (probably on April 1).

Air Anglia's two F.27s are familiar sights at airports in Scotland, as are its two DC-3s. The airline told "Flight" last month that up to 90 per cent of its operations are directly or indirectly in support of oil exploration. Opera-tions in support of oil exploration are exempt from fuel rationing