

Naval Operating Base
Kwajalein, Marshall Islands
December 11-13, 1950

Operation Blister

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At about 1930 Monday, December 11, 1950 it started to rain on Kwajalein. This is no novelty in itself since the annual average rainfall is in the neighborhood of 85 inches, making the poncho standard clothing gear. The evening activities were, therefore, not affected - movies, bingo and clubs continuing as usual.

At the eleven o'clock curfew the activity of the island subsided and the lights slowly snapped off, signaling the retirement of personnel, entirely unaware of the appalling picture that dawn was to reveal.

During the night, many of us found it necessary to get up and take emergency measures to make our quarters less pervious to the elements. The more observant noted the wind at about 25 knots and the downpour to be torrential - but again we were lulled back to sleep with the reflection that we were on Kwajalein and wind and rain were pretty much the order of the day or night.

About 0600 on Tuesday, December 12, the realization of our predicament began to crystalize and within the hour the picture was clear. The rainfall in a period of five hours was established by the local Weather Section at 14 inches and the rain was still falling. It later developed that a total of 17 inches fell in 24 hours.

The road on the lagoon side of the island was covered in spots with three feet of water. Other areas, including the various compounds, the airstrip and taxiways, held veritable lakes. About one half of the runway proper was inundated.

The most spectacular effect was to be seen on the runway and taxiways where semi spherical protuberances, immediately called "blisters", had formed. Approximately 150 blisters had formed ranging in size from that of an inverted soup bowl to about 25 feet in diameter and more than two feet high.

The first reaction was that there had been some sort of subgrade failure and that a major repair job would be required.

The contractor, Contractors Mid-Pac, was directed to alert men and equipment for this repair and a small crew was immediately dispatched to investigate in more detail. The opening of two blisters revealed no disturbance of the sub-base. It was sound as a nut.

By this time Mr. T. H. Vaughn, Head of the Public Works Testing Laboratory at 14th Naval District, who was aboard on temporary duty, arrived on the scene. After a brief inspection, he stated that entrapped air had caused the blisters and that if the air was released by a small puncture, the blisters would disappear.

In a few minutes a supply of braces and 1/2 inch bits were on the scene, and the Sea Bees were drilling. As soon as the 3" layer of macadam was penetrated, the blisters subsided with the hiss of escaping air, much like a deflating tire. The air was noticeably foul, probably from decayed organic matter in the subgrade.

As the crew worked down the airstrip and back up the taxiway, there was time for reflection on the cause of this phenomena, with the final theory, still unproved, as follows:

The normal ground water level is about 5 feet below the surface. Between the layer of macadam and the ground water level is a strata of loose coral, well compacted, but very porous. In normal times, the voids are filled with air. With the heavy rainfall and a high tide (4.5) the ground water rose rapidly, tending to force the air upwards. When the air reached the restraining skin of macadam it was unable to escape and started to build up pressure. The blisters formed at the weak spots, similar to the familiar bulge at the weak point of the inner tube of a tire. With the release of pressure, the macadam, being fluid, returned to its original base without fracture.

The theory that the tide contributed in no small measure is supported by the fact that when the tide came up again in the evening new blisters formed even though the surface and ground water had substantially lowered.

Although the blisters had top billing, they were by no means the only effect of the deluge. The topography of the island is such that the outside rim is appreciably higher than the interior. As the runoff poured into the center, the surface water level had risen like coffee in a cup. The cup soon overflowed and individual gullies were formed by these outlaw streams. As the streams rose they carried sand and coral with them to the sea, widening and deepening the stream beds. This brought more water from the center and the continuing downpour lent ever increasing power to the destructive force.

The boat pool and the contractor's barracks area suffered the most from this action. In the former, two boats were undermined and turned over on their sides. Two of the contractor's barracks and one latrine also collapsed. Huge holes, up to six feet deep, formed under the 4" concrete floor slabs which snapped off like peanut brittle.

When the Sea Bees finished "Operation Blister", they turned to constructing sea walls across the ends of the large gullies to prevent further erosion from the wash action of the evening tide, which was to be 6.0, one and a half feet higher than the morning tide.

Oil drums were hauled to the site and one end burned or cut out. The drums were lined up across the ends of the gullies and filled with sand. Sand bags were used to extend the wall to natural ground at the elevation of the drum tops.

As the tide reached its peak again at 1801, the last gap was breached and coral was being trucked in and bulldozed behind the sea wall, filling in the washouts.

The contractor's operations extended through the night and the seventeenth and last patch was completed at about 0200 on Wednesday.

As a final check on the condition of the pavement, Admiral S. C. King, USN, the Commander N.O.B., ordered a load test. Cdr. T. J. White, CEC, USN, Public Works Officer, directed the contractor to load up two 50 ton trailers which had been used on pavement evaluation to test the pavement. The two trucks covered the entire area side by side, followed by a mobile flood light bank. The inspectors found no evidence of failure.

By 0800, December 13, the airport facilities were cleared of all equipment and there was no indication of the storm and the subsequent activity, except for the small pool of water between the taxiway and the runway, and the well-swept appearance of the pavement. The broom brigade had done a thorough job.

The runway was re-opened for traffic at 0800; the first plane took off at 1045, and the Kwajalein strip was back in business.

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