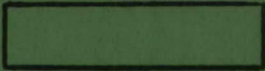


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TECHNICAL REPORT NO. 74-75

EXPEDIENT MEANS FOR MOVING HELICOPTERS

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by

Charles R. Wilson
Mobility Branch

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Final Report

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U. S. ARMY LAND WARFARE LABORATORY
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REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER LWL-TR-74-75	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Expedient Means for Moving Helicopters	5. TYPE OF REPORT & PERIOD COVERED Final Report	
	6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s) Charles R. Wilson	8. CONTRACT OR GRANT NUMBER(s)	
9. PERFORMING ORGANIZATION NAME AND ADDRESS US Army Land Warfare Laboratory Aberdeen Proving Ground, MD 21005	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS LWL Task 20-M-72	
11. CONTROLLING OFFICE NAME AND ADDRESS	12. REPORT DATE April 1974	
	13. NUMBER OF PAGES	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS. (of this report) Unclassified	
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report) Approved for public release; distribution unlimited.		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report) <p style="text-align: right; color: red;">TECHNICAL LIBRARY BLDG. 305 ABERDEEN PROVING GROUND, MD STAP-TL</p>		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number) helicopter handling ground movement of helicopters		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number) This report covers the design, fabrication, and preliminary testing of some expedient means for moving skid mounted helicopters in rough terrain. The work was done in response to a request by the Mobility Equipment Research and Development Center (MERDC) for support of a camouflage program conducted by Modern Army Selected System Test Evaluation and Review (MASSTER) at Fort Hood, Texas.		

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BLOCK 20. ABSTRACT CONTINUED

Due to the short time span of the task (three months total), there were but three different means examined. One means was a commercial unit "Robotow" consisting of electrically powered units adapted to drive the standard ground handling wheels. The other two means consisted of hardware to skid the helicopter either on a set of skis fitted to the skids, or on the skids themselves if conditions permitted.

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INTRODUCTION

A camouflage evaluation program was conducted by Modern Army Selected System Test Evaluation and Review (MASSTER), Fort Hood, Texas during 1972. The Mobility Equipment Research and Development Center (MERDC), Ft. Belvoir, VA as the Lead Laboratory for camouflage furnished some equipment for evaluation and furnished funds to support development of other items conceived by and developed by the US Army Land Warfare Laboratory (LWL). Other items were originated, developed and funded by LWL. One group of the items funded by MERDC and developed by LWL was designed to move helicopters from an exposed landing site to or within a treeline where the helicopter could be more readily camouflaged.

The verbal guidance from the Deputy Chief of Research and Development to the Commander, LWL was to devise some expedient means of moving helicopters which could be demonstrated by 1 August 1972 at Fort Hood, TX. This deadline permitted only three months to develop the concept, design and fabricate the hardware, perform in-house testing and ship the equipment from Aberdeen Proving Ground to Fort Hood, TX. Procuring materials was also included in the time allotted.

The initial guidance was expanded by MERDC to stipulate that (1) no ground vehicles or other ground support equipment would be available at the moving site, and (2) the maximum distance of travel required would be one hundred feet. The designed hardware was based on these ground rules and the additional self-imposed rules that (1) no modifications were to be made to the helicopter, and (2) the helicopter skids were not to be subjected to loads greater than that for which they were designed.

Considering the time frame, the constraints and the resources available, only three different means were developed and sent to MASSTER. These were a set of "Robotow" wheels, a commercial item consisting of electrically powered units adapted to drive the standard ground handling wheels. The "Robotow" units were included at the direction of the Assistant Chief of Staff for Force Development (ACSFOR) who remembered the "crazy wheels" as an item tested by the 11th Air Assault Division in 1964. The other two means consisted of a towing method common to both approaches and hardware which would permit sliding the helicopter along the ground, in one on a set of skis and in the other on the skids themselves.

DESCRIPTION OF EQUIPMENT

"Robotow"

The "Robotow" units (sometimes referred to as "crazy wheels") were developed by Aircraft Dynamics, Lima, Ohio in the 1960-61 time frame. They were evaluated at that time, and a number of sets were purchased, but they did not become a part of the standard inventory. They consist of electrically powered capstans which attach to the standard ground handling wheels through an adapter. They are shown attached to a helicopter in Figure 1. They are single speed units, so that directional control is effected by switching one unit off, or by reversing one unit. They were originally designed to use the aircraft battery as a power source, which limited their operating time to under five minutes. Due to the danger of a hot start when using a marginal battery, pilots were reluctant to use the "Robotow" units at all. During this evaluation the units were powered from a generator set. It was found, however, that with a constant voltage and amperage available - rather than the decreasing voltage from a battery - the units were subject to overheating in less than one minute. It was necessary, therefore, to operate the units with extreme care. This problem, coupled with the necessity of an external power source, made the units impractical for field use.

Ski System

The ski system consisted of skis to support the helicopter, a gasoline engine-powered capstan winch to provide motive power, and ground anchors to provide a fixed point for the winch. These components are shown in Figure 2. The skis consisted of a plastic coated trough for each skid, cross tubes, and diagonal cable bracing. Each ski was made in two sections so that it could be put under the skid with the aid of the standard ground handling wheels.

Assembled, the skis effectively form a sled on which the helicopter sits. The towing bridle was attached to the sled rather than the helicopter so that towing loads were not applied directly to the helicopter. Figure 3 shows a UH-1H sitting on the skis. Similar systems were built for the AH-1G and OH-58 helicopters. The geometry of the skis permitted the helicopter to be flown off the skis if desired. The gasoline engine-powered capstan winch is a commercial item manufactured by Parke Thompson. The winch is capable of pulling approximately 3500 pounds which, with the two-part line system used, provided approximately 7000 pounds of force with which to move the helicopter. A fixed point for the winch and the other end of the tow line could be any convenient tree, or in the absence of a tree, either of the two types of anchors provided. For normal or soft soil condition, the "Danforth" anchor, shown attached to the winch plate in Figure 2, was used. For soil conditions too hard for the "Danforth" anchor to be set in, the Lozconia arrow point anchor was used. It is shown in Figure 2 along with a sledge hammer and driving rod necessary to set the anchor.



Figure 1. "Robotow Units"

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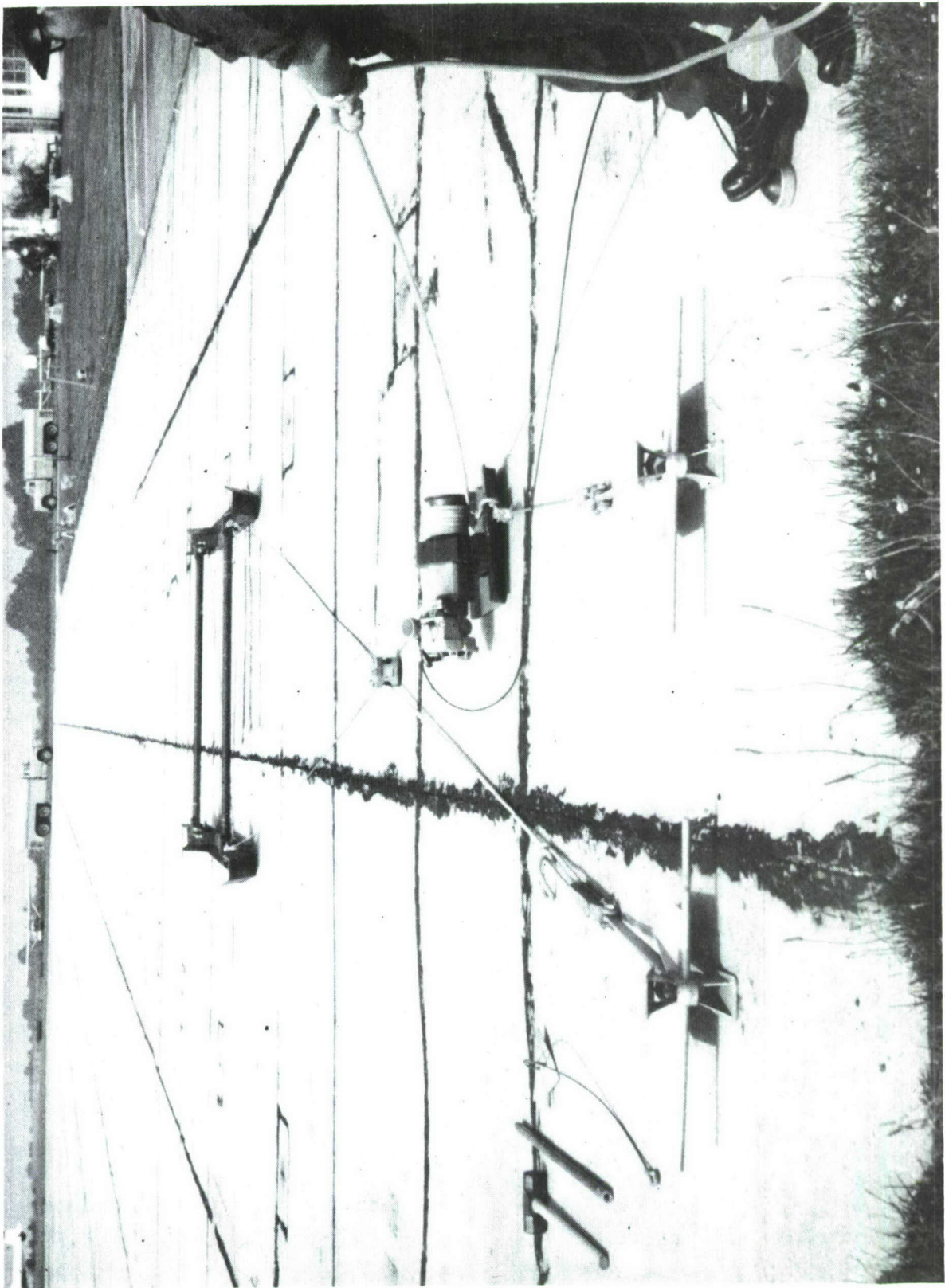


Figure 2. Ski System, Component Parts



Figure 3. Skis on UH-1H Helicopter

Helicopter movement was effected by setting the anchors and towing the helicopter in a straight line to a desired point. Turns of up to 45 degrees could be made by resetting the anchors in the desired direction. The tow line was 5/8" diameter braided "Dacron" with a breaking strength of approximately 11,000 pounds.

Bare Skid System

The bare skid system was intended for soil conditions in which the additional ground contact area provided by the skis was not necessary. It consisted of diagonal cable bracing for the skids and cross tubes. The same towing system was used. The system is shown installed on a UH-1H helicopter in Figure 4.

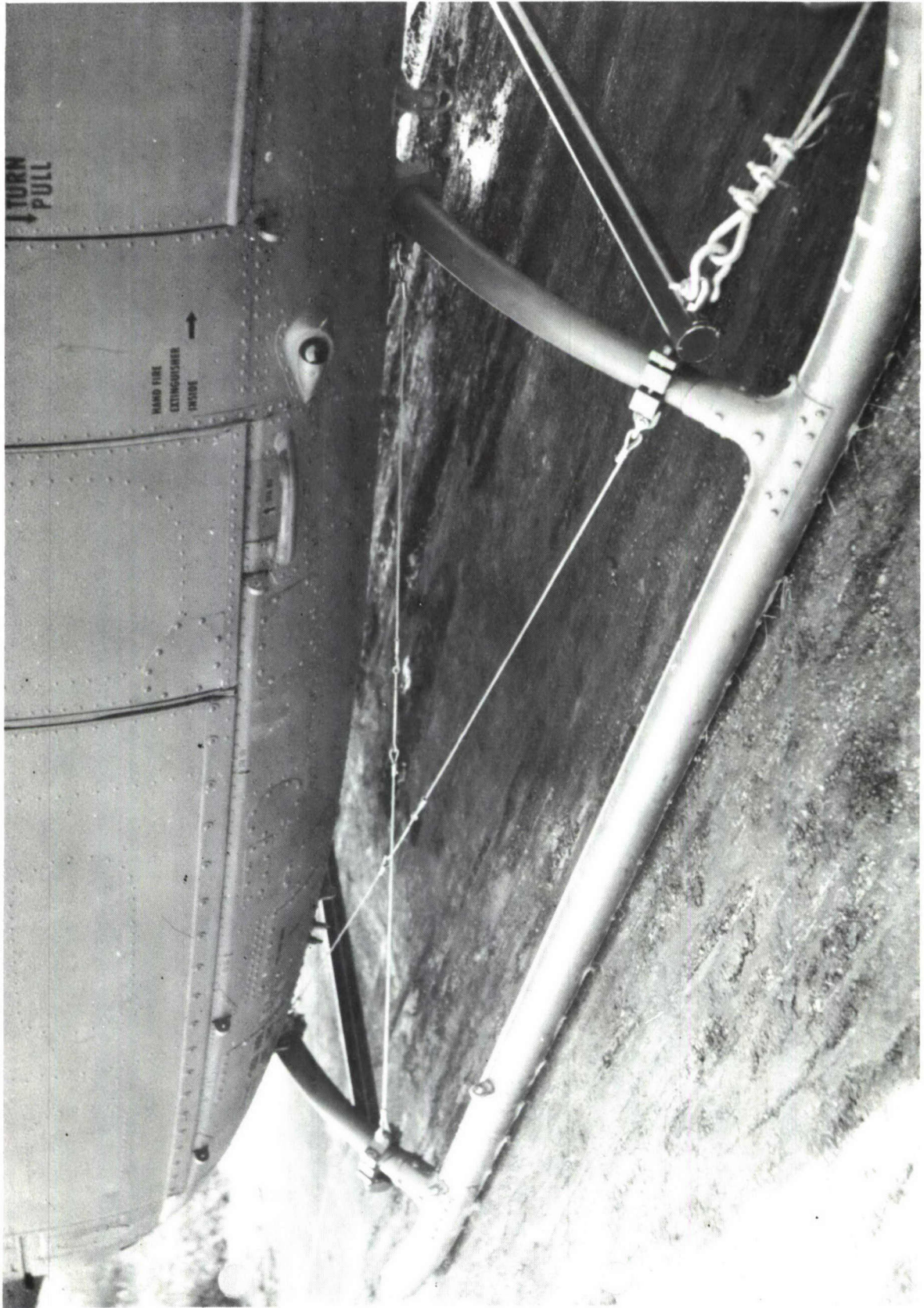


Figure 4. Bare Skid System

TESTS

Because of the short time span of the task, LWL tests were limited to functional and safety testing. Each item was tested to insure that it functioned as intended without damaging the aircraft. Limited towing and turning tests were conducted with the skis and skids in a number of conditions: soft and hard ground, plowed ground, across small ditches, and up and down slight slopes. All conditions were traversed without damage to the equipment or aircraft. The tests were not sufficient, however, to determine any limits or extremes for safe or effective usage.

A brief demonstration of all the equipment was conducted by MASSTER on relatively hard level terrain. From the demonstration MASSTER personnel determined that under the conditions of their testing and for their purposes, a tactical vehicle towing the helicopter on its standard ground handling wheels would be more convenient. No additional evaluation or tests were conducted.

CONCLUSIONS

1. Due to a limited operating time when using the aircraft battery, overheating with a constant power source, and the impracticality of providing a separate power source, the "Robotow" units as tested are unsatisfactory for field use.
2. The field user reaction to the ski systems indicate that the time and effort required to move the helicopter by these methods are not acceptable.
3. A doctrinal definition of the ground rules and circumstances under which helicopters are to be moved in rough terrain must be established before meaningful development of equipment can be accomplished.

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