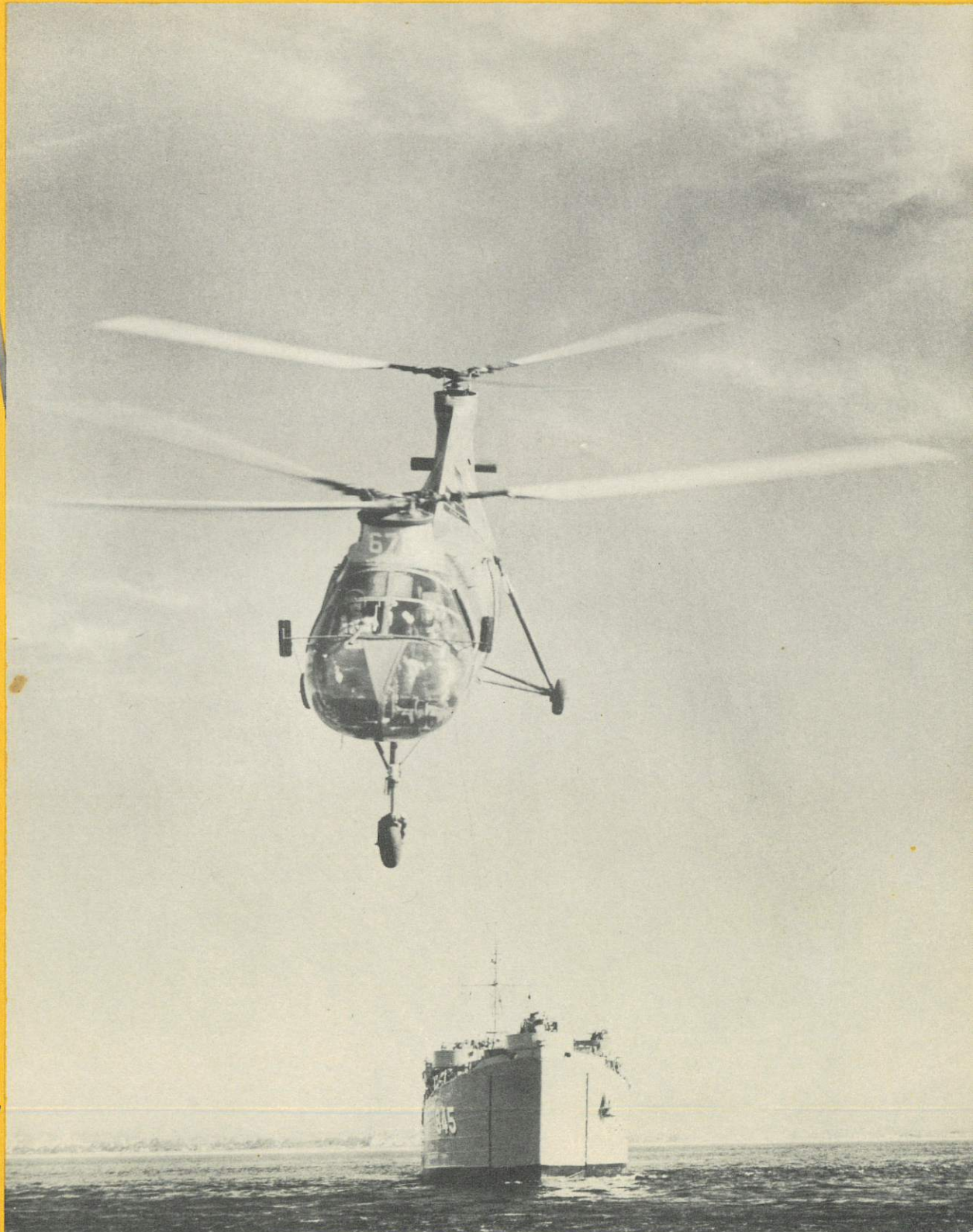


# **TOWING** with the **VERTOL 44**



H-21



Work Horse



**COVER**

VERTOL H-21 Towing 3000 Ton  
LST at U.S. Naval Amphibious  
Base, Coronado, Calif.

## INTRODUCTION

The concept of helicopter towing was initiated by the Vertol Aircraft Corporation in conjunction with the U.S. Navy Bureau of Aeronautics in 1951, at which time the feasibility of towing mine-countermeasures equipment was studied.

A series of helicopter minesweeping tests and operational evaluations has been completed successfully by the U.S. Navy and Vertol Aircraft Corporation, using HRP-1 and H-21 tandem helicopters. These tests demonstrated the feasibility and advantages of helicopter minesweeping.

As an outgrowth of helicopter minesweeping, other helicopter towing applications became apparent. Accordingly, additional towing evaluations have been conducted by the U.S. Navy, Air Force, and Army to determine the towing capabilities of the tandem helicopter as applied to land and sea salvage operations.

This pictorial report illustrates the towing capabilities of the Vertol 44 (Military H-21 Workhorse) helicopter.

# AMPHIBIOUS TOWING OPERATIONS

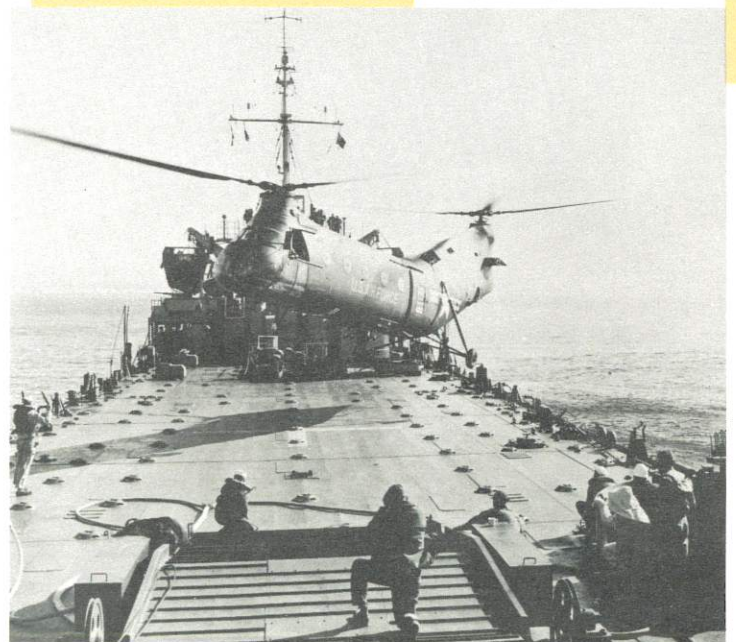
The H-21 Workhorse used for the towing tests presented in this report is a tandem-rotor, single engine helicopter in production for the U. S. Air Force, U. S. Army and friendly foreign governments. It is powered by the Wright R1820-103 engine with a take-off rating of 1425 horsepower and a maximum continuous rating of 1275 horsepower. For towing operations, a Vertol special tow hook kit is installed in the aft fuselage section.

The overall size and controllability of the H-21 enable it to be operated from restricted deck areas and landing sites.

H-21 IN NORMAL TOW ATTITUDE

H-21 Landing aboard  
ponton-causeway

H-21 Operating from  
deck of LST





The LST with rudder amidships is turned in a radius of approximately 550 yards by the H-21 illustrating the maneuvering capabilities while towing.

Navy LST, displacing over 3000 tons, is towed at a speed of 4.5 to 5.0 knots by the H-21 using normal rated power (1275 hp).





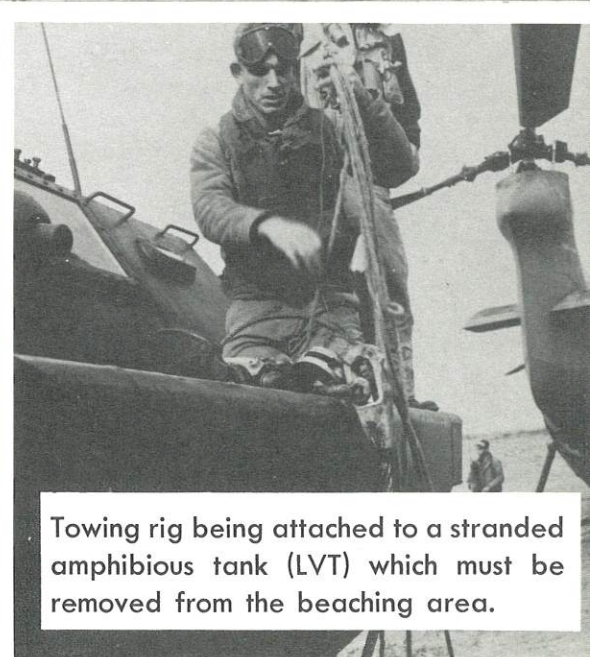
An LCU displacing 330 tons being towed onto the beach at a speed of 8-9 knots. The H-21 was capable of handling the large variations of cable tension encountered during this operation without any control difficulties.

A stranded LCU is pulled clear of the beach by the H-21. The helicopter was also used to position the 2500 lb. anchors.

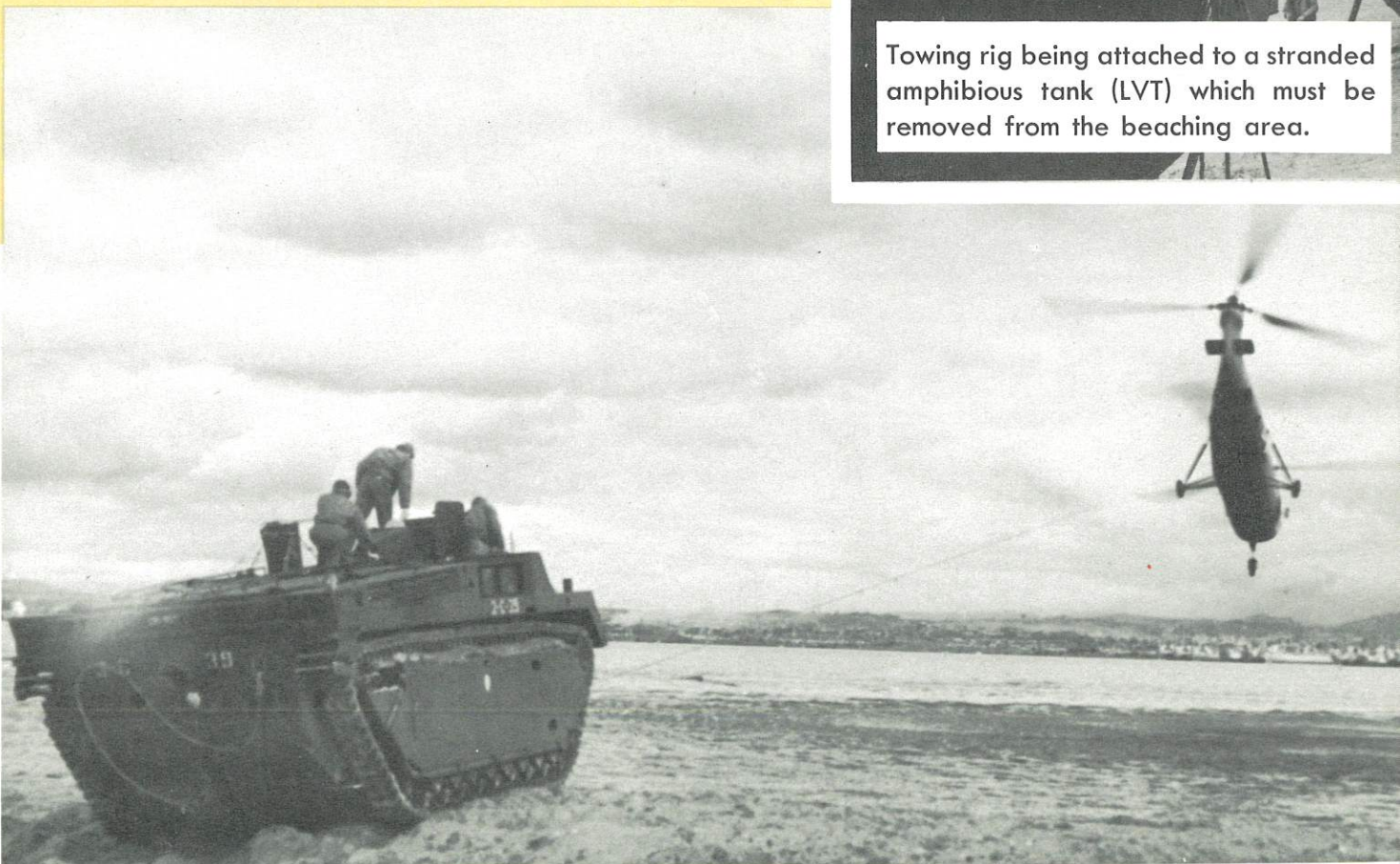


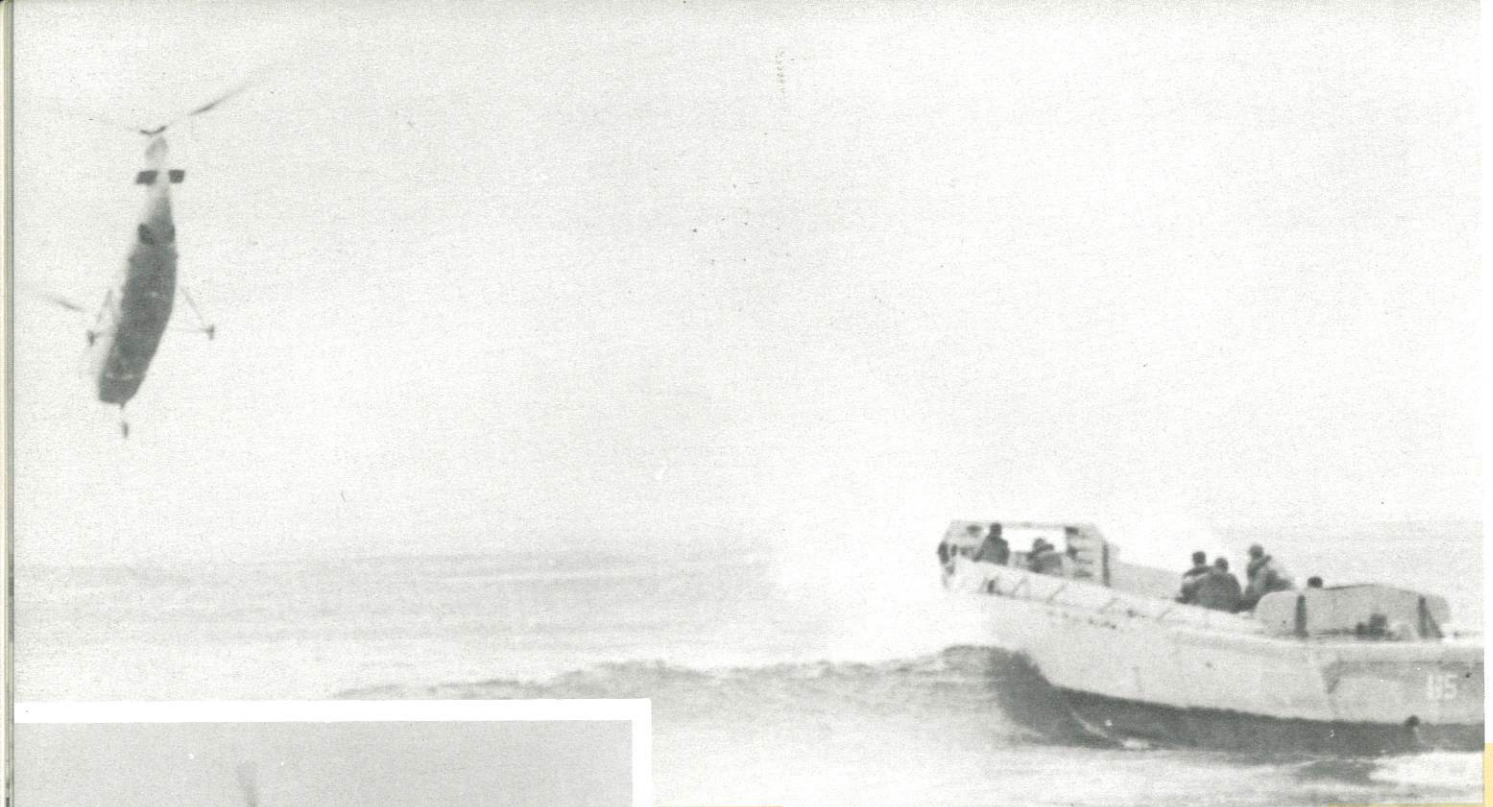


The H-21 tow helicopter moves LVT, which weighs 23,350 pounds off the beach and into the water, demonstrating its ability to clear congested beachheads of abandoned or disabled equipment.



Towing rig being attached to a stranded amphibious tank (LVT) which must be removed from the beaching area.

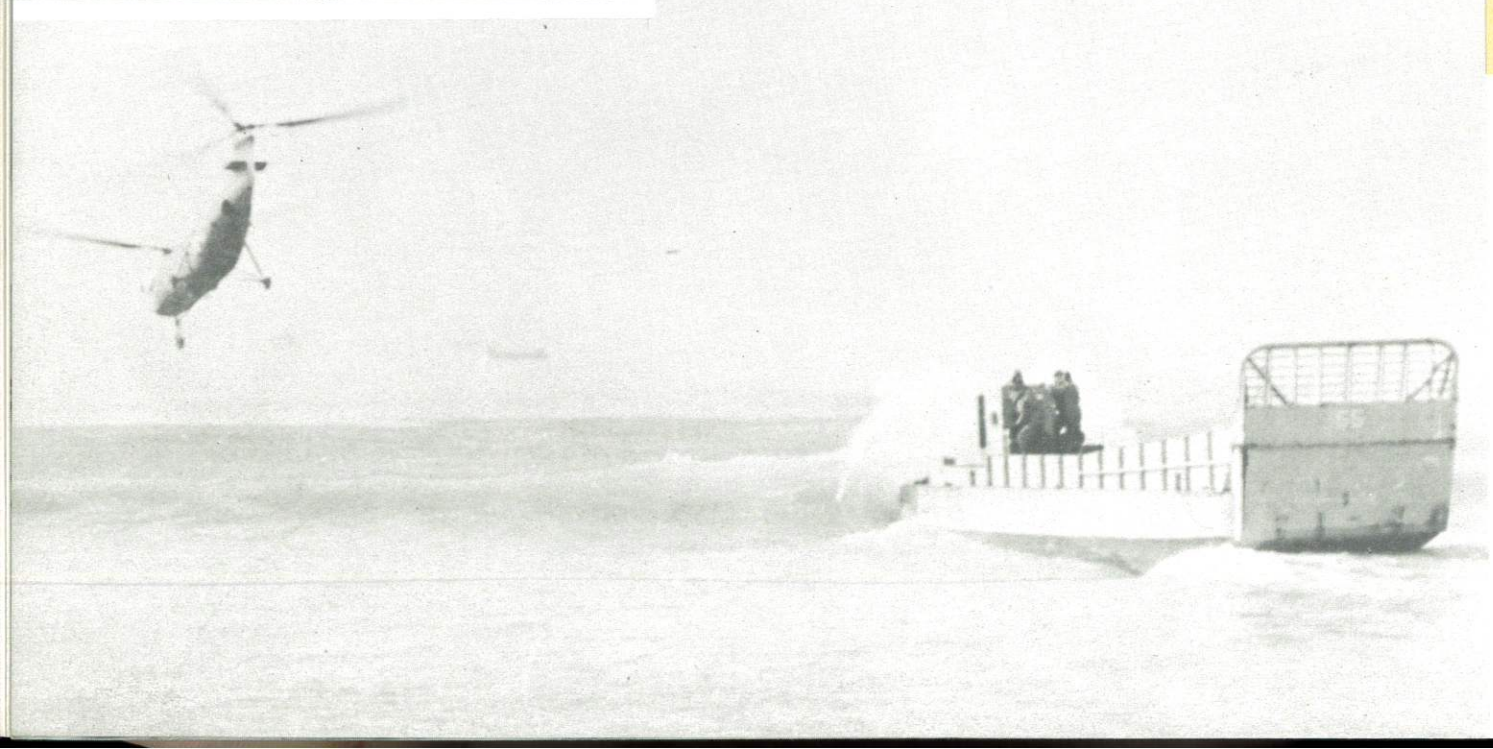




Demonstrating the complete practicability of towing small craft from or onto the beach, the H-21 Workhorse recovers a broached LCVP, with six crewmen aboard, and pulls it to sea at a speed of 22 to 25 knots.



After hovering over an LCM in order to attach its tow line, the H-21 easily pulls the stranded craft to deep water at a speed of 10 knots.



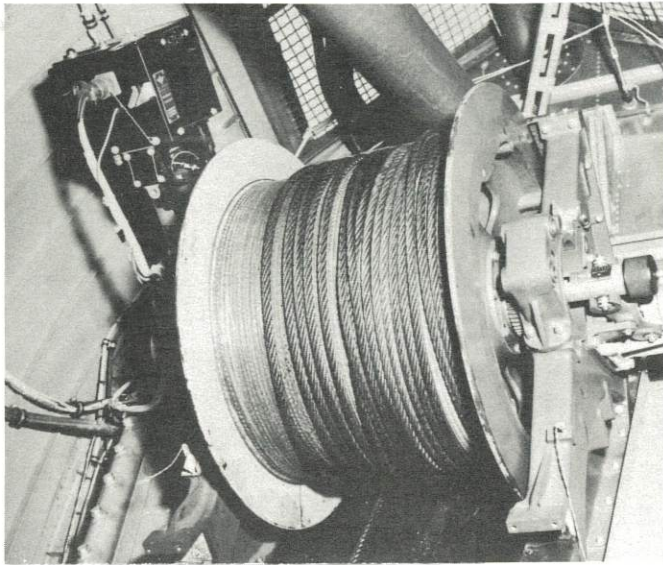




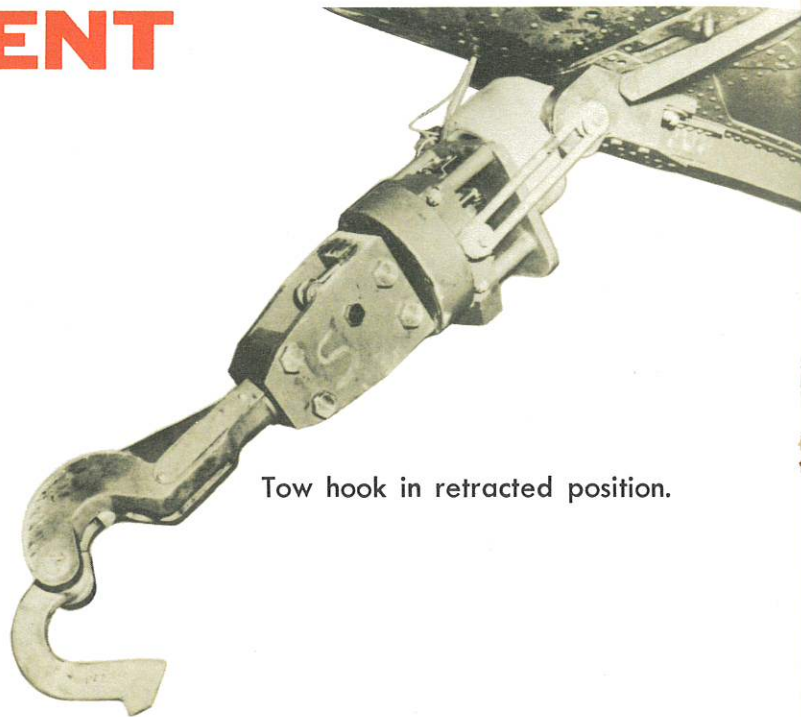
Without assistance of any kind, the Vertol H-21 helicopter demonstrates its ability to assemble sections of a pontoon causeway at sea, tow them to the desired location, beach the causeway at a specific point and place all necessary anchors. The helicopter's superiority over surface tugs for this operation was conclusively demonstrated in these tests.



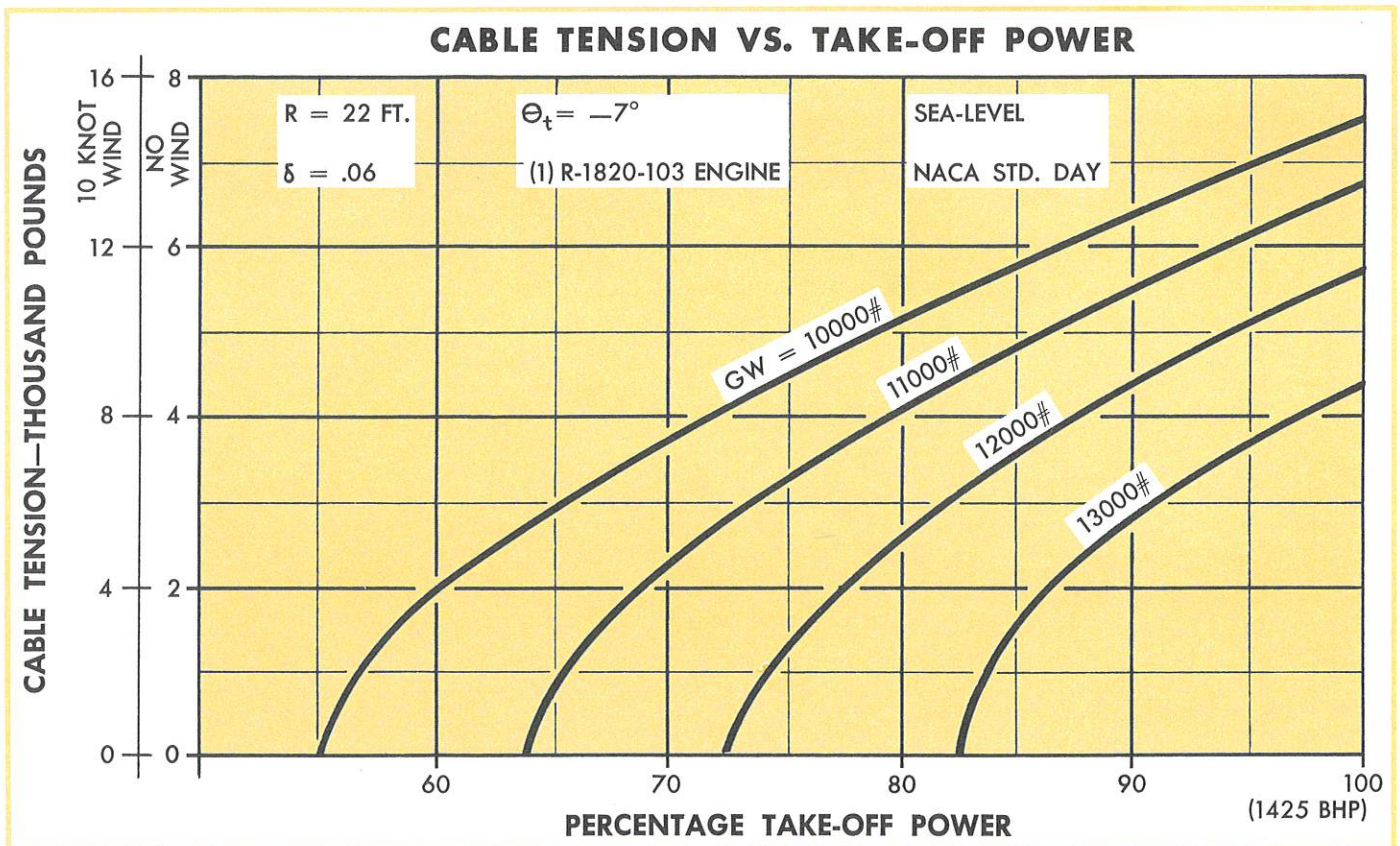
# TOWING PERFORMANCE AND EQUIPMENT



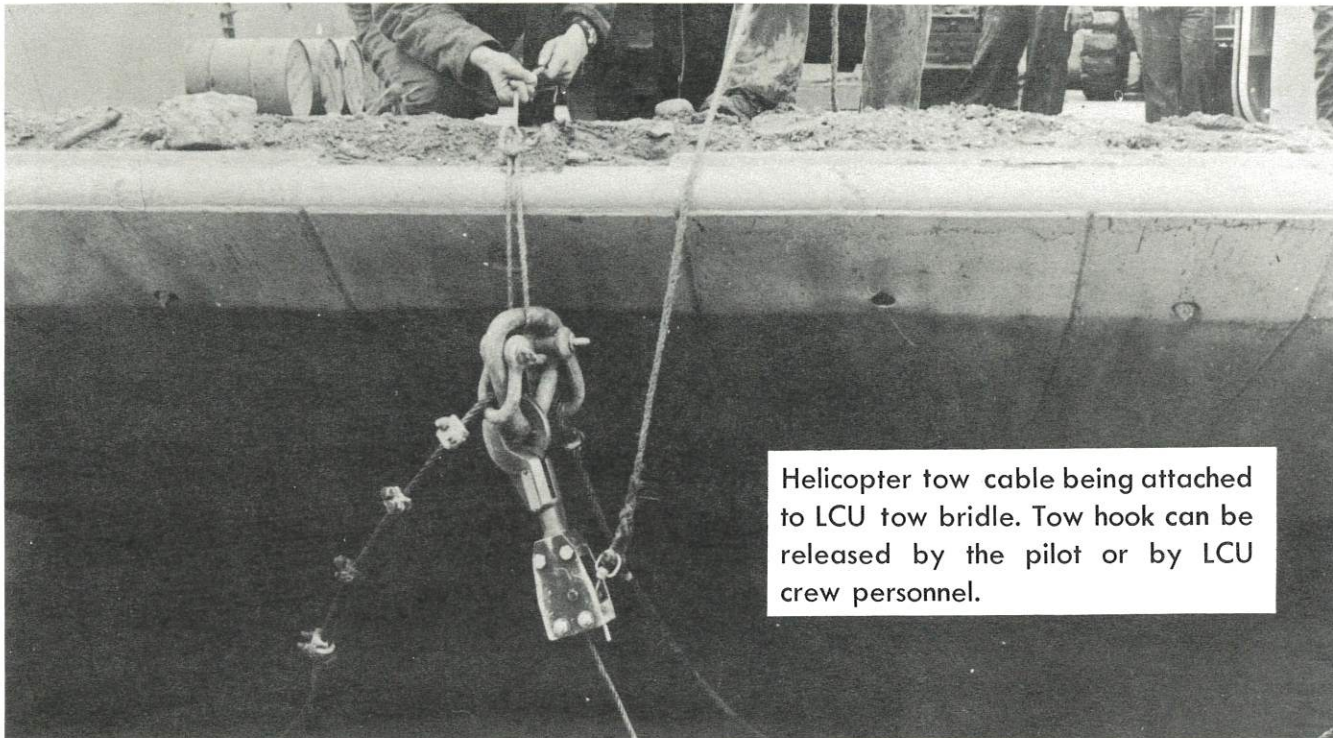
Two-speed, electrically powered towing winch installed in the aft fuselage section.



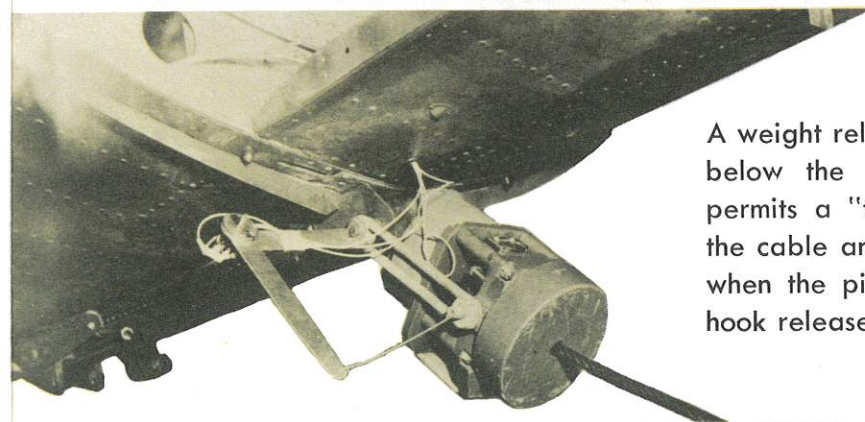
Tow hook in retracted position.



The curve on this page illustrates the cable tensions which can be achieved by the H-21 Workhorse at various percentages of take-off power and gross weight. It should be noted that in a 10 knot wind condition, tensions in excess of 12,000 pounds may be achieved depending upon the gross weight of the helicopter.

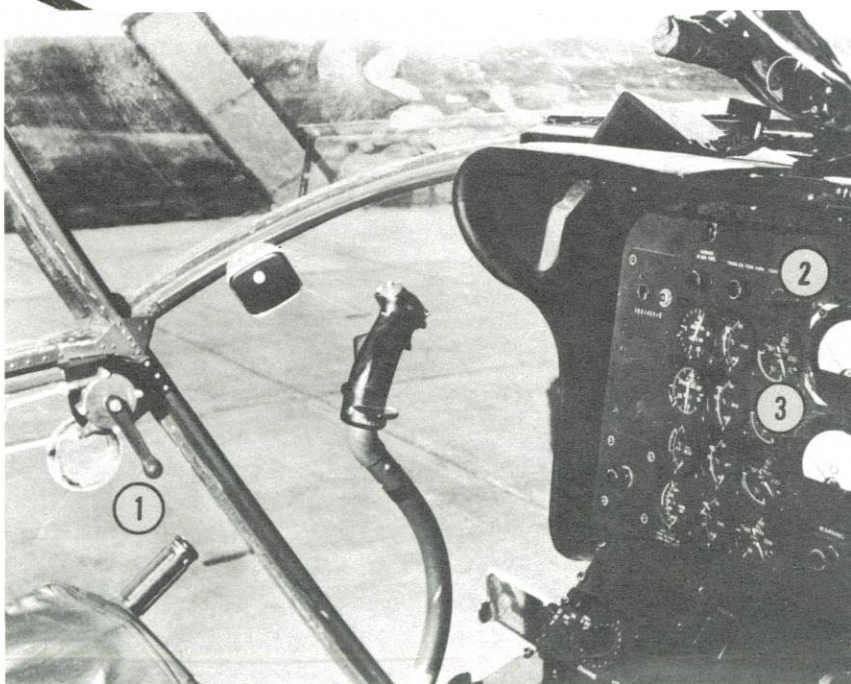


Helicopter tow cable being attached to LCU tow bridle. Tow hook can be released by the pilot or by LCU crew personnel.

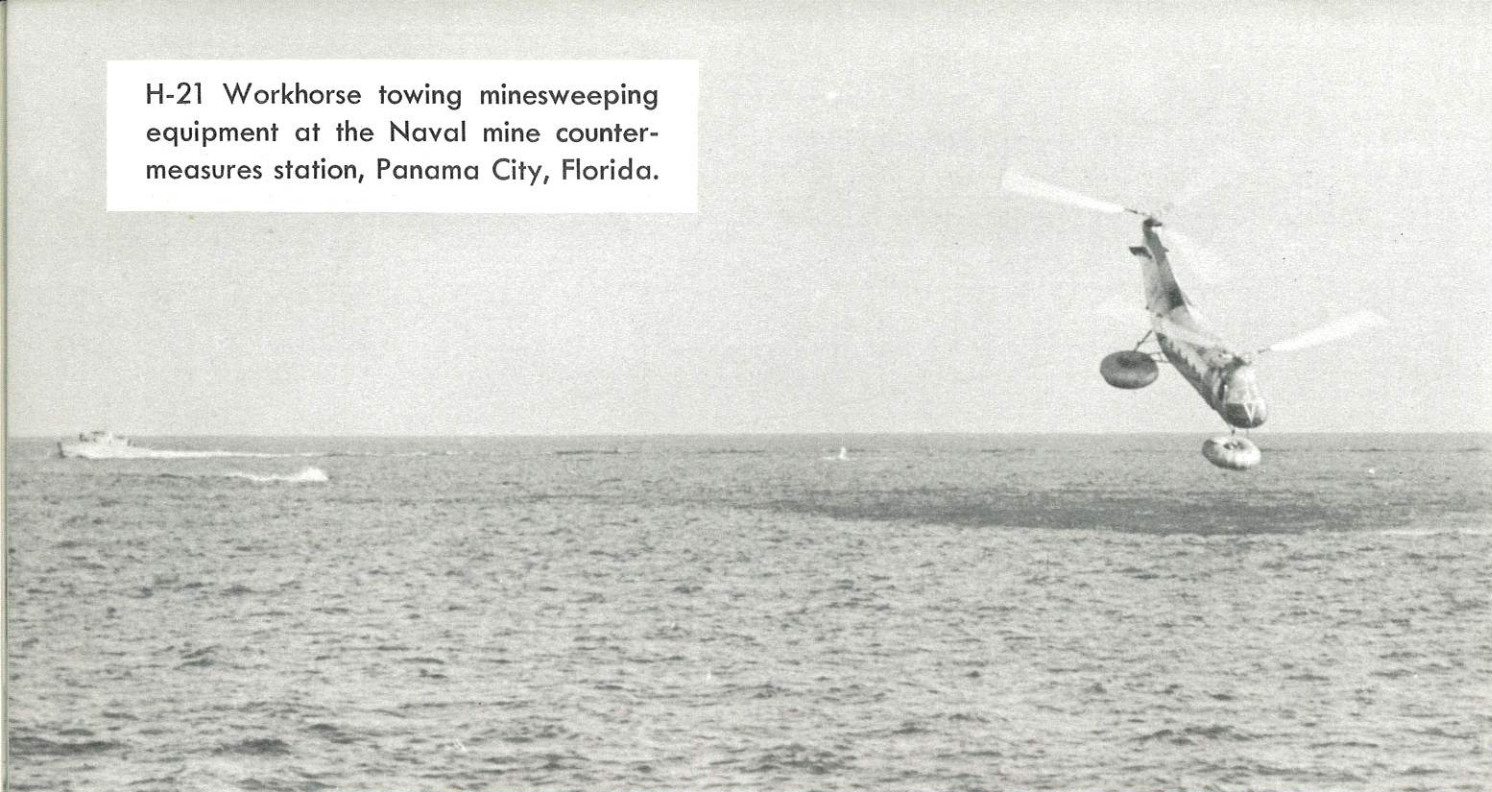


A weight release mechanism located below the keel of the helicopter permits a "traveler" to slide down the cable and release the tow hook when the pilot actuates the remote hook release lever.

Cockpit interior showing remote hook release lever (1), cable tension indicator (2), and cable angle indicator (3). Buttons on pilot's cyclic stick enable him to operate the 2-speed electric cable winch and the emergency cable cutter. Rear view mirrors are provided on both sides of the cockpit for rearward visibility.

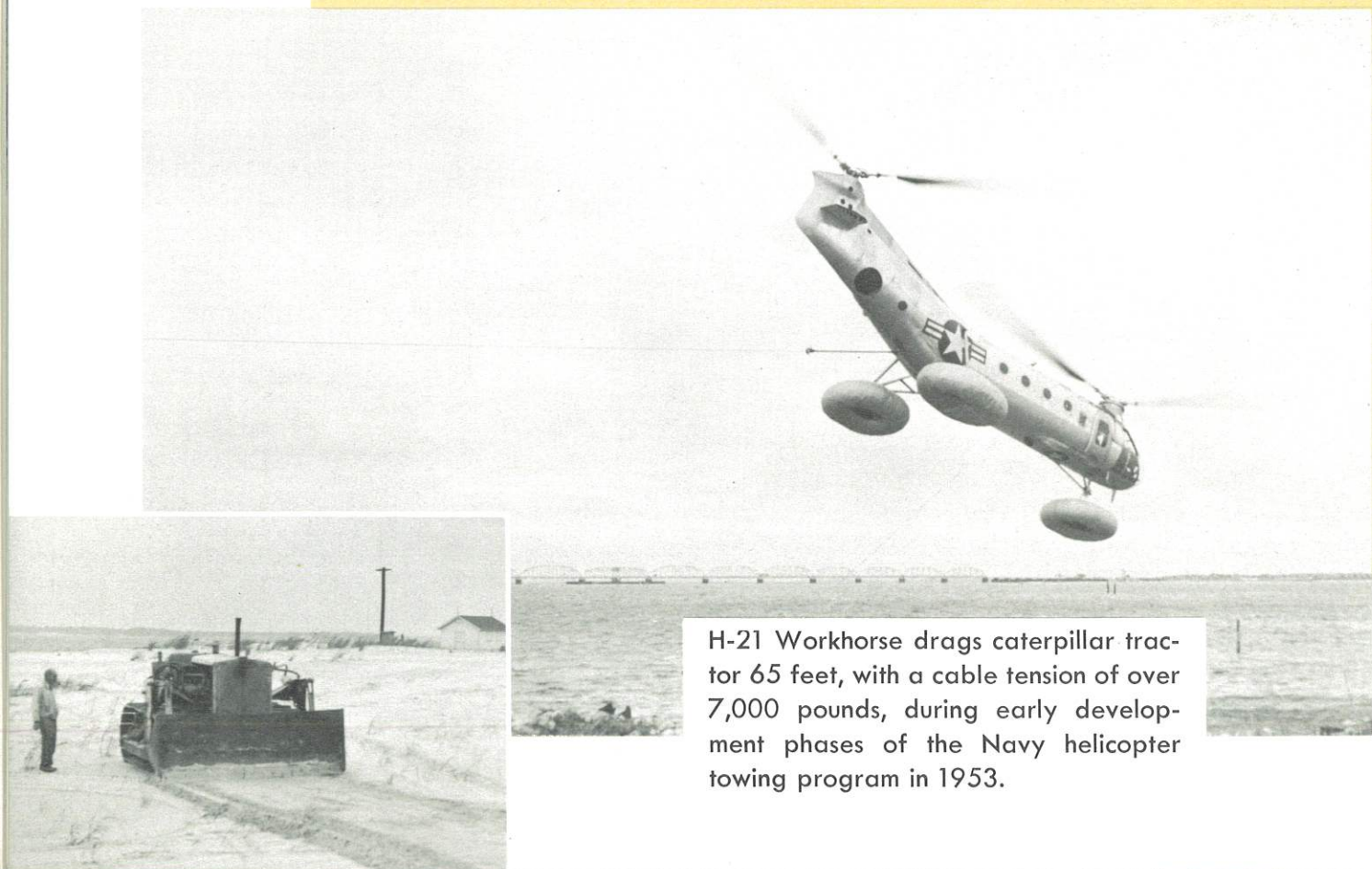


H-21 Workhorse towing minesweeping equipment at the Naval mine counter-measures station, Panama City, Florida.



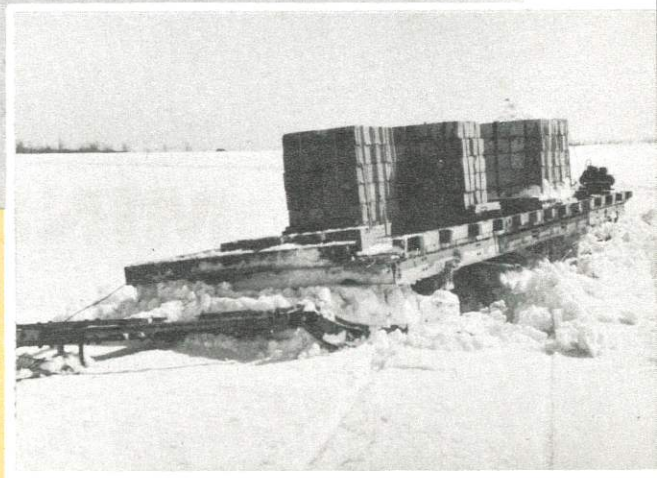
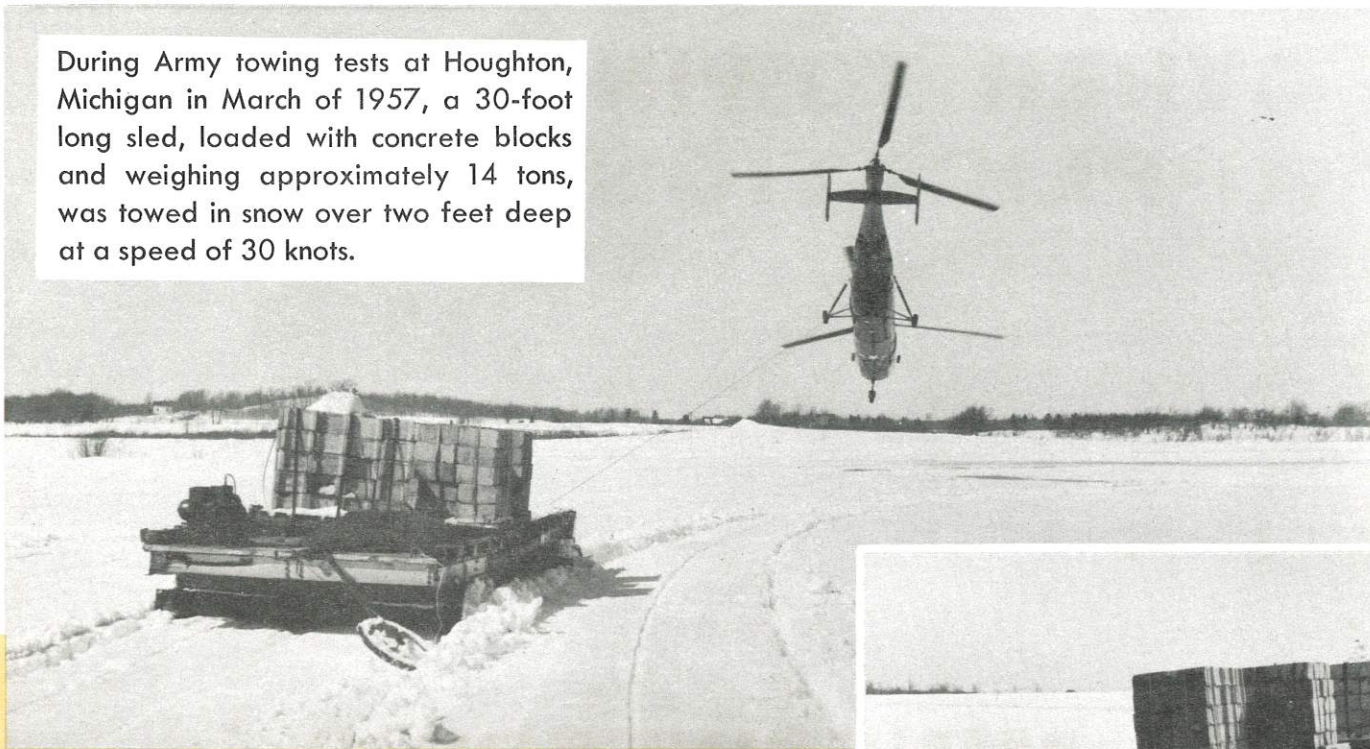
## MINESWEEPING

The helicopter minesweeping development program was first initiated by the United States Navy and Vertol Aircraft Corp. in 1951. Since that time, Vertol HRP-1's and H-21's have successfully demonstrated the feasibility of helicopter minesweeping. The H-21 has been equipped with flotation gear for extended overwater towing operations.



H-21 Workhorse drags caterpillar tractor 65 feet, with a cable tension of over 7,000 pounds, during early development phases of the Navy helicopter towing program in 1953.

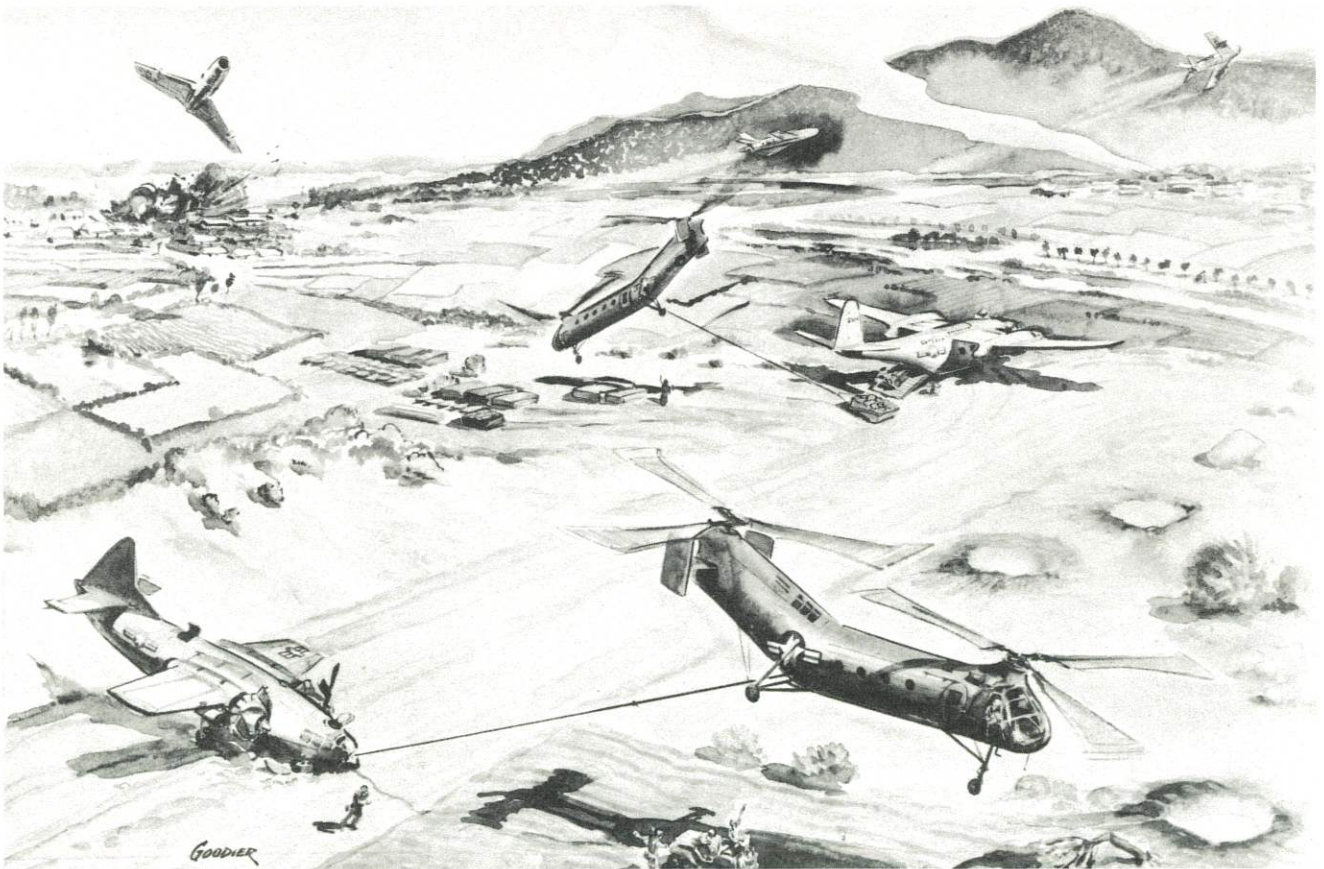
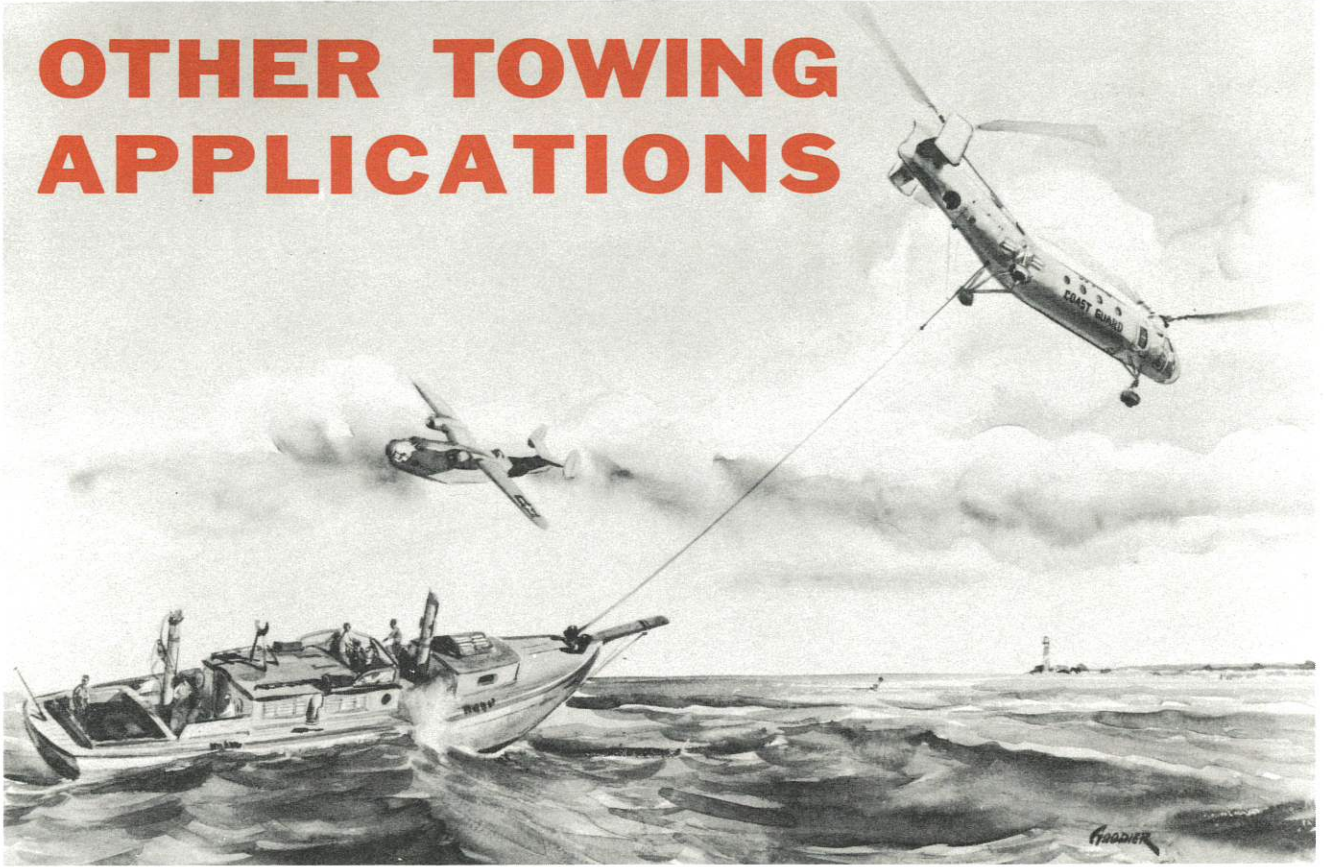
During Army towing tests at Houghton, Michigan in March of 1957, a 30-foot long sled, loaded with concrete blocks and weighing approximately 14 tons, was towed in snow over two feet deep at a speed of 30 knots.

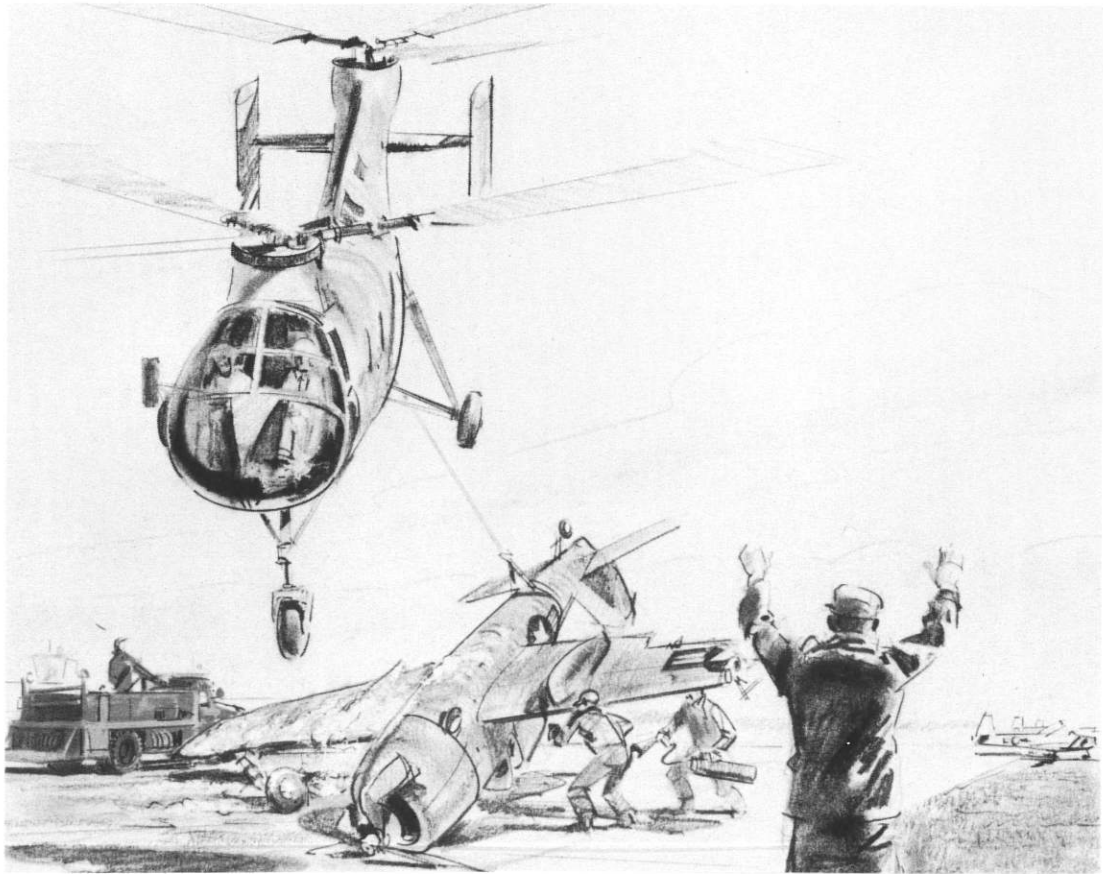
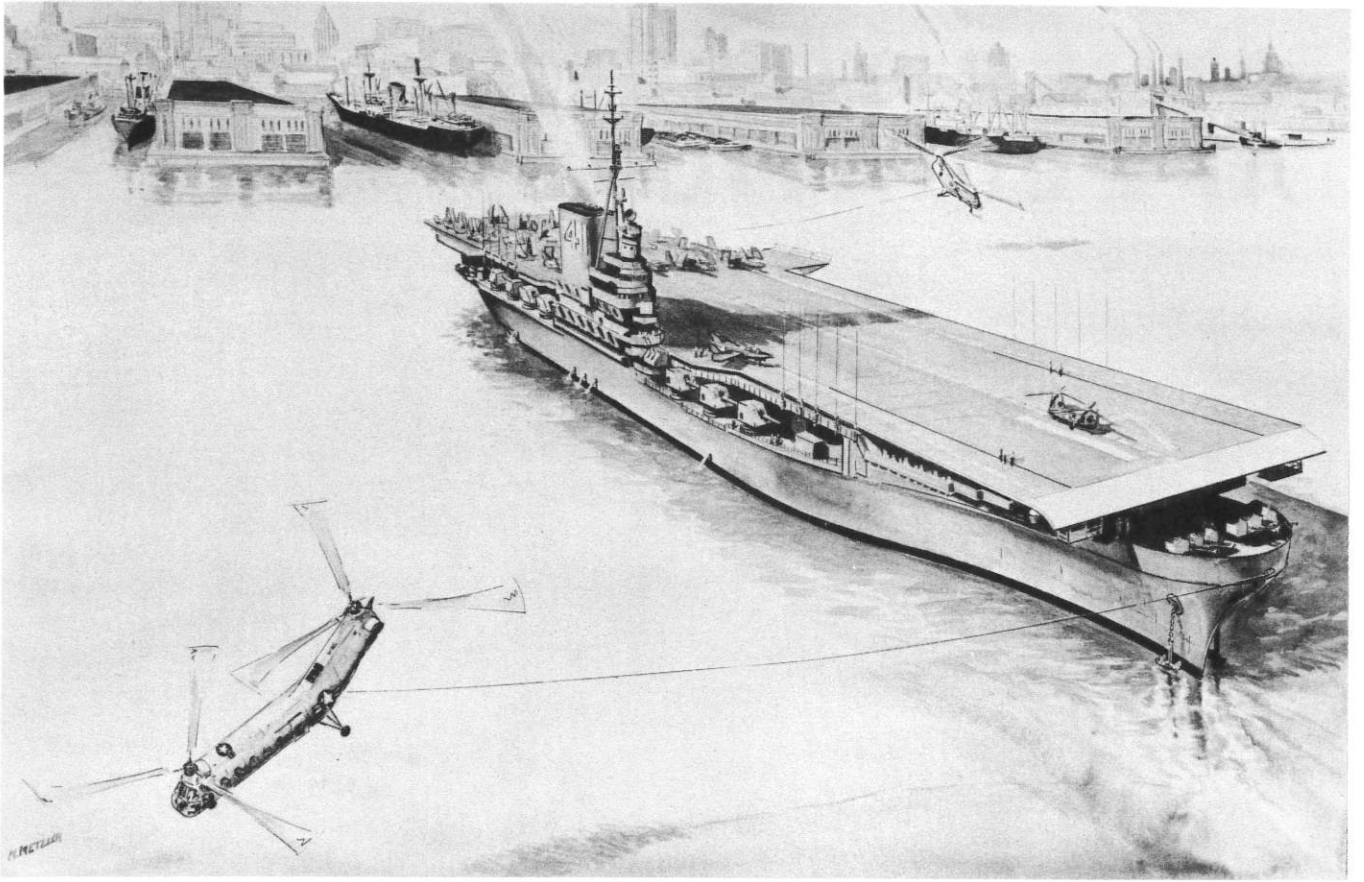


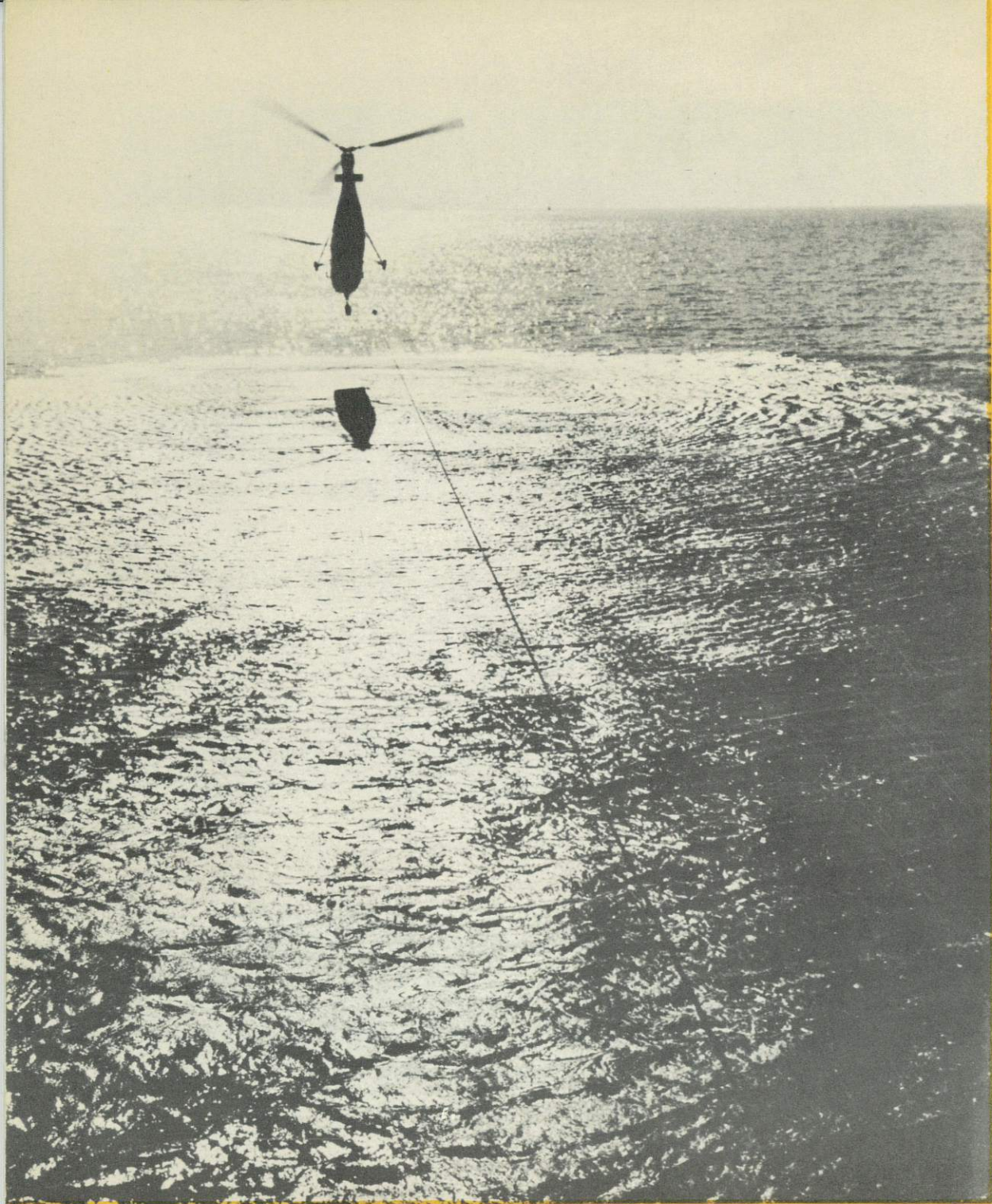
Further evidence of the tandem helicopter's value in salvage of disabled or stranded equipment was demonstrated during U. S. Army towing operations at Fort Rucker, Alabama, when a 48-ton M-48 tank was towed by the H-21 Workhorse.



# OTHER TOWING APPLICATIONS







**VERTOL**

*Aircraft Corporation*