

# Nike Hercules Gives Troops Potent Punch

## Army, Industry Provide Anti-Aircraft Weapon

When the Army first fired the Nike Hercules all the way down the White Sands Missile Range it had to move the back wall of that shooting gallery back 40 miles.

That was in 1960—and the Hercules had been in the hands of troops for three years.

To trace the history of the Nike Hercules we have to go back to the very early days of American missilery—1945 to be exact. It was then that the Army, Western Electric Company, Bell Telephone Laboratories and the Douglas Aircraft Company began labors on a weapon that was to be the crack of dawn in a whole new era of anti-aircraft defense.

The first weapon was called simply the NIKE, after the Greek Goddess of Victory. Later this

weapon got the masculine given name of AJAX, and a more muscular brother was naturally named HERCULES.

### First Battery

Today the vast Nike Hercules management program is directed by Lt. Col. Joseph C. Baer with offices here on Redstone Arsenal. The Colonel got into the Nike program in 1954 as a Battalion Commander at Detroit. This was just one year after the first Ajax battery was activated at Fort Meade, Md.

The Colonel can call on 16 years experience as an artillery officer. Since receiving his commission in the Coast Artillery Corps from Officers Candidate School in 1942, he has served with AAA and missile organizations continuously except for a break from 1945 until 1949.

During that period he was with the State Department in Cairo, Egypt, as a Property Disposal Officer; Director, Administration and Fiscal Division; and, finally, as Acting Central Field Commissioner for Africa and the Middle East, Office of the Foreign Liquidation Commissioner.

Col. Baer is a native of Reading, Pa. and attended Pennsylvania State University. He is a graduate of the Command and General Staff College.

He came to Redstone Arsenal in 1959 as Chief of the Technical Programs Division of Research and Development, Headquarters, AO-MC. Later he became Acting Deputy to the Assistant Chief of Staff for R&D. Last January he was appointed Project Manager for Ajax, Hercules, Target Missiles and Multi-system Test Equipment.

### Support Agency

While the Colonel's principal staff is here, he also has a support office in Washington headed by R. O'Dell, and field offices at Western Electric Co., Burlington, N.C., headed by G. W. Haug; General Electric Co., Syracuse, N.Y., headed by G. S. Brown; Douglas Aircraft Co., Charlotte, N.C., headed by A. R. Andrews; and Aircraft Armaments, Inc., Cockeysville, Md., where S. L. Little is in charge.

### Smock Is Deputy

The Deputy Project Manager is Edward L. Smock, who answers to both Ed and Leo. Smock probably has as much missile experience as

anybody on the Arsenal with the exception of some of the German scientists. Born in Louisville, Ky., and graduated from the University of Kentucky with a degree in electrical engineering, Smock began working on guided bombs back in 1943.

Later he went with the Naval Ordnance Test Station where the 2.75 rocket and Terrier Missile were being developed. He came to Redstone in 1952 and continued work on the Terrier. Later he became chief of a missile research and development project.

He added two other deputy titles to his name prior to becoming Nike deputy chief. He was Deputy Chief of Surface to Air Missile



EDWARD L. SMOCK

Systems and Deputy Chief of Technical Programs for the Army Ordnance Missile Command.

The Nike Hercules Project Manager's Office is responsible for the management of the development, engineering, procurement and logistical support program for all items and components of the system for the U. S. Army and other

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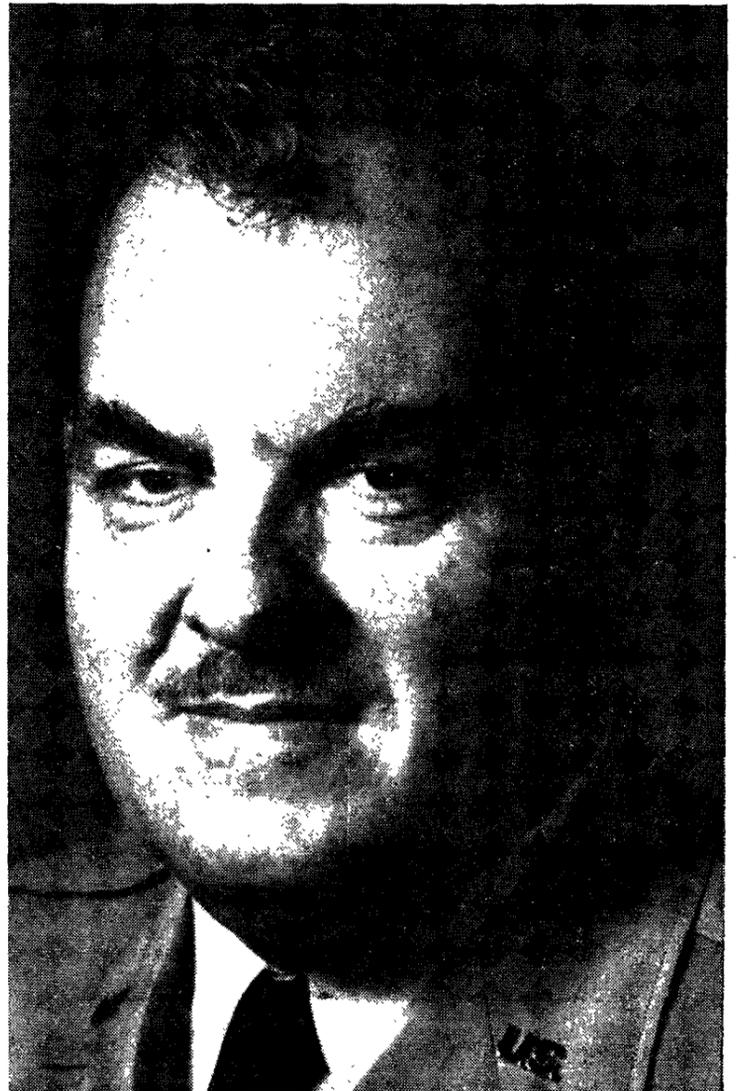
## The Redstone Rocket

SECTION TWO

Redstone Arsenal, Ala.

Dec. 19, 1962

Page 1



Lt. Col. Joseph C. Baer — Nike Hercules Program Manager



THE HERCULES



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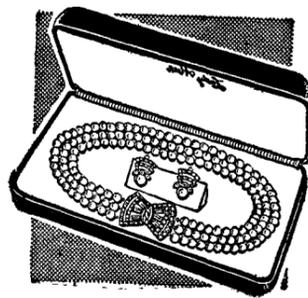
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## HERCULES

(Continued From Preceding Page) customers.

### 4,000 Sub-Contractors

That long statement boils in part down to this: The Office manages some 100 prime contractors and about 4,000 sub-contractors.

Not only that but, there are 44 other government agencies concerned in one way or another with Hercules; ranging from the Human Research Laboratories (HumRRO) to the White Sands Missile Range, and from the U. S. Army Tropic Test and Research Center, Canal Zone, to the U. S. Army R&D Office at Fort Wainwright, Alaska.

As long as we're describing the Office with numbers, here are a few others that are significant. About 246 people are directly involved in the management. Government support services add another 6,000.

### Separate Services

Numbered among those in support services are Redstone Arsenal employees who don't answer directly to the Project Manager's Office. These include members of the Directorate of Supply and Maintenance, the Directorate of Research and Development, the Directorate of Procurement and Production and the Missile Support Command.

Then, prime contractors and sub-contractors have another 20,000 people employed on the Hercules program. So far we've counted some 26,200 persons directly involved with the system without even counting the thousands more who man and maintain the Ajax and Hercules batteries deployed around the world.

Through fiscal 1962 about \$129 million has been spent on research and development for the system. But that figure is only 8 per cent of the money that has

been spent on production.

Through 1962 some \$1,730 million has been spent for production hardware and services. This year alone Col. Baer and his staff will manage some \$4.45 million worth of R&D and pay out another \$178 million for production.

### More Than 300 Sites

Right now there are more than 300 Nike Hercules sites throughout the world. And the missile, which has a tremendously high reliability rating—the exact figure is classified—has been fired more than 1,000 times.

The Ajax which many of this country's missilemen cut their teeth on is rapidly being phased out. Many Army Missile Command employes still speak with nostalgia of the "old days" when anti-aircraft gun aiming radars such as the M33 were being converted to work with this brash young weapon that carried its own brain into the sky and tracked down its prey while on the wing — something an artillery shell could never do.

The Nike family has roots reaching back to the very genesis of missile development. The knowledge gained in its building has, in turn, aided in the development and subsequent fielding of many missiles in the vast arsenal this country has today.

### Weigh a Ton

The Ajax missiles are about 30 feet long, have a wing span of some 50 inches and weigh at blastoff slightly more than a ton. Contrast this with the Hercules which is only about eight feet longer, but measures about 90 inches from fintip to fintip and leaves the launcher weighing five tons.

The Hercules, which became operational in 1958, is replacing the Ajax in all theaters of operation. The principal users of the Ajax today are some National Guard



**HERCULES SECRETARIES**—These are secretaries to the Hercules Project Office top officials. From left: Paula Gatewood, Lucille Sheats, Correne Huggins, Joyce McWhorter, Leah Peters and Pat Middlebrooks.

units and the missile training site at McGregor Range, N.M. Army missile units from the United States as well as allied countries fire the Ajax as well as the Hercules at McGregor Range.

Much of the Ajax equipment replaced by Hercules system items is put to use elsewhere. In some cases it changes clothing from military to civilian. Ajax radars are being used at airports for aircraft control and at weather stations to aid in forecasting. Ajax surplus radars are also used at missile ranges for surveillance and target control.

The Hercules with a nuclear warhead capability and bigger motors than the Ajax has a greater speed and kill capability than its smaller brother. The Hercules can soar to heights in excess of 100,000 feet and for a range of more than 85 miles.

### Supersonic Speed

The supersonic speed of the Hercules and its high maneuverability makes it capable of intercepting other missiles. For example, the Hercules has knocked down the Corporal missile and an-

other Hercules fired against it as a target. So far the Hercules has destroyed every type of winged target it was sent after.

The Nike missile systems use a command guidance system. The bare bones of this system are three radars and a computer "brain."

The acquisition radar is the sentinel for the Nike battery. This radar shoots out pulses of energy in a continuously rotating pattern like a wagon wheel with many thousands of spokes.

Once the acquisition radar de-

(Continued on Next Page)

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(Continued From Preceding Page) tects a target and points out its approximate range and azimuth, its job is done. The location of the target is transferred to the pinpointing tracking radar which will dog the target until the kill is completed.

**Radar Also Listens**

While the target tracking radar is following every move of the target the missile tracking radar, its identical brother in appearance, is following the missile, listening to its electronic pulse beat and issuing guidance orders. The computer, meanwhile, sits in the middle and receives both the position of the target and that of the missile.

Its job is to compute how far the missile is from the target and, in turn, issue control orders to the bird to bring the two together. This is no mean job considering that the computer must do some pretty complicated three dimensional trigonometry. Not only does the computer do its mathematics, but it also keeps a written record of the whole operation on both paper and photographic film.

The man in the Nike Hercules Project Manager's Office who keeps his finger on all programs is Melvin (Mel) Johnson, a work-



MELVIN JOHNSON

ing engineer turned manager. Johnson was born in McGregor, N.D., just 25 miles this side of the Canadian line and took his degree in electrical engineering from North Dakota State University. He claims he got in Ordnance "by accident" during World War II and ended up a Major. He has been at Redstone since 1958 and with the Nike Project Office for three months.

**Was in Plans-Programs**

Prior to taking over the Nike Program Management Office he was Chief of Plans and Programs for the Army Ordnance Missile Command and Chief of the Program Budget Division in the office of the Comptroller and Director of Programs.

Johnson's office is split into two branches; the Review and Analysis Branch, headed by George Bittenbender, and the Project Budget Branch with Jack Williams as the senior program specialist. Johnson "keeps house" for the Nike Project Office. He looks after the details of managing the missile system as well as seeing that its programs dovetail and there's money to pay the bills.

His Review and Analysis Branch receives periodic reports from all of the other Nike Project offices. From these the Branch can construct a picture of the whole operation. You might call it a stereo picture because it not only shows the present status of the Nike system, but also where it's been, where it's going and how fast it's traveling.

**Two Types of Programs**

An established system like Hercules has two types of programs; those which require the expenditure of production funds, and those which call for research and development dollars.

In addition to these expenditures, the Project Manager's Office will monitor indirectly the expenditure of another \$25 million in Operation and Maintenance Army (O&MA) funds and stock funds. This money will be spent for such goods and services as repair parts, training of personnel and maintenance.

**Systems Engineering**

Merle Pederson, a native of

South Dakota, heads up the Nike Systems Engineering Division. Pederson took his degree at South



MERLE PEDERSON

Dakota State College at Brookings with majors in engineering and physics.

He did radar work at the Naval Research Laboratories and the Engineering Research and Development Laboratories at Fort Belvoir, Va., before coming to Redstone Arsenal in 1958. Pederson landed with the Hercules project when he came to work here.

When Pederson is away, T. J.

Adams Jr. assumes his duties.

The division is responsible for Hercules research and development and engineering. A major part of this job is monitoring efforts by Hercules contractors.

Pederson's office is broken down into the Development Engineering Branch, Product Engineering Branch and the System Requirements and Analysis Branch.

On a system such as the Hercules the system's contractors do much of the slide rule and drafting board work. The Project Manager's Office "writes the technical requirements according to military needs." The technical requirements (TR's) become a part of the contract which the item is manufactured under.

**Broad Requirements Listed**

When asked how a new item of missile equipment gets its start, Pederson explains it this way. The Combat Development Command draws up the broad over-all objectives. These are prepared by high level defense planners. The broadly written requirements go to the Chief of Research and Development at the Army level.

Here the necessary capabilities of the item are determined. These requirements are sent to the Army Materiel Command of which the Army Missile Command is an element. The Missile Command—in our case the Nike Hercules

Project Office — supervises the building of the item, its testing and adherence to requirements.

The Production Engineering Branch under Al James makes sure that a Hercules modification is compatible with the rest of the system. It may also suggest more economical and better ways of producing an item. An example of this is a suggestion made by the Branch that motor cases be cast instead of turned, saving both money and time.

**Keep Up With Advance**

Pederson says his group keeps up with missile developments in other fields through membership in professional societies, contractor presentations, technical publications and equipment schools.

The Hercules manager who is (Continued on Next Page)

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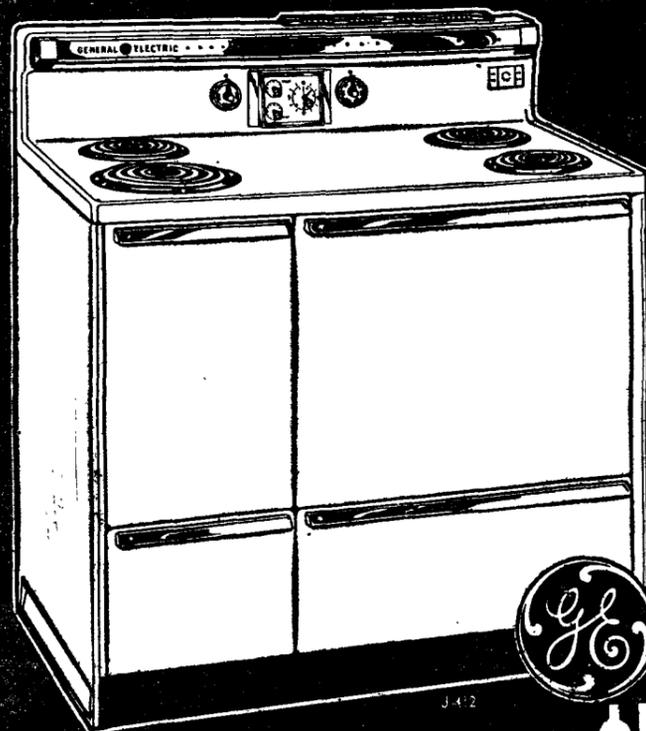
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**HERCULES**

(Continued From Preceding Page) probably closest to the man in the field is A. E. (Art) Tarwater. Tar-



**A. E. TARWATER**

water is a native of Alabama—he was born at Hodges—and a graduate of the University of Alabama. He received a degree in electrical engineering in 1950 and spent four years with the Tennessee Valley Authority as a design engineer.

When Tarwater came to Redstone in 1955 he worked with both the Corporal and Nike Ajax programs. In 1957 he became a full-time Nike engineer.

Tarwater says his Systems Support Division "cooperates with the Nike Engineering Division in designing and modifying the system for operation and maintenance by troops in the field."

**Clearing House**

His Division acts as a sort of clearing house for problems from the field. Many of these problems are solved by Tarwater's people and an answer sent back to the field. Some may result in modifications to the equipment. Tarwater says "every missile system is nothing more than an R&D model," capable of further improvements.

Tarwater says his Liaison and

Technical Procedures Branch deals with the management of an individual missile system as well as its functioning. His Systems Branch is a hardware outfit and is broken down into sections that look after problems in missile and ground handling equipment, tools and test equipment, external guidance, test equipment, radars, and mechanical parts of the system.

He said the Division doesn't normally design equipment, but may recommend specific design in order to meet the problem at hand.

**Smallest Division**

One of the smallest divisions in the Project Manager's Office—but not a small one in significance—is the Quality Assurance Division. This four-man operation is headed up by Don Howard, a native of Jackson, Tenn.

The Quality Assurance Division determines the rigid inspection standards that Nike equipment must pass. While this Division does not perform many inspections itself, it does pass the requirements to the Army Procurement District which does the actual inspection.

**Evaluate Contractors**

Another important function of this office is its evaluation of contractor's quality control methods. It also determines if a contractor's operations meets the specifications set forth by the contract.

Another function of the Division is to furnish drawings of the item and purchase descriptions to the Procurement District which does the inspections.

One of the most important functions of the Division is to coordinate standards with the Industrial Engineering Laboratories in the Directorate of Procurement and Production. These labs have the capabilities of providing direct analysis and testing of missile items.

**Grocery List**

The next time you go to the grocery store with a list of 15 or 20 items think of Fred Chesebro and consider yourself lucky. Chesebro has a list of 175,000 separate items. He is head of the Nike Procurement and Production Divi-



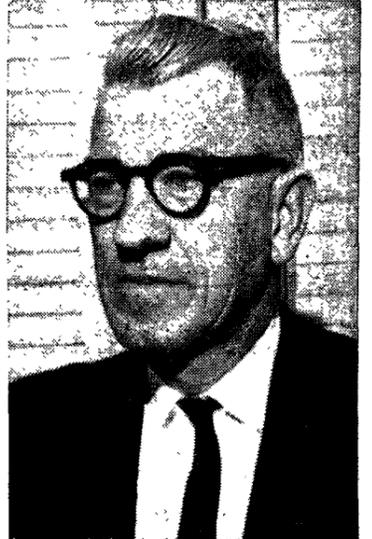
**FRED CHESEBRO**

Chesebro is a native of Stoning-

ton, Conn., who came to Redstone Arsenal as a private in 1951 and liked it so well he stayed on. With a long background in procurement, he was Chief of the High Altitude System (Nike) procurement program in the old Industrial Operations. There are 30 people in the division which deals primarily with the system's 100 prime contractors.

Chesebro says his division is concerned with "the planning, procurement and delivery of all Nike items." Imagine how complicated your grocery list would be if you had to purchase from 100 stores and make sure that each item met a set of rigid standards.

Lewis Dorris, a retired Nike maintenance Warrant Officer, heads up the Operations Office. Dorris' team handles the general administrative details such as mails, records, and travel. It must also develop new administrative



**LEWIS DORRIS**

procedures and methods to handle the burgeoning Nike program.

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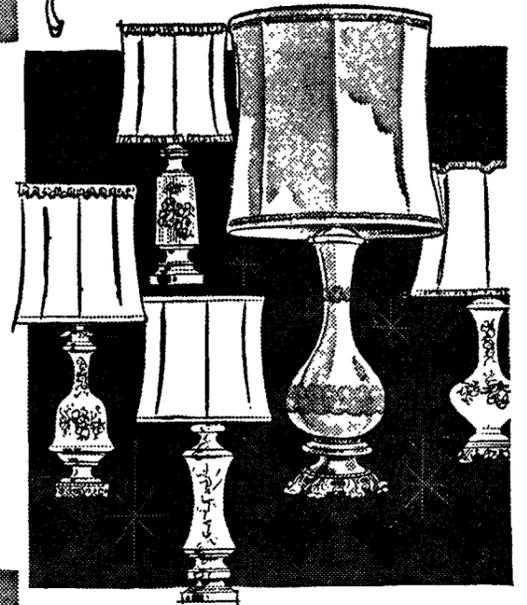


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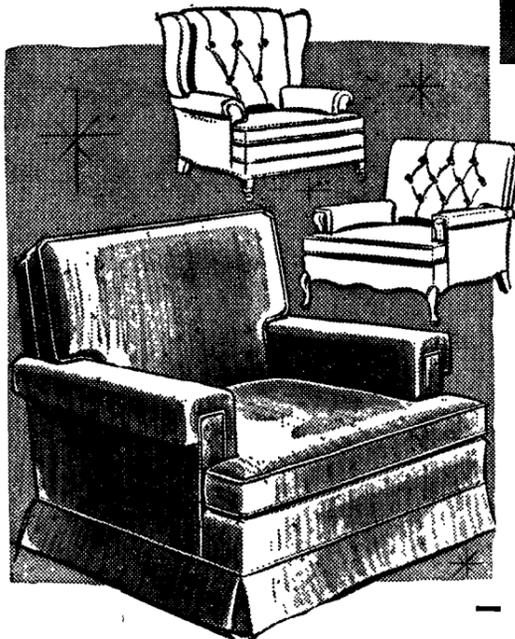
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## Pershing Tested For Battlefield, Airborne Mobility

Army's future battlefield mobility will be demonstrated when its Pershing ballistic missile and its newest and largest helicopter, the CH-47A Chinook, are combined in compatibility tests starting Dec. 11 at McCoy Air Force Base, Orlando, Fla.

Personnel of the Army Materiel Command and the industries in-

involved in the two systems will combine efforts in tactically moving the Pershing system with a Chinook helicopter, designed to carry Pershing missile system components and other heavy military equipment.

No firings will be connected with the compatibility test.

Pershing project personnel from the Army Missile Command; others from the Martin Company, Orlando Division, Pershing prime contractor; Vertol Division of the Boeing Company, Chinook prime contractor; U. S. Army Aviation Board; U. S. Army Airborne and Electronics Special Warfare Board

will conduct the tests.

Pershing project personnel will document techniques used in the loading, flying and unloading of the weapon system.

The Chinook is scheduled to enter the Army inventory in early 1963. Plans call for the use of one aircraft in the test, although several Chinooks would be required to transport a complete Pershing firing unit in a tactical movement.

Objectives are to evaluate the air transportability of the system by the Chinook aircraft, evaluate helicopter load securing techniques and to obtain Pershing weapons system operational reliability data. Pershing staff members also

plan to obtain further information on system and subsystem performance.

Major system components include the missile on an erector launcher, power station, programmer test station and communications control. These units are mounted on tracked vehicles to provide greater mobility.

A load master from the Electronics Special Warfare Board will direct the loading, unloading and tie down procedures used in the test. A helicopter pilot from the Aviation Board and one from the

Boeing Company will fly the aircraft.

Martin Company will be represented by a local system test team. The Pershing missile system was developed under the technical supervision of the U. S. Army Missile Command.

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The Redstone Federal Credit Union's Board of Directors declared a four and one-half per cent dividend for its members to be posted December 31.

The dividend will reflect on the members accounts on the January quarterly statement.

Also at the December meeting, Brig. Gen. H. P. Persons was appointed to the Board of Directors to fill a vacancy on the nine man board.

President Harold B. Carpenter said, "We are pleased to announce the dividend to shareholders. In addition to a liberal return on shares on deposit, members have the unique life savings insurance benefit, matching savings up to a maximum of \$2,000 subject to age and eligibility provisions. This coverage represents a direct cost to the Credit Union, but is obtained by shareholders simply by having savings on deposit."

### Births at Post Hospital

Ronald Eugene Hughes, 7 lbs., 7 ozs., Dec. 1, son of Cpl. and Mrs. James Dewey Hughes.

Stephen Gregory Hendrix, 7 lbs., 9ozs., Dec. 1, son of 2/Lt. and Mrs. Joseph S. Hendrix.

Beverly Susanne Clough, 6 lbs., 10 ozs., Dec. 3, daughter of Sgt. and Mrs. Charles E. Clough.

Paul Edward Pinkley, 6 lbs., 7 ozs., Dec. 3, son of SP5 and Mrs. Edward K. Pinkley.

Brett Eugene Owen, 7 lbs., 4 ozs., son of Sp4 and Mrs. William L. Owen, Sr.,

Gregory Wayne Jones, 5 lbs., 13 3/4 ozs., Dec. 6, son of Sp4 and Mrs. William H. Jones.

Deborah Gail Andersen, 7 lbs., 2 1/2 ozs., Dec. 6, daughter of Sgt. and Mrs. Albert W. Andersen.

James NMN Roy, 7 lbs., 9 1/2 ozs., Dec. 7, son of Capt. and Mrs. Edward E. Roy.

William Edward Ross, 6 lbs., 2 3/4 ozs., Dec. 8, son of SSgt. and Mrs. James W. Ross.

Kimberle Jean Hooten, 7 lbs., 6 1/2 ozs., Dec. 10, daughter of Sfc and Mrs. William H. Hooten.

Michael Lynn Spivey, 8 lbs., 3 1/2 ozs., Dec. 10, son of Pfc and Mrs. Herbert L. Spivey.

Sigma 7, Astronaut Schirra's spacecraft, used a new missile impact location system. At the moment of parachute deployment, a small bomb was released. Sound waves from the exploding underwater bomb were picked up by several receiving stations and plotted for a general fix on Schirra's impact area.

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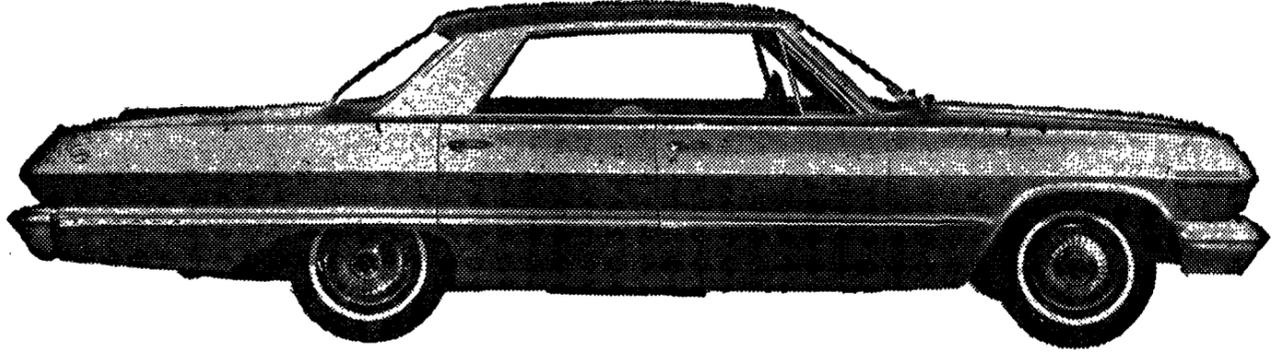
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Redstone Arsenal, Alabama

# RCA Wins Bid For Contract

A contract exceeding \$2 million for further development of multi-system test equipment has been awarded to the Defense Electronics Products Division of RCA, Camden, N. J.

Work on the \$2,100,000 contract will be done at RCA plants in Camden and Burlington, Massachusetts. Contracts totaling \$5,200,000 have been awarded for the multi-system test equipment production.

Multi-system test equipment is being designed to automatically test many Army missile systems. The equipment is presently programmed for testing the Mauler and Lance systems. Plans call for the system to be adapted to the Shillelagh anti-tank system as well as other future programs.

The automatic test equipment contains a computer and other electronic circuits which not only systematically isolate trouble in missile systems but also checks its own malfunctions.

Col. D. F. Shepherd, commodity manager for Target Missiles and Multisystem Test Equipment, said the system will substantially reduce the cost of maintaining missile systems in the field.

He said reduced maintenance costs will result because fewer trained personnel will be required to operate the automatic system and missile checkout and repair time will decrease.

Basic components of the multi-system test equipment will include electronic, hydraulic and pneumatic units. Each unit is in an enclosed van and may be mounted on a standard Army truck or tracked vehicle. The system will be transportable by helicopter.

The contract was negotiated by the Philadelphia Procurement District.

### QUOTE OF THE WEEK

"I do not know how you can distinguish between Chinese communism and Chinese imperialism. Chinese communism and all communism is imperialist. Let that be understood." W. Averell Harriman, United States Assistant Secretary of State.

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### WINTER QUARTER

JANUARY 3 - MARCH 22, 1963  
CLASSES BEGIN - JANUARY 7

Placement Tests:  
Jan. 2 & 7: Math-6:00 p.m.;  
English 7:00 p.m.

# HUNTSVILLE CENTER

## University of Alabama

REGISTRATION: JANUARY 3 AND 4 — 12:00-8:00 P.M.

FOR FURTHER INFORMATION:  
CALL 539-7731

LAST DAY OF REGISTRATION:  
JANUARY 16

### — Schedule of Classes —

#### DAY CLASSES ON MONDAY AND WEDNESDAY\*

Accounting 2 ..... (8:00-10:05)	French 2 ..... (10:10-12:15)	English 2 ..... (1:00-3:05)
History 2 ..... (8:00-10:05)	Mathematics 15 ..... (10:10-12:15)	Drawing 5 ..... (1:00-5:05)
	Reading Improvement ..... (10:10-12:15)	Drawing 11 ..... (1:00-5:05)

\*For course title and prerequisite see listings below.

#### MONDAY AND WEDNESDAY (Evening Classes)

First Period (5:50 - 7:55 p.m.)

COURSE TITLE - PREREQUISITE	SEM.	HRS.	CR.
ACC 100 Advanced Accounting - ACC 53			Cert. Cr.
AE 121 Aircraft Structures - MH 64			3
<b>AE 177 Dynamics of Flight</b> - AE 131 and GES 131			3
CH 2 General Chemistry (Lab. Fri. 6-10) - CH 1			4
DR 5 Fundamentals of Mechanical Drawing (Lab. Fri. 6-10) None			2
DR 11 Engineering Drawing (Lab. Fri. 6-10) - MA 9 or previous instruction in Mechanical Drawing			2
ED PSY 65 Child Development - ED 63 or equivalent			3
ED 233 Introduction to Public School Organization & Administration - Graduate standing (Registration Feb. 6, 1963) (6-9 Wed. only for 18 weeks)			3
SPE 93-203 The Exceptional School Child - Grad. standing or Perm. of Instr. (Registration Feb. 6, 1963) (6-9 Wed only for 18 weeks)			3
<b>EE 181 Electromagnetic Fields and Waves</b> - EE 134			3
<b>EE 204 Industrial Electronics</b> - EE 104 and Grad. standing			3
<b>EE 212 Network Synthesis</b> - EE 211 and Grad. standing			3
<b>EE 223 Pulse and Digital Circuits</b> - EE 151 or 171 and Grad. standing			3
EH 1 English Composition - See footnote			3
EH 6 English Literature - EH 5			3
EH 42 English Composition for Engineers - EH 41			3
GES 77 Nature and Properties of Materials - CH 15, PH 6, & MA 49			3
<b>GES 221 Graduate Engineering Analysis I</b> - MA 53 and Grad. standing			3
HY 2 History of Western Civilization - None			3
IE 53 Manufacturing Processes - Soph. standing or Perm. of Instr.			3
MA 01 High School Algebra - None			NC
MA 9 College Algebra - See footnote			3
MA 11 Introductory College Mathematics - See footnote			3
MA 51 Calculus - MA 49b			4
<b>ME 201 Fundamentals of Thermodynamics I</b> - Grad. standing			3
<b>MH 251 Mechanics of Continuous Media</b> - MH 64, 80, MA 53 and Grad. standing			3
<b>MH 256 Advanced Vibrations</b> - MH 155 and Grad. standing			3
<b>MH 281 Advanced Fluid Mechanics</b> - MH 80 and Grad. standing			3
<b>NE 152 Principles of Nuclear Engineering II</b> - NE 151			3
PHL 3 Problems of Philosophy - None			3
PH 6c Technical Physics (Heat, Light, Sound) (Lab. Tues. 5-8) - PH 5c			3
<b>PH 232 Electromagnetic Theory II</b> - PH 231 and Grad. standing			3

#### Second Period (8:00-10:05 p.m.)

ACC 2 Principles of Accounting - ACC 1			3
ACC 107 Income Tax Procedure - Perm of Instr.			Cert. Cr.
AE 131a Fundamental Aerodynamics - MA 51, MH 80, ME 95			2
BL 52 Introduction to Business Law - BL 51			3
<b>CH 201 Advanced Inorganic Chemistry, Part I</b> - Grad. Standing in Natural Science or Perm. of Instr.			3
EC 11 Principles of Economics - None			3
EE 54 Electric Circuits I - EE 51, MA 51			3
EH 03 Fundamentals of English - None			NC
EH 1 English Composition - See footnote			3
EH 2 English Composition - EH 1			3
EH 41 English Composition for Engineers - See footnote			3
GEO 1 Physical Geography (Lab. Sat. 8-12) - None (Accepted as a Physical Science by College of A&S and Ed.)			4
GR 55 German Conversation - GR 3-4 or 9-10			3
HY 64 The Westward Movement in American History since 1803 - 9 hrs. of HY or Perm. of Instr.			3
IE 56 Engineering Statistics and Industrial Applications - IE 55 and MA 51			3
IE 212 DESIGN AND MANAGEMENT OF ORGANIZATIONS - Grad. standing and Perm. of Instr.			3
MA 15 Trigonometry - MA 9 or MA 11			3
MA 49a Calculus and Analytic Geometry - MA 25			3
MA 49b Calculus and Analytic Geometry - MA 49a			2
ME 136 Thermodynamics II - ME 95			3
MH 55 Statics - MA 49, PH 5, Pre or parallel MA 51			3
PH 72 Intermediate Mechanics (Problem Session Thurs. 6-10) - MA 51			4
POL SC 3 Functions of American Government - POL SC 1			3
Reading Improvement - None (Begins Jan. 14 and meets for 7 weeks)			NC

#### TUESDAY AND THURSDAY (Evening Classes)

First Period (5:50 - 7:55 p.m.)

COURSE TITLE - PREREQUISITE	SEM.	HRS.	CR.
ACC 1 Principles of Accounting - None			3
<b>AE 221 Transonic and Supersonic Flow Theory</b> - AE 171			3
ART 7a, b; 8a, b Design and Orientation (Tues. only 6-10) None			1½
Citizenship for Foreign Born Persons (Tues. only) None			NC
EC 12 Principles of Economics - EC 11			3
EE 52 Fundamentals of Electrical Engineering II - EE 51 and GES 77			3
<b>EE 205 Servomechanisms</b> - EE 177 or Perm. of Instr.			3
<b>EE 302 GASEOUS ELECTRONICS</b> - EE 136 and 221 and Grad. standing			3
<b>EE 305 Advanced Topics in Servomechanisms</b> - EE 205			3
<b>EE 306 Theory and Application of Analog Computers</b> - EE 205			3
EH 1 English Composition - See footnote			3
EH 2 English Composition - EH 1			3
DFC Digital Computer Fundamentals - None (Begins Jan. 15)			NC
FR 1 Elementary French - None			3
GR 3 Intermediate German - GR 2			3
HUM 101 Man and His Behavior (For. Engr. students only) - Jr. standing			3
IE 54 Engineering Organization - EC 11			3
MA 9 College Algebra - See footnote			3
MA 49a Calculus and Analytic Geometry - MA 25			3
MA 98 Introduction to Theory of Differential Equations - MA 91			3
<b>MA 123 Series and Special Functions</b> - MA 53 and 98			3
<b>MA 224R Celestial Mechanics II</b> - MA 124R and Grad. standing			3
<b>MA 233 Differential Geometry</b> - 17 hrs. of MA and Grad. standing			3
<b>MA 256 Complex Analysis</b> - MA 255, either MA 170 or 171, Perm of Instr. and Grad. standing			3
<b>ME 163 Principles of Propulsion</b> - ME 136			3
MH 56 Dynamics - MH 55 and MA 51			3
<b>MH 262 Advanced Mechanics of Materials II</b> - MH 64 and Grad. standing			3
<b>MH 366 Theory of Plates and Shells</b> - MA 53 and Grad standing			3
PH 5c Technical Physics (Lab. Mon. 5-8) - MA 25 or parallel; recommended parallel MA 49a			3
<b>PH 103 Elementary Quantum Mechanics</b> - PH 53, 72 and MA 51			3
<b>PH 121 Heat and Thermodynamics</b> - MA 51			3
RUS 1 Elementary Russian - None			3
SOC 1 Introduction to Sociology - None			3

#### Second Period (8:00-10:05 p.m.)

ACC 3 Accounting Analysis - ACC 2			3
BIO 2 General Biology (Animal) (Lab. Fri. 6-10)			4
Digital Computer Fundamentals II - Perm. of Instr.			NC
EH 9 American Literature - EH 2			3
FR 2 Elementary French - FR 1			3
GR 2 Elementary German - GR 1			3
HY 22 The United States Since 1865 - None			3
MA 02 Plane Geometry - None			NC
MA 15 Trigonometry - MA 9 or MA 11			3
MA 25 Analytic Geometry and Calculus - MA 15; MA 11 recommended			3
MA 73 Theory of Equations - MA 51			3
ME 95 Thermodynamics I - PH 5, MA 51			3
MGT 52 Labor Economics - Pre or parallel EC 12			3
MH 64b Mechanics of Materials - MH 64a			2
PH 7c Technical Physics (Electricity and Magnetism) (Lab. Wed. 5-8) - PH 5c or 6c			4
PH 73 Introduction to Nuclear Physics - 8 hrs. of PH			3
PSY 3 General Psychology - PSY 1 or Junior standing			3

**Boldface symbols indicate Graduate Study Program Courses.**  
FOOTNOTE: Students are placed in appropriate sections of beginning English and Mathematics depending on score made on placement tests.

SPECIAL OFF CAMPUS OFFERINGS IN THE COLLEGE OF EDUCATION BEGINNING FEBRUARY 2, 1963 AND CONTINUING FOR 18 WEEKS.  
ED 88 Teaching Secondary School Subjects (Hours to be arranged) - Perm. of Instr. 3  
ED 97 Secondary Student Teaching (Hours to be arranged) - Perm. of Instr. 9

#### OTHER SPECIAL COURSES

EE 56 Electric Circuits Lab. (Fri. 6-10) - Concurrent with EE 54 1  
CURRENT AFFAIRS SEMINAR - "Focus on Aspects of Far Eastern Affairs" (8-10) Friday nights, February 15 through March 22, 1963 NC

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Drive in keeping with road, weather and traffic conditions.

### Be Alert To Holiday Hazards

Make allowances for unpredictable driver and pedestrian actions. Most holiday accidents involve drinking and speed too fast for conditions.

### Watch Out For Others

Allow plenty of time for your holiday travel. On long trips make frequent stops. Arrive relaxed.

### Plan A Safe Drive

Drive with good tires, properly adjusted brakes, lights and turn signals working, windshield wipers and defrosters functioning properly.

### Use Courtesy Abundantly

It Pays! "Make Courtesy Your Code of the Road" your holiday resolution.

Full enjoyment of the holiday season is something to which all of us look forward. With this enjoyment goes the individual responsibility to protect your family, yourself, and your community. Let's all DRIVE for a safe holiday.

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**Ford**

Ford — Falcon & Thunderbird



**SCIENTIFIC RESEARCH**—Richard White, left, an Army Missile Command chemical engineer gathers scientific information on propellants at the newly created Redstone Scientific Information Center. Reference librarian James P. Clark, center, helps John A. Bitzer, a technical writer with Marshall Space Flight Center, find scientific information. The Center serves all elements located at Redstone Arsenal including contractors who are working on government contracts.

## Central Depository Will Cut Cost Substantially

A newly created central depository for technical information at the Army Missile Command is expected to give the U. S. government a substantial saving.

F. E. Croxton, director of the Redstone Scientific Information Center, points out that the center is designed to serve all elements located at Redstone Arsenal. In addition, representatives of private corporations and companies who are working on government contracts may use the facilities.

The Redstone Scientific Information Center currently serves several thousand scientists, technicians and administrative specialists who are working in the missile and space field.

"To my knowledge," Croxton says, "this is the first major program where separate government elements have combined efforts to set up a central agency to make technical information available to scientists and technicians. The annual savings are made in reduced administrative and opera-

tional costs."

Croxton points out that collecting information for missile and space scientists is an expensive business. But he emphasizes the savings realized by utilizing one facility for housing and indexing the technical information.

Major elements within the Redstone Scientific Information Center with which "customers" will likely deal include the library, a technical research group and a

translation group.

The primary purpose of the Center, according to Croxton, is to make the latest scientific information available to the facilities' "customers."

Plans for the center call for a mid-1963 move into a new building which will triple available space. The probable need for library branches near concentrations of scientists is under study.

The study group foresees

branches located near groups of scientists throughout Redstone Arsenal.

The Redstone Scientific Information Center is organized around a board of eight directors. Four members of the board are appointed by the Commanding General of the Army Missile Command. The remaining four members are appointed by the director of Marshall Space Flight Center.

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