SKIN DIVER
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THE WONDERS OF WATER

SPECIAL FEATURE

UNDERWATER PROPULSION DEVICES

RIVER IN THE SEA

N.A.U.I. Instruction Course - June 17-23

SPORTSMAN DRY SUBMARINE

One-man and two-man submarines have been exhibited at skin diving shows, sportsmen's shows, and boat shows throughout the country . . . and now this new concept in underwater recreation embodied in the SPORTSMAN DRY SUBMARINE is now offered to the public for the first time. For you and your friends the SPORTSMAN DRY SUBMARINE offers an ideal partnership hobby—and is perfect for diving clubs.

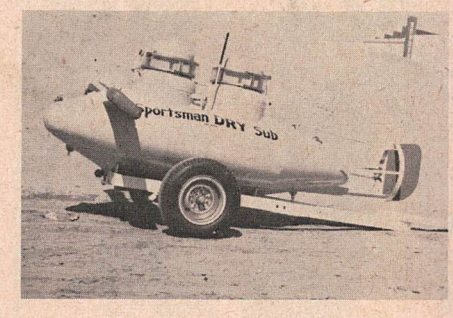
Over ten years of research and development make the SPORTSMAN DRY SUBMARINE the safest, most comfortable, and most versatile unit being produced today. The SPORTSMAN DRY SUBMARINE, like all dry submarines, consists of two hulls . . . the innermost hull is known as the pressure hull. It is a concentric tube tapered at each end . . . made of heavy welded steel construction. The pressure hull is constructed according to A.S.M.E. pressure vessel standards. The outer hull ballast tanks are constructed of lighter material, as they are subjected to very small pressure.

SPECIFICATIONS

RANGE: Approximately 10 miles.
CRUISING DEPTH: To 200 feet.
POWER: 2 HP electrical motor; 2 speeds forward, 2 speeds reverse.
SPEED: 2 to 6 knots.
OVERALL LENGTH: 12 feet.
BEAM: 50 inches.
WEIGHT: 2000 pounds.

However, unlike a military submarine, the SPORTSMAN DRY SUBMARINE has two conning towers with a clear Plexiglas cylindrical window mounted on each entrance hatch . . . of one inch nominal thickness . . . giving 360° view to the passengers sitting inside the dry and warm pressure hull.

The design of the SPORTSMAN DRY SUBMARINE allows it to submerge to a neutral buoyancy. The submarine may then be maneuvered in any direction with airplane type controls. *No experience in scuba diving is necessary!* A working depth of 300 feet is considered safe; however, the SPORTSMAN DRY SUBMARINE is built to withstand pressure of 1300 feet. It can be surfaced in four ways: surface under power; blowing ballast tanks; blowing trim tank; or dropping lead keel. Each submarine is completely tested before delivery. Free instructions with purchase.



Very portable, the SPORTSMAN DRY SUBMARINE can be towed on any road, and launched at any location. (A specially designed, heavy duty trailer is available.) The SPORTSMAN DRY SUBMARINE is being offered at the introductory price of **$3800.**

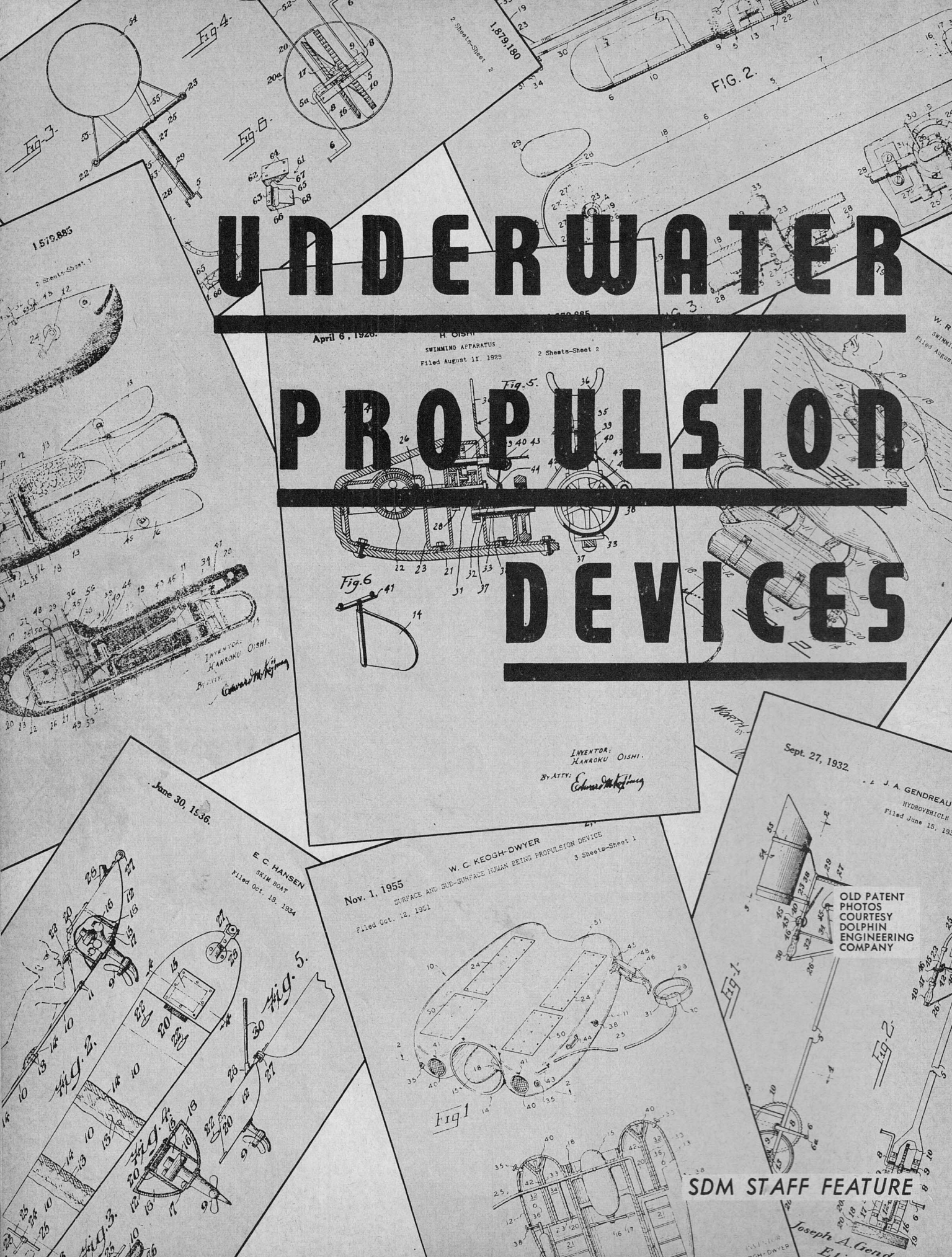
While this unit is practical for underwater survey work by marine scientists, underwater explorers, and for inspection work by underwater construction and underwater salvage companies, our engineering department is available for consultation with Departments of Interior, State Fish and Game Departments, and civil Underwater Recovery Units to design and construct other submarines to meet special and different specifications.

AREA FRANCHISE DEALER INQUIRIES INVITED

SPORTSMAN DRY SUBMARINE, INC.

P. O. BOX 428 **LOMITA, CALIFORNIA**

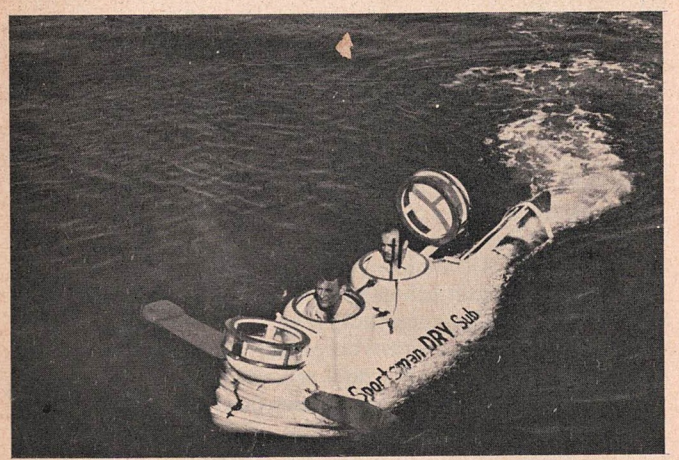
UNDERWATER PROPULSION DEVICES



THERE are three major types of underwater propulsion devices, all of which will be covered in this feature. The three types are dry submarines (towed or self-propelled), wet submarines (towed or self-propelled), and hand-held propulsion and towed devices.

Dry Submarines

As the name implies, this underwater vehicle remains dry inside like the conventional submarine. Occupants breathe normally in an atmosphere which is kept fresh by storage tanks within the submarine. Probably the most complex of the three different types, the dry submarine is also the most expensive.



The Sportsman Two-Man Dry Sub cruises along the surface with inventor Armstrong in the front hatch.

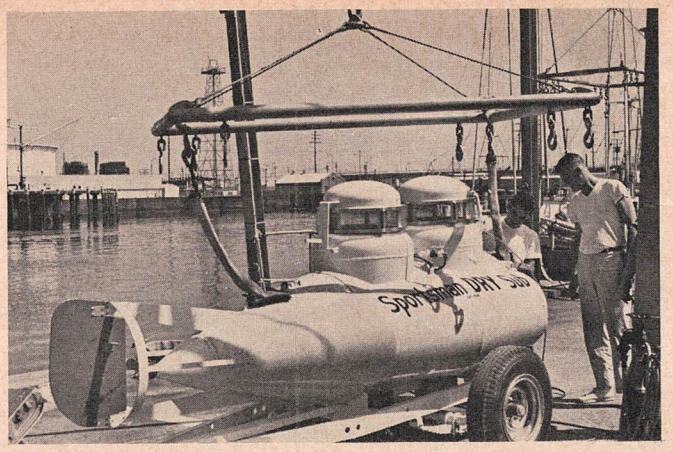
by RAY FETTERMAN

THE SUBMERSIBLE vehicle is not a new thing to this century. History reveals that several intrepid individuals braved the unknown long before the western hemisphere or the Roman Empire were known. There was a submarine at the disposal of Alexander the Great. Most submarines, to date, have had to go the route of the military, due to the enormous expense involved.

Now there is the opportunity for everyone to have a long awaited "look see" at the wonders of the subsurface waters of the seas and lakes of the world. The opportunity to do this was afforded by the exhaustive pioneering research of one man, who spent nearly nine years developing a submarine for the man in the street. Edmond Armstrong of Redondo Beach, California is the man who did it.

Another visionary joined ranks in the winter of 1960, Ron Blevins. Together, the two worked out the kinks of the original one-man model which Ed Armstrong had built with loving care. He had startled swimmers and boatmen of Redondo Beach with his "monster of the deep" and had proven that a compact size dry submarine was both practical and safe to operate. The pioneer model was torn apart and every piece analyzed. The new team poured over stress and pressure data and engineered another one-man submarine. From this model was born the idea of a two-man dry submarine. Before launching into the production phases of the new submarine, a major marketing survey program was initiated. Happily, the reaction was positive and the production prototype was started through its manufacturing processes.

August 1961 was the time of debut for the Sportsman Two Man Dry Submarine. The general public had their



The Sportsman is prepared for lowering into the water at Redondo Beach, California.

first face to face viewing of a truly *DRY*, two place operational submarine.

As predicted, the men and women of the world of sports were quick to acknowledge the fact that a new era of sporting was opening. Here was the means of safely, comfortably, dryly and economically diving below the water's surface and opening new vistas of group and individual water sport activities.

The Sportsman Dry Submarine, manufactured by Sportsman Dry Submarine Inc., Lomita, California, is a vehicle 12 feet in length, 58 inches beam and weighs 2500 pounds fully equipped. Two passengers enter the sub through individual, hatched conning towers. Each tower has clear, wrap around, Plexi-glass windows giving the occupants an undistorted 360° field of view.

Underwater cruising speeds range from one to six knots, forward and reverse. The cruising depth is set at 300 feet! Maximum tested depth is a healthy 1300 feet. The powerful DC motor energized by sealed lead-acid battery packs will carry the passengers for ten to fifteen mile cruises on one charging of its batteries. All controls of the Sportsman are positioned for ready access of both occupants and everything is kept as simple as possible, permitting everyone the maximum of enjoyment each time the submarine takes to the water.

Airplane-type controls actuate the diving planes and the steering rudder. Control valves for the ballast and trim tanks are conveniently and properly placed for optimum safe operation at all times. No purchaser of the Sportsman Dry Submarine will be given delivery of it until he has been given a thorough training course by the appointed retail dealer or the company proper. He must qualify as a safe operator!

Nothing is left to chance in the entire operation. Naval officers used to commanding and operating the front line nuclear submarines have been amazed and thrilled by the professional manner in which the Sportsman conducted

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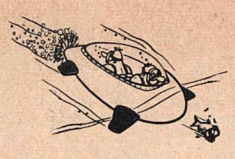
The Goldfish, designed by B. L. Dickman of Auburn, Indiana, for underwater photographic work, is used also in the annual Sub-Marine Rodeo at Pleasant Lake, Indiana. This is a good example of a one-of-a kind dry sub.



UNDERWATER PROPULSION DEVICES

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itself for them. This attitude is reflected by all professionals engaged in underwater activities, who have taken demonstration rides. Clean, dry and pure air is supplied the two occupants for continous periods in excess of twenty-four hours by means of metered oxygen, carbon dioxide and moisture absorbers. This provides a major safety factor for all concerned. It would be a simple matter to extend this time period if the operators had the need for longer dive periods in any given operation. The generous air supply, coupled with the ten to fifteen mile cruising range, enables the passengers to enjoy the ever changing panorama of the underwater world.

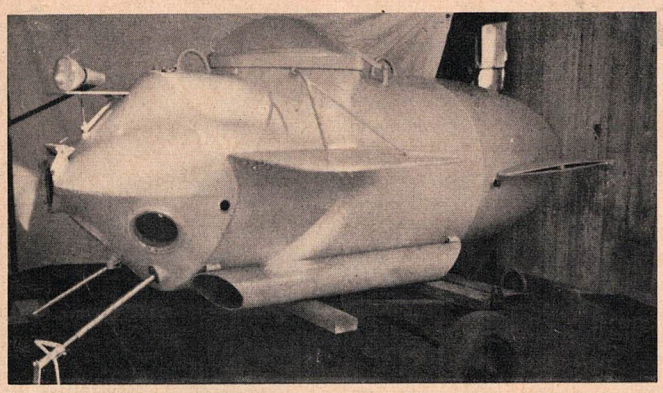
Skin diving has been a sport which has grown in interest and participation by thousands of percent in a relatively short time. Dry submarining will do nothing to diminish the ardor and interest in this wonderful field of water sports. To the contrary, it will recruit more people to the activity. Daily we hear of sunken treasure, ships and boats sinking, tales of adventure and romance spun about innumerable "sure thing" locations in all parts of the world. The portability of the dry submarine makes it possible for the adventurer to actively pursue the lure of treasure seeking, salvage spotting and recovery.

Dry submarining is a field in which people of all ages can participate. There is no physical effort, no pressure differentials, no depth adjustments necessary. Limiting the time of submersion and controlling the ascent rate is ruled out. Two of the first noncompany soloists were grandmothers.

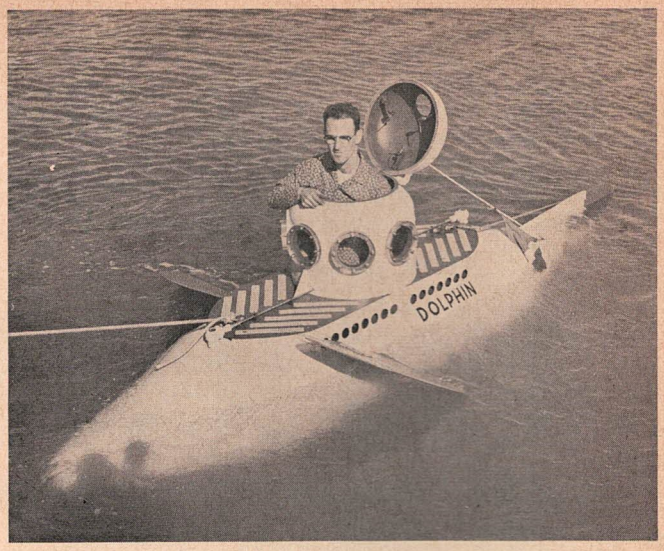
Family participation is a natural with the Sportsman Dry Submarine and, these days, it is necessary to have leisure time activity available for the entire age span of families. It is very probable that groups will form Dry Submarine clubs across the nation and their activities will cover interests not even considered in this writing.

Underwater photography is simplified and expanded with the introduction of the Sportsman to the field. Bulky, pressure-proof camera cases are eliminated and camera equipment of all classes may be freely used from within the confines of the Dry Submarine. Special lighting systems may be added to the submarine, at the owners' option, to permit correct color registration at all depths covered.

The tremendous number of new sporting avenues opened



This dry, tow sub was designed and built by Ernest Marcoux of St. Petersburg, Florida. It has battery operated, remote control hands and is said to have a working depth of 2000 feet.



The Dolphin, a self-propelled, two-man dry sub designed by Doug Privett, the man in the photo. The second man lies prone and views the bottom through a thick porthole low in the nose.

by the Sportsman Dry Submarine are not the only aspects of application. Close upon the heels of the enterprising sportsmen, industrialists, commercial men and government agencies began expressing their interest in the new submersible. Companies installing, maintaining and surveying sites of underwater pipelines have expressed the need for a submersible to patrol the long runs encountered.

Salvage companies, fisheries, insurance companies, geological concerns and many other commercial enterprises engaged, in some way, in the marine business world have a definite need for the Sportsman Dry Submarine. Salvage crews will find that they can spot their divers more effectively and finish the job of raising a ship or cargo faster and with less damage, thus increasing the profits per operation. Insurance companies will be able to investigate and settle claims on sunken vessels with minor expense, compared to the methods used until now. The Dry Submarine provides a roving field office for diving observers, crew bosses and excutive personnel. Through the use of underwater communication and closed circuit TV, plus custom camera equipment, a complete record and on the spot control of every operation is possible to maintain.

Research science groups engaged in all phases of oceanographic activities have had demonstration rides in the Sportsman Dry Submarine. The nature of the activities of such institutions as the Naval Electronics Laboratories, Scripps Institution of Oceanography, the Department of Interior, and other organizations of the same stature and scope cause them to have a definite need for medium depth submersibles. The submarines designed for these groups will be of a more specialized nature and have features considered quite exotic by the layman. The Sportsman model will find service as well, but the demands of science make it necessary that new design concepts flow from the manufacturing team headed by Armstrong and Blevins.

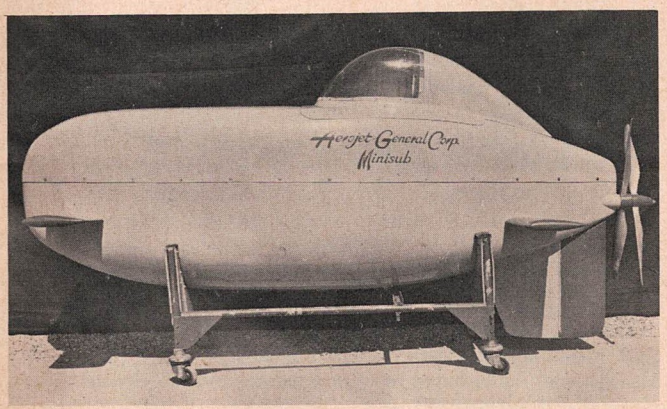
While smaller and less technically outfitted than its commercial and scientific sisters, The Sportsman Dry Submarine is no less designed. Safety is uppermost in every phase of manufacturing and quality control. Five ways are provided for surfacing the submarine. It may be surfaced under motor power, its ballast tanks may be blown, the trim tank blown, high pressure air reserve is provided and if all else should fail to provide a positive state of buoyancy, there is a droppable lead keel. The submarine is completely pressure tested

before delivery is authorized and every weld is x-ray tested to insure absolute integrity throughout the structure.

The operator and his passenger may make numerous dives and surfacings without having to return to base for replacement of low pressure air tanks. Giving the battery packs an overnight charge will enable the owners of the Dry Sub to enjoy hours of diving and cruising pleasure. The cost of daily operation is very low. Unbelievably, it is *LESS* than *ONE DOLLAR* per day! Even the cost of purchasing the Dry Submarine and its custom built trailer is far less expensive than most people believe possible, less than $5000.00 for the entire package, ready to go. This includes, besides the trailer, a pressure proofed compass, depth gauge, oxygen and air environment controls, air tanks, batteries . . . the works! Sportsman Dry Submarine, Inc., has left optional equipment strictly up to the choice of the individual purchaser. He may, of course, buy specialized camera equipment, navigational aids, surface and subsurface communications gear, or any of the costlier equipment offered the commercial user. The main value remains the operational package represented by the soon-to-be widely seen and used Sportsman Dry Submarine. Care to join the newest club in the world . . . Dry Submariners ?

Wet Submarines

Again as the name implies, the "wet" submarine is free flooded, that is its interior is filled with water and occupants breathe from compressed air bottles through a regulator just as a diver using scuba. This device can either be towed or self-propelled, and examples of each are shown below.

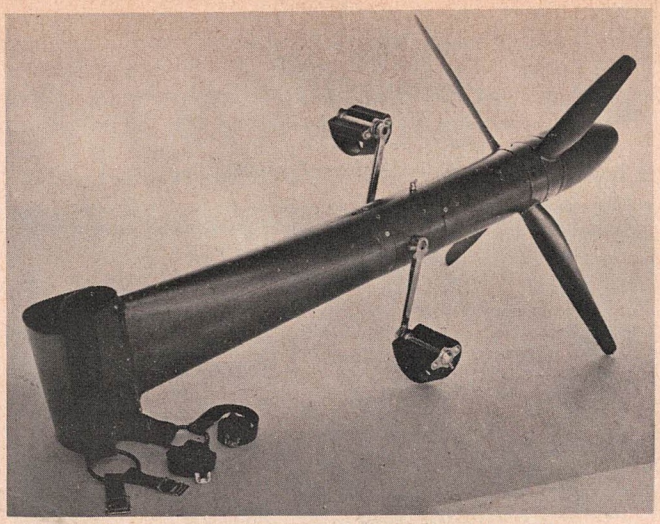


The MiniSub Mark III was built by Aerojet General Corp. engineers. It is free-flooded and has a streamlined plastic-impregnated laminated glass cloth hull. It is self-propelled by pedals connected by chains to the props at the rear.

AZUSA, California—During the brief hiatus of the late '40's between wars, the United States Navy was searching for a more rapid and efficient means of propelling its underwater demolition teams. Aerojet-General put its propulsion experts to work on the problem.

Calvin A. Gongwer and George M. McRoberts, manager and chief engineer, respectively, of the former Underwater Engine Division, handled this study. They were intrigued by the possibilities and, after submitting the final report, decided to work out their ideas at home. As one design led to another, Gongwer and McRoberts gradually evolved several types of swimmer propulsion units that have both commercial and military applications.

The first of their designs was the Mark I. It was not much more than a floating 2x4 with fins and props. The swimmer



This strange device is the Aerojet Mark IV Aquaped. The diver straddles the body of the propulsion device and connects the suspender-like straps to his body. By pedaling instead of finning, he can double his speed underwater.

lay face down on the eight-foot-long board and pumped a set of bicycle pedals that turned two small propellers. Commander Francis D. Fane, then chief of the Navy's UDT units at Coronado, came up one day to participate in a demonstration on a small reservoir near Gongwer's home in Glendora. Fane's interest was encouraging and stimulated further development. Work moved from a hobby status at home to a company project at the nearby Azusa, California, plant.

To reduce the drag on the Mark I created by a swimmer's body exposed both above and below the board, the more streamlined Mark II was designed. It was a propeller driven modified surfboard with a canopy made of aircraft fabric completely enclosing the swimmer. Lying prone and looking forward through a large observation port, an operator could pedal the Mark II twice as fast as a swimmer with fins.

On one test, the Mark II was equipped with bottles of compressed carbon dioxide giving it a speed of 4 mph for a short time. Later models (Mark III, VI, VII) offered dual propulsion systems—both a sealed electric motor and foot power. These subs with a battery and electric motor can attain a speed of 7.25 mph. Although most customers prefer

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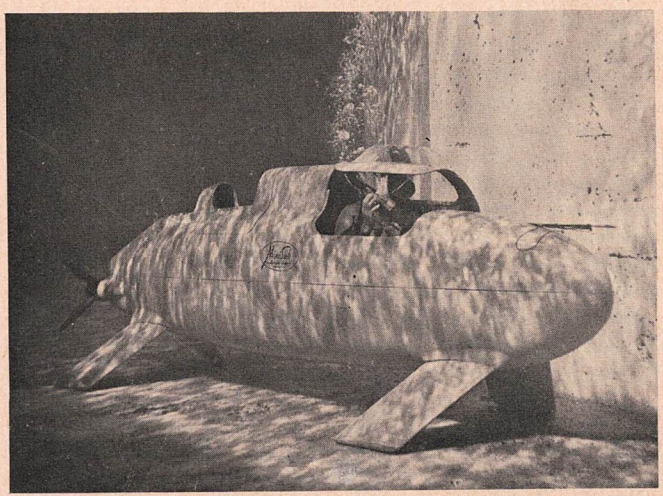

MiniSub Mark VI is a two-man, free-flooded underwater vehicle. The driver faces forward and the passenger faces to the rear, though both occupants may pedal to propel the submersible. Rear area can also be used for cargo.