

Perforated Steel Plate (Marsden Matting)

One Brief History

At some time during the 1970's, I came across this article. It interested me so I kept it, and you may also find it interesting. I have reproduced it below.

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The Magic Carpet

By SMSgt John D. Conklin, *The Airman* Staff
Published in "Airman" magazine, February 1964

Around the world in WWII the 'welcome mat' was out for the US fighters, bombers and cargo aircraft thanks to an incredible product as vital to wartime air operation as the intrepid crews and aircraft.

Once a closely guarded military secret, the product consumed the energies and production capabilities of 29 industrial plants during the height of its usefulness in the mid-1940's.

The amazing new discovery was perforated steel planking. It was wonderfully rugged, heavy and always reliable. Remarkably, it turned sandy beaches, muddy plains and the most unlikely spots on earth into dependable landing strips for military aircraft. No doubt about it, it helped America win the war.

PSP, as it was called, was the brainchild of an ingenious American inventor, Gerld G. Greulich, who was approached in the late 1930's by the War department officials who sought ways to permit the AF to move anywhere with portable airports. With no particular interest in aviation, but a long record of successful steel product patents, Greulich listened as officers discussed the critical need of the US military for portable airstrips. "*Here's your airport,*" inventor Greulich reportedly asserted, scratching out a hastily made pencil sketch of PSP on the back of an envelope. Soon his company laid out the first model runway in his own back yard. Between his makeshift proving ground and his company's workshops he worked out the method of producing a single unit that later became the key element for hundreds of portable runways and airstrips from the islands of the Pacific to the rugged Aleutians and the sandy plains of northern Africa.

What emerged from his idea was an item that looked very much like "*a lot of holes tied together with pieces of steel.*" An early viewer said it looked more like a sheet of roofing talked back to a cannon than anything expected to assist the war effort.

It was a sheet of cold rolled steel, a ¼ inch thick, and 15 in wide with more holes than surface. It incorporated a quick, simple self-fastening principle that allowed like units to be rapidly locked together along their sides to produce a steel clad surface virtually anywhere in the world. A half length (5 ft long) with the same general features was used to trim out the staggered rows of standard PSP units. (Pictures 1 and 2)



Picture 1 and 2 – PSP locking

By Any Other Name

Throughout WWII, PSP was literally the welcome mat laid out all over the world for US aircraft. A pilot in those days would even fly another hundred miles for a strip of PSP.

On the other hand, the aviation engineers who “reshaped half the earth’s surface and covered it with PSP” had various unmentionable nicknames for the stuff. Nevertheless they became expert at moving, removing, tugging, carrying and aligning it in their unsung battle with cold steel, hot steel, mud, and sweat. Well, not exactly unsung, for while American planes were looking for the latest steel strip, the aviation engineers were sometimes loosening their aching backs and sullied lungs with their favourite song, “*The Airborne Aviation Engineer.*”

It is little wonder the aviation engineers were inclined to boast a bit. Reports in early 1943 showed that 9 out of 13 airfields overseas employed PSP in whole or part. These airfields were generally constructed “tinker-toy” fashion of 60,000 sheets for a runway approx 150 by 5000 feet. Getting the metal to prospective airfields was a matter of moving 2,000 tons of PSP in 35,000 cubic feet of cargo space in ships, planes or trucks. (Picture 3)



Although PSP had its drawbacks and problems, its value was unquestioned. The publication, *Aviation Engineer Notes*, September 1943, said: “*It is not a magic carpet. It cannot be floated on a swamp. It is heavy, and transportation constitutes a problem, but in every situation, it has made possible a hard-surfaced runway in a matter of days.*” And that’s what the airmen wanted.

Picture 3 - PSP

General H. H. Arnold in his report to the Secretary of War, January 4, 1944, left little doubt about his views on the role of PSP in WWII. General Arnold’s report stated:

“The portable steel landing mat, used in all theatres, has been one of the outstanding developments of the war.”

A Manufacturing Miracle

Meanwhile, back on the home front, nearly every major steel fabricator and steel producer was sharing the load of producing PSP along with the other wartime steel products. George Reiss, reporting in the trade journal, *Steel*, in August 1943, wrote: *“Already the plants have produced enough steel runways to build a four-laned highway nearly half-way across the nation. And much more is on the way. Some 29 steel-fabricating plants are devoting all or most of their production facilities to the making of portable airports.”*

Forming PSP was an interesting process. The ¼ in thick steel stock, sheared to length and width, arrived in bundles in freight cars or trucks from the steel producer or processor. The bundles were carted to the head of the conveyor line by specially designed low-slung motor carriers.



There it was deposited on skids or roller conveyors. From there the steel stock snaked from stage to stage through the plant, being first ribbed by a giant forming press, pierced and flanged by another mammoth unit, slotted and trimmed to exacting standards. After it was finish-formed the PSP continued to move through the plant at about the pace of a man walking and on into bonding, painting and drying facilities. At the shipping point, PSP left the conveyors and was steel banded into bundles suitable for shipping to seaport. (Picture 4)

Picture 4 - PSP bundles

Customer Got Expert Installation

From the modest beginning in the backyard of the inventor, PSP installations became a crowning tribute to the ingenuity and resourcefulness of the aviation engineers. Techniques were developed in the US for the rapid deployment and installation of PSP into combat-ready runways and air facilities in a matter of hours. Some of the first exhaustive tests to determine the fastest methods of performing all the tasks associated with PSP were performed at Fort Belvoir, VA. Other tests to prove the feasibility of using it on various soils and under various weather conditions were conducted across the country and far behind the lines of combat theatres.

Along with experimentation into fast methods of handling and installation, military officials sought ways of effectively camouflaging PSP. Inherently, it possessed a self-concealing effect once it was down long enough for the local vegetation to find its way through the perforations. But, when first installed on fresh cleared terrain, it became, inappropriately, quite stand out despite its standard olive drab colour. In some cases, special painting and concealing techniques were used by the aviation engineers to hide their work. Nevertheless, among various designs conceived by the concealment experts were ways of transforming a field of PSP into farm plots, orchards or something with less enemy appeal than a neat, new steel-clad airstrip. The story goes that one pilot, well aware that he was to test the effectiveness of a concealed field of PSP, flew his aircraft to the designated coordinates and then informed the control tower, *“Where’s the airport?”* *“Right below you Sir,”* the tower operator assured the pilot. Refusing to believe the well-intended instructions because he could see nothing but a vast orchard and pleasant fallow fields below, the pilot flew beyond its range and crashed the aircraft.

On locations in the war theatres, and with AAF aircraft practically waiting overhead for the next completed strip of PSP to be installed, airfield after airfield were rapidly built. Employing 6 crews of perhaps 12 men each, an aviation engineer battalion would place stretched of PSP in multiple faces each the width of a runway (approx 150 ft) and 1000 ft in length. Prior to beginning this method, that looked like a disjointed committee effort at problem solving, the engineers would very exactly establish reference points to assure alignment of the six separate faces. Then, only a slight tug by tractors or earth movers would pull the slack out of the individual faces of PSP to achieve the necessary hookup.



AUSTRALIAN WAR MEMORIAL

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A Curtiss P-40 Warhawk piloted by Squadron Leader Keith "Bluey" Truscott of No. 76 Squadron RAAF taxiing along Marsden Matting at Milne Bay, Papua New Guinea in September 1942

While rapid installation techniques were being developed, other engineer groups were studying how to demolish an airstrip of the perforated stuff. It was no easy task to plan and prepare the right charges of high explosives that would do sufficient damage to the sturdy planks to prevent enemy seizure and use.

Then, too, there were the engineers working on the ways and means of straightening vast quantities of PSP suffering from sagging ribs, swayback, and other conditions symptomatic of the overdose or bomb-laden aircraft; or worse, the sinking feeling caused by soft earth parting company with the PSP just as it was smacked by the wheels of a returning bomber.

For most of these PSP ills, straightening and reconditioning facilities, worked out by the aviation engineers and allied contractors, saved the day.

All in all, when the chips were down throughout WWII and the USAF planes needed somewhere to set their wheels in a hurry, PSP, aided by untiring engineers, came through like manna from out of the blue. And when all was fought and won, the aviation engineers bent under an estimated 200,000,000 pounds of PSP, proudly straightened their backs and came back home.

PSP stayed on. It lies peacefully among the tall grasses at the edge of jungle, on the beaches and beneath arctic snows. It rests, almost knowingly in fitting repose after carrying a huge share of the burdens of the world's worst war. (Pictures 5 and 6)



Picture 5 and 6 – RIP

On a personal note:

The first PSP I saw was when I landed in Port Moresby airport in a Fokker friendship in 1970. As it was taxiing, I noticed a change in the sound and, on looking out, saw it was on a taxiway of Marsden matting... a good use-by date! When I got to Madang, it was common stuff. The Department of Works had a yard full of it and I obtained a few sheets for the Civil Defence vehicle which was constantly getting bogged. I brought these back to Australia.

I've seen a suspension bridge at Bogia (south of Madang) which used the matting and wire cables.



I did an army patrol to Truscott airfield in the Kimberly region of WA in 1983 and there was a lot of matting left there, together with old steel helmets, rusted, but quite intact. I had the chopper pilot sling a piece which I was going to take back to Darwin for the Mess but when the Nomad aircraft arrived to extract us, the pilot said he didn't have the load capacity and I had to throw it away. (That was in the days when the Nomad had a habit of falling out of the sky! I didn't argue.) It was in very good condition (it was a half sheet).

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