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Military engineering in the Falkland Islands 1982–83

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The Paper makes clear the crucial role played by the rapid construction of forward airfields in the successful development of the Falklands War. The AM2 mat surface can be described as a series of aluminium planks, linked together by in situ hinges. Experience with this type of mat in Vietnam on sites of low bearing capacity had shown that there was little load transference between adjacent planks, and that its use was limited by the California bearing ratio (CBR) of the subgrade on which it was laid. What site preparation was required prior to laying the AM2 mat for the short take-off and landing (STOL) strip, mentioned in § 14, and what was the CBR of the subgrade?

47. Reference is made in § 27 to overslabbing the runway at Port Stanley. This was not the first occasion on which this expedient had been employed under operational conditions. In Singapore, after the Japanese surrender in 1945, it was urgently necessary to upgrade the old civil airport at Kallang. The Japanese had laid a concrete runway on the original grass field, but this proved to be only 5 cm thick, and was rapidly deteriorating under RAF traffic. The expedient there employed was to adhere two layers of prefabricated bituminous surfacing (PBS) to the concrete, followed by two layers of pierced steel plank, the under layer being reversed to avoid puncturing the PBS membrane. This specification successfully withstood RAF transport traffic while work proceeded on the rehabilitation of Seletar and Changi airfields.

48. A possible solution to the problem of spreading the aircraft wheel-load on low CBR subgrades may lie in the application of transverse prestressing to an aluminium matting surface. In theory, this should overcome the lack of load transference through the mat hinges. By spreading the wheel-load over a greater area, the requirement for large imports of fill, as noted in § 31, would be reduced. Has any research been carried out on prestressing airfield mat surfacing?

49. Regarding mine clearance in peacetime (§ 40), there may be an application of a method used for the clearance of a heavy growth of seaweed in connection with a small harbour project in St. Kilda. Small charges were attached to sheets of welded steel mesh, and lowered onto the beds of seaweed. On firing the charges, the steel mesh disintegrated and cut the seaweed, which was removed by tidal action. For minefield clearance, the mesh would have to be positioned by cable from a helicopter. Such an expedient may have already been tried. If so, what difficulties were encountered?

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Brigadier Barton

Mr Colquhoun correctly describes the AM2 mat as aluminium planks linked by hinges. The 12 × 2 ft planks are substantial extrusions with unperforated top and bottom surfaces and multiple webs running in the long direction. Additional extrusions form interlocking joints on all four sides, with separate locking bars for the short sides that are inserted during laying. The planks are laid in a bonded pattern with the long side across the runway. In this way the load distribution is particularly good in the transverse direction; which is the more critical one for avoiding rutting. As Mr Colquhoun says, the bearing capacity of the underlying base or subgrade is a limiting factor. However, the various matting expedients are equivalent to substantial thicknesses of flexible construction; for example, the old pierced steel plank (PSP) developed in World War II is equivalent to 225 mm (9 inches) of flexible construction and AM2 mat of about 600 mm.

51. The STOL strip (§ 14 of the Paper) was made using prefabricated surfacing aluminium mat (PSA for short—it came before the Government Department of like initials!) not AM2 mat. PSA is half the weight of AM2 and consists of corrugated aluminium planks, 2·74 m (9 ft) long by 250 mm (10 in) wide. PSA mat was developed to provide expeditionary runways for transport aircraft like Hercules operating with low tyre pressures (0·55 MPa/80 psi) when laid on ground of CBR 4% or more. Recently PSA has been used to provide STOL strips for Harrier and, because of the lower aircraft loading, the CBR of the foundation soil can be as low as 2–3%. These were the conditions which obtained at Port San Carlos, and the PSA runway carried 150 operational sorties during the period 5–14 June 1982. Site preparation at Port San Carlos was minimal. The grass surface was preserved as far as possible, with just a few high spots removed.

52. Mr Colquhoun's reference to Singapore in 1945 is interesting. The technique he describes is still used with PSP for providing aircraft hardstandings where a good hardcore or similar base is available. In 1945, two layers of PSP on a good base could cope with the aircraft then operating, but by 1982 a requirement to raise an airfield pavement's declared LCN from 16 to 45, in a very short time, required an expedient of a different order. Although there was plenty of PSP in the Falklands, it was believed then that only AM2 could meet that bill, and experience since has shown this to be right.

53. Mr Colquhoun asks about research into prestressing airfield mat surfacing. Research was carried out in 1961 at the Military Engineering Experimental Establishment (MEXE) at Christchurch into prestressing wire reinforced membranes for use as airfield surfacing. The work showed that such a system would reduce sinkage or rutting but that substantial anchorage forces were required. Providing these in an area of already weak ground was likely to be very difficult. Also there was the basic problem with this arrangement that in mobilizing the strength of such a system, deflections were necessary causing the rutting that we try to avoid. During the development of PSA mat at MEXE, some experiments were done in which the mat was post-tensioned. Great practical difficulty was found in tensioning and anchoring large areas and the small amount of prestress which was achieved did not produce any significant improvement in performance. The concept was, therefore, abandoned.

54. The 'large imports of fill' referred to by Mr Colquhoun was really the crushed rock base for the mat. This formed an essential part of the new pavement and it is doubtful if any useful reduction in the thickness of this base could have been achieved. With a geo-grid separation layer under the base a thinner base

layer could not have been worked with our construction plant.

55. On the question of mine clearance in peacetime, the system mentioned by Mr Colquhoun was not tried in the Falklands. Like many others suggested, it is unlikely that it would ever have given the 100% guaranteed clearance needed in peacetime. Sappers are quite capable of creating gaps in minefields in specific places for access trucks using normal breaching techniques. However, it is the guaranteed clearance of all mines from large areas which presents major problems and Mr Colquhoun's suggestion would have been most expensive and laborious while still not giving the guarantee needed.