In the following pages, it is our pleasure to outline the varied experience and performance of WNRE and to suggest something of our potential as creative engineers.

Of necessity, the photos deal largely with special purpose equipment and vehicles—all of our own conception and design—which have reached the stage of construction.

The forty-odd projects that resulted in reports on research, operations analyses, technical surveys, and concept and design studies are more difficult—in fact, virtually impossible—to illustrate. The important thing is that we not only wrote, but read them and put the results to work.

Since WNRE was founded in 1954, our work has ranged from problem analysis to production . . . from design and construction of 30-pound scale-models to development and production of the largest track-laying vehicle ever built . . . from testing new vehicular concepts in the Arctic Circle to tire tests on the deserts of Arizona. In fact, with our POLECATS now in Antarctica, our work has extended, literally, from Pole to Pole.

The result has been the forging of an integrated, imaginative, fast-moving team capable of tackling unusual problems and carrying through from concept to construction.

Our talents, experience, facilities, and enthusiasm for dealing with unusual problems are at your disposal. We invite your custom.

WILSON NUTTALL, RAIMOND, Engineers, Incorporated

C. J. Nuttall, Jr. President
PROBLEM ANALYSIS AND RESEARCH

SCALE MODEL RESEARCH

WNRE engineers field test a scale model tracklayer.

TIRE RESEARCH

WNRE-designed rig tests full-size, single, driven tires.

SKI RESEARCH

A single-ski rig tests the unique submersible ski concept in Michigan.
WNRE cut its teeth on research—on off-road vehicle research, an unusual and difficult field. Why do vehicles get stuck? How can design concepts be altered so vehicles won’t bog down? How can design produce higher cross-country speeds?

A continuous series of WNRE projects has dealt with the problem of vehicle mobility at every level: problem analysis, research planning, field and laboratory testing, the interpretation and presentation of these results in reports, concept studies, operational analyses.

Consultation and planning has put us in touch with vehicle, soil, and snow experts throughout the world. Our field work has taken us through mud, sand, marsh, muskeg, and snow from the Greenland icecap to the deserts of Arizona ... from the tundras of Alberta to the swamps of Louisiana. The total effort has involved studies of tires, tracks, and skis in the laboratory as well as in the field.

WNRE is particularly proud of its part in developing the use of scale models for studying and predicting the performance of off-road vehicles. Our connection with scale-model research dates back some 15 years to the first tests at the Experimental Towing Tank, Stevens Institute of Technology. As a firm, WNRE gave this work new impetus and direction by testing the models in actual field conditions on all kinds of terrain. As a result of WNRE’s leadership, scale-model testing is now one of the off-road designer’s tools.

WNRE began with research. We are still research-oriented and research-capable.
DESIGN AND DEVELOPMENT

CONSTRUCTION EQUIPMENT DESIGN

Workmen test traveling trench cover forms for transportation tunnels.

SKI VEHICLE DESIGN

Engineers work with experimental shop craftsmen in creating the KEEBIRD.

TRACKED VEHICLE DESIGN

The MUSK-OX prototype takes shape in the shop.

WNRE engineers test a mock-up of the design for the POLECAT.
WNRE design and development activity began with the need to create unusual equipment in support of our research. As research progressed, it became evident that concepts and graphs were not a satisfying end product. Only working machines could prove the worth of the new directions suggested by research.

Translation of research to hardware demanded design work which was alert, imaginative, and sympathetic in order to bridge the gap. Under this impetus and leavened by the diverse backgrounds of our key people, WNRE's design activities expanded.

The KEEBIRD was our first major design problem. This unusual vehicle is intended to test the concept (suggested by the U.S. Army’s Dr. Henri Bader) of skis running, hydro-foil fashion, at modest, controlled depths below the hard, jolting snow surface typical of the Greenland icecap.

The detailed design of the KEEBIRD was preceded by preliminary calculations, a complete vehicle concept study, and slow-speed control trials of a single ski mocked-up on an ordinary over-snow vehicle. After the elements proved themselves, detailed design was completed, the vehicle constructed in the WNRE shops, and first trials run in Greenland. These trials, while still not complete, indicate that the idea will work, and in the Arctic, comfortable, all-weather surface transportation at speeds nearing the century mark may be common within a few years.

Since the KEEBIRD, WNRE design work has ranged from small field instrumentation (such as the soil/snow shear vane) to a complete 50-ton tracked vehicle of radical design... from a complete vehicle/soil research laboratory to a system for the continuous snow-roofing of transportation tunnels in Greenland.
CONSTRUCTION AND TESTING

The step from design and development to construction and testing ... from a small model and instrument shop to a full-fledged experimental vehicle shop ... was a natural one for WNRE.

For the successful creation of working experimental equipment, a nucleus of skilled craftsmen is required, and WNRE already had trained this core of craftsmen in support of its research work. The expansion of our Rock Hall shop was undertaken in the fall of 1957 for the first of the KEEBIRDs and POLECATs.

In November, 1958, the experimental shop began construction of the first MUSK-OX, which was delivered in February, 1959.

The MUSK-OX not only demonstrates WNRE's capabilities in the construction of prototypes, but also embodies the most advanced results from our accumulated research.

A bellyless, tracked vehicle, the MUSK-OX is designed to carry 20- to 25-ton payloads over the treacherous waterlogged muskeg of Northern Canada. It is 50 feet long and, with its cargo, grosses 100,000 pounds. It has the first air suspension system ever applied to a tracked vehicle, and is the first vehicle in its weight class to achieve a nominal ground pressure of less than three pounds per square inch. With four fully powered tracks, the MUSK-OX is steered by full hydraulic-servo joint articulation, a development pioneered by WNRE on the POLECAT in early 1958.

The MUSK-OX, an outgrowth of WNRE's total unique experience, required only one year from first concept to delivery.
POLECAT TESTS

The POLECAT prepares for a test run over rough, snow-covered terrain in Greenland.

SPECIAL TRACK AND TIRE TESTS

A test rig tests the bag track concept.  A special trailer tests beadlock devices.

KEEBIRD TESTS

The KEEBIRD starts trials in Greenland, reached speeds up to 50 mph.
PRODUCTION AND FACILITIES

EXPERIMENTAL SHOP FACILITIES

MAIN OFFICE AND PLANT

Engineering, administration, and production are located at main office and plant, Chestertown.

WNRE maintains an experimental shop and laboratory at Rock Hall, Maryland.
The success of WNRE's prototypes led to production of some of these vehicles. At our Chestertown plant, the POLECAT is now in production for commercial and military users. The MUSK-OX will soon follow.

An all-terrain, tracked carrier, the POLECAT is capable of on-road speeds of 35 mph and off-road speeds in most soft or rough terrains of 10 to 20 mph. All four tracks are fully powered, and the vehicle is steered by hydraulic-servo joint articulation. Because of its extremely long wheelbase, as compared to other tracked vehicles in its weight class, its ride over rough terrain is remarkably smooth.

Equipped for cargo carrying, the POLECAT is a 2 1/2-ton payload vehicle. The basic configuration, however, is readily adaptable to a variety of purposes. Current production features a rear-engine, front-cab Arctic personnel carrier (Model 600) and a front-engine Arctic VIP carrier with reclining seats for six in the rear cab (Model 900).

The POLECAT is, perhaps, the best example of WNRE's comprehensive capabilities from problem analysis to production—even though no specific physical research was required. The original design drew upon the entire body of WNRE's research and background. The advanced configuration had been proposed in previous work, model-tested, and studied in connection with development testing of the small, Canadian Army 600-pound carrier, the RAT. The hydraulic servo-control of the steering joint—unique when first conceived by WNRE—later was successfully scaled up for a 25,000-pound test rig and then for the 100,000-pound MUSK-OX.

The POLECAT 600 series (left) and 900 series (right) on the WNRE production line.

The first MUSK-OX passes final tests. Production will start late in 1959.
KEY PERSONNEL

Nucleus of the imaginative, fast-moving WNRE team is a group of five key men with diversified talents, experience, and backgrounds.

C. W. “Bill” Wilson... senior engineer and vice-president... accumulated invaluable automotive and research experience at Aberdeen Proving Grounds, winding up as chief of the Vehicular Mobility Research Section... moved to Stevens Tech for a “post-graduate” course in vehicle research as assistant chief of the Motor Vehicle Research Division... came with WNRE as one of its original founders... is a specialist in field research and testing... has a fundamental practicality that keeps design work constantly in touch with the facts of life.

C. J. “Cliff” Nuttall, Jr... chief engineer and president... started as a naval architect (Webb Institute, ’43)... moved in Darwinian fashion from water craft to amphibians (amphibious jeep, DUKW, and Weasel programs) to land vehicles (vehicle mobility, vehicle scale models, design)... started work with Sparkman & Stephens... came ashore at Stevens Tech as chief of the Motor Vehicle Research Division... helped establish WNRE... broad experience in research, design, and use of marine, automotive, and laboratory equipment... contributes an imaginative, well-rounded engineering background to the group.
V. M. "Vince" Raimond ... administrative vice-president and secretary-treasurer ... served in the U. S. Air Force ... worked on yacht design with Sparkman & Stephens before entering the University of Alaska to earn his B.S. in Civil Engineering ... went with Stevens Tech's Motor Vehicle Research after several years as a general contractor in Fairbanks, Alaska ... then became one of WNRE's original "big three" ... has an eye for administration as well as a thorough background in engineering and vehicle research.

T. F. "Tom" Helms ... vice president for industrial design ... served in the U. S. Air Force before graduation from Pratt Institute ... worked with Lippencott & Margulies and with Raymond Loewy ... designed consumer goods and capital equipment for over 100 of the country's largest manufacturers ... worked on the habitability program for America's first atomic submarine, the USS Nautilus ... joined WNRE in 1958 ... has a flair for designing simplicity and productability into anything from propeller beanie to locomotives ... heads up the WNRE Industrial Design Division, a subsidiary division of the firm.

Hjormund Krummen ... vice president for Canadian operations ... trained in Sweden as an aircraft designer ... fought with the Norwegian Air Force in World War II ... emigrated to Canada where he worked with Atlas Polar and A. V. Roe ... became project engineer on the 600-pound tracked cargo carrier, RAT, for the Canadian Army Directorate of Vehicle Development ... joined WNRE in 1957 ... played a key role in the development of the KEEBIRD and MUSK-OX ... applies an imaginative but highly practical engineering mind to every problem.
WNRE AND THE FUTURE

How can WNRE’s accumulated research be put to work for you? How can its unique background in design, its experience in development and testing of prototypes, its facilities for production answer your problems?

Exploitation of WNRE’s unique and growing know-how with large, articulated track-layers could have an all-terrain 60-ton payload missile carrier or cargo carrier in operation in less than a year. Only detail design and construction would be involved in this logical extension of a now well-proven concept.

WNRE’s unequalled experience in the use of vehicle scale-models could be put to work on research on high-speed ground vehicle propulsion systems and on pretesting radical new vehicle proposals. Our total capability insures rapid translation of results into practical design information, complete designs, or practical working machines, as desired.

Our background in vehicle mobility, soil and snow mechanics, and in the creation of unusual machinery especially qualifies WNRE in the study and development of specialized construction equipment.

The variety of WNRE’s solutions to off-road transport problems and our wide practical knowledge of off-road conditions suggest that this experience can be utilized in the development of complete integrated transportation systems for the exploitation of natural resources in remote areas.

Increasing emphasis on STOL and VTOL aircraft requires revaluation of most support systems with emphasis on high ground mobility and extreme light weight, a revaluation that WNRE is well qualified to undertake.

If you have an unusual problem in our field, WNRE may already have the solution. And if the solution is still to be found, WNRE’s comprehensive capabilities are geared to find it quickly, economically, unequivocally.
Length
Width
HT

Front 32' 13' 13'
Rear 34' 13' 13'

Reducible to 10' x 4 for shipping

Fuel 700 U.S.