



U.S. Air Force

**SUPERSONIC INTERCEPTOR PLANE**—The A-11 interceptor plane recently unveiled is shown in flight. The plane can fly at three times the speed of sound or more than 2,000 miles per hour.

## AERONAUTICS

## 'Aluminum Barrier' Broken

► THE BREAKING of the "aluminum barrier" by the recently unveiled A-11 interceptor plane is an aeronautical advance comparable to the invention of the jet engine.

In announcing the success of the A-11, President Johnson at his news conference attributed much of it to a metallurgical breakthrough in which heat-resistant titanium is tooled and fabricated as easily as conventional aluminum.

This aroused an immediate controversy since it was little more than a year ago that the Government rejected a design for the TFX fighter-bomber, supposedly due to its use of titanium.

Comparing the use of titanium in the TFX plane with its use in the A-11, however, is like comparing a peach and an orange, an official of the Titanium Metals Corporation of America, New York, told SCIENCE SERVICE. It sidetracks the whole significance of the titanium-covered A-11—its ability to break the wall that has stopped all planes except the rocket-powered X-15, which itself is made of 18% titanium.

This barrier exists at Mach 2.2, or speeds of 1,450 miles per hour, at which extremely high temperatures are generated and aluminum weakens. Titanium is a lightweight, high-strength metal that has a melting point of 3272 degrees Fahrenheit in comparison to aluminum which melts at 1220.36 degrees Fahrenheit.

The A-11 proves that aircraft can successfully be flown at three times the speed of sound or more than 2,000 miles per hour, putting the U.S. out in front in the development of a supersonic transport. The British and French in building their supersonic airliner Concorde are sticking closely to known aluminum technology, thus limiting the speed of the craft.

Titanium has been commercially available since 1950 and has been used in the second stage Minuteman missile rocket cases, B-52 engines and Mercury space capsules among other things.

A lighter plane can be built from tita-

nium than from aluminum or steel, but the weight saving has not been enough to justify the added fabrication costs.

This corrosion-resistant metal is produced in the United States today by the same method that was developed in the 1930's by Dr. Wilhelm Kroll of Luxembourg. In 1963, production was 7,900 tons.

Dr. Kroll was the first to invent a process for extracting pure titanium metal from the ore that could be applied to relatively large-scale production.

In Kroll's process titanium oxide is chlorinated to form titanium tetrachloride, a heavy colorless liquid, and mixed with magnesium or sodium in the presence of an inert gas in a red-hot container. The chlorine reacts with the magnesium or the sodium and the pure titanium is left in a spongy mass which must then be melted or consolidated into solid ingot.

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## BIOCHEMISTRY

## Phenobarbital Increases Liver Enzyme Action

► PHENOBARBITAL, a barbiturate drug that is prescribed to calm the nerves and help people sleep, is under study because it increases the action of liver enzymes related to the spread of cancer.

Some liver enzymes appear to convert chemical compounds into substances that cause cancer, but other liver enzymes may also act to detoxify, or make harmless, cancer-causing chemicals.

Just how cancer-causing agents act chemically on cells to transform them into cancer cells is not known, Dr. J. A. Miller of the University of Wisconsin Medical School, Madison, told a conference on the evaluation and mechanisms of drug toxicity in New York.

One "attractive" possibility, Dr. Miller said, is that the cancer-causing substance, or carcinogen, attacks the DNA (deoxyribo-

nucleic acid) and RNA (ribonucleic acid), those parts of the cell that control the manufacture of proteins. Carcinogens are sometimes found in the body chemically joined to protein, and these protein-carcinogen complexes could play a role in cancer production.

The possible interaction of viruses with carcinogens in such a way that tumors are produced should not be ignored, Dr. Miller pointed out.

Whatever the cause, he said, the result of the cancer-causing action on the cells is to release the brakes controlling normal cell production. The "runaway" cells that grow the fastest become the nucleus of the tumor.

Dr. Arnold D. Welch of the Yale School of Medicine, New Haven, Conn., who recently reported experimental work with a drug called 6-azauridine which stops cancer growth without injuring normal cells, discussed the action of several other drugs in combating viruses.

One new drug, 5-iododeoxyuridine (IUDR), has produced encouraging results in patients suffering from herpes keratitis, a common eye infection with serious complications.

The disease can result in partial loss of vision due to the formation of scar tissue on the cornea.

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## TECHNOLOGY

## Electronic 'Bloodhound' Sniffs Out Danger

► A NEW ELECTRONIC "bloodhound" does everything but wag his tail. His keen "nose for trouble" sniffs out any dangerous scent in a cleaning establishment, hospital, laboratory or factory.

When a toxic gas comes between a special ultraviolet lamp and a sensitive detector tube, the Honeywell hound "barks" an alarm or triggers ventilating fans. His sniffer can detect gasoline, paint, lacquer, ammonia, styrene, foam rubber, tear gas, acids, and even bad apples and ripe bananas.

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