

FLUIDS/ HYDROSTATIC PRESSURE

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7 Miles Under the Pacific, a Director Will Take On His Riskiest Project

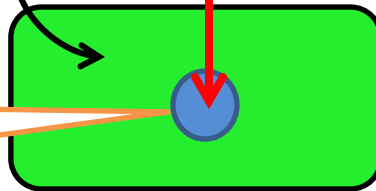
As a boy, he used to squeeze his body into drainage pipes, snaking along to see how far he could go.



James Cameron with his miniature submarine, the Deepsea Challenger, after a trial in Australia. As an adult, he made the two top-grossing movies of all time, "Avatar" and "Titanic"

Pressure on porthole due to 7 miles of sea water above.

Porthole: 3 inch in diameter



INTRODUCTION : The weight density of water is $D = 62.4 \text{ lb/ft}^3$. Hydrostatic pressure $p = D h$ where $h = \text{depth}$.
 $144 \text{ inch}^2 = \text{ft}^2$, $2000 \text{ lb.} = 1 \text{ ton}$
 $5280 \text{ ft} = 1 \text{ mile}$, $A_{\text{circle}} = \pi R^2$, $p = F/A$

QUESTIONS: (a) Convert 7 miles into ft? (b) Find the hydrostatic pressure (p) at 7 miles deep in lb/ft^2 ? (c) Find p in lb/inch^2 (d) Find p at 7 miles deep in Tons/ft^2 ? (e) Find p at 7 miles deep in Tons/inch^2 ? (f) Find area A of a 3 inch diameter wide porthole (in inch^2)? (g) Find force (F) in pounds on this 3 inch diameter porthole? (h) Find F in tons on this porthole?

ANSWERS: (a) 36,960 ft. , (b) 2,206,304 lb/ft^2 , (c) 16,016 lb./inch^2 , (d) 1103 tons/ft^2 , (e) 8 ton/inch^2 , (f) 7.07 inch^2 , (g) 113,097 lb. ,(h) 56.55 tons

And on Wednesday, [James Cameron](#) folded his 6-foot-2-inch frame into a 43-inch-wide capsule and plummeted, alone, down five miles in the New Britain Trench off Papua New Guinea. His feat, in a 24-foot-long craft dubbed **the Deepsea Challenger**, broke by a mile the world depth record for modern vehicles that a Japanese submersible had held. But he

wants to go deeper: This month, Mr. Cameron plans to **plunge nearly (((seven miles)))** to the planet's most inaccessible spot: the **Challenger Deep** in the western Pacific, an alien world thought to swarm with bizarre eels and worms, fish and crustaceans. He wants to spend six hours among them, filming the creatures and sucking up samples with a slurp gun. **"His attempt is also dangerous. Two people once died in a submersible.** Last month, Mr. Cameron lost two members of his team in a fatal helicopter crash. He built his miniature submarine secretly in Australia, and already it has outdone all other watercraft in **its ability to ferry people through the deep's crushing pressures.** His goal with his next dive is to tackle a much older record. A half century ago, in a technical feat never equaled, **the United States Navy sent two men down nearly seven miles into the Challenger Deep, their vehicle 60 feet long. A**

window cracked on the way down. National Geographic said the public would be able to follow Mr. Cameron's expedition at www.deepseachallenge.com. The crew capsules of submersibles are made small to better withstand tons of crushing pressure, and thus have no amenities. Mr. Cameron's solo model is unusually small, its inner diameter less than four feet. He said the vehicle over all had many cameras but **(((only one thick porthole, its inner diameter three inches)))**. He described the craft as a "vertical torpedo," meant to fall and rise quickly so as to maximize time for exploring the seabed.