Apollo Command Module Bilge Pump

by Jim Peacock

I can't remember dates or the time frame things happened this far back. All I know is that it was fairly early, probably the first year I was at JSC, which was 1962. When I showed up fresh from the USAF R & D, I was assigned in the Apollo Program Office, to be responsible for all mechanical devices in the Command Module. This included the Landing and Recovery equipment, so it wasn't long before I met Wayne Koons as he seemed to be the lead man in the Recovery Division for my equipment. We got off to a good start, as I remember, when he called me up and introduced himself and started to run down the list of all the recovery gear being designed, and what was wrong with it, and wanted to know if I could help him get the design changes that would lead to successful recoveries. It struck me as a bit strange that none of the equipment had been properly designed. But it was easy to take his advice, because I understood the value of his experience with recovery operations was much better than what came off the drawing boards of the designers at Rockwell. So we got along very well, and he often invited me out to witness Command Module boilerplate tests in Galveston Bay. We got the design changes we wanted without a squabble.

So after a couple of years advancement into the program, we got to the point of doing drop tests in a pool constructed at the Rockwell Downey, California plant with a better structural replica of the command module. It was up to me to determine the drop test conditions for the first drop test, and the Rockwell designers let me know that they were apprehensive about passing the drop tests. The command module bottom heat shield was designed for aerodynamic pressures of re-entry, because they had no way of estimating the loads for water landing. So rather than using the worst on worst landing conditions of one failed parachute at 28.5 knots wind speed, I backed off to a normal three parachute landing with a wind speed of 20 knots, basically normal conditions for a Pacific landing. The idea was that if we tested worst on worst, and it failed, the Rockwell management would be reluctant to redesign the heat shield. So we dropped it in the pond at the normal landing conditions. The impact knocked a whole in the bottom and it sunk in two and a half minutes!

So the command module structure was immediately beefed up to take the water drop test loads. During the following tests, the question of the allowable leak rate came up. My Rockwell counterpart, Joel Underwood, called me one day and asked me what the acceptable leak rate should be. My answer was that there was none specified, because the requirement was that the structure should not fail. He seemed hard pressed by his management to establish an acceptable leak rate, just in case some water came in after a drop test. So I finally told him I would consult with the Recovery Division, which I did. As expected, Wayne and I were in agreement, no allowable leak rate. But I carried the conversation further saying that the designers were used to having a specified requirement, so he answered, almost joking, that “The leak rate shall not exceed the capacity of the bilge pump!” So we laughed about that and I told him that was a good answer, although there was no thought about adding a bilge pump to a spacecraft flying to the moon. When I called Joel back, and gave him the answer, I could sense his bewilderment coming through the phone line. He had no answer to that and that’s the last I heard about the Command Module leak rate requirement. Fortunately, there were no further failures of the drop tests, or operational landings. Although we did have a two chute landing. Apollo 15 landed with two chutes when one chute was destroyed from an unexpected flare up of the Reaction Control Jets. This was required because we preferred to land with the RCS fuel tanks empty because of the hazard. The fix was to land the Command Module with remnants of fuel in the tanks, which had been demonstrated as structurally acceptable by previous landings.

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