Atomic Powered Flight Looms

NACA Scientists to Seek Greater Speeds, Range

CLEVELAND. — New jet fuels, twice as powerful as present mixtures, new high heat-resistant metals, and the staggering possibilities of atomic-powered flight await the elusive "break throughs" of air science—insights which will open the way to vast speeds and ranges.

Living daily in the habitat of transonic speeds, scientists of the National Advisory Committee for Aeronautics already think in terms of 10 and 20 Mach numbers. The theoretical application of atomic power to aircraft is already a practical problem of the right materials and the right cooling systems.

Between problem and product lies the long, tireless route of design, experimentation, and test—a road NACA has traveled hand-in-hand with industry, civil research and the military since 1915.

A dramatic annual "stockholders report" made by NACA last week to top brass of government and industry, described the group's future projects. The presentation, staged at NACA's Lewis Flight Propulsion Laboratory in Cleveland, Ohio, reviewed recent achievements and sketched a few of the problems which separate science from high Mach speeds and unlimited nuclear power.

FRAMED in the hedgehog of stator blades inside a jet engine compressor casing, an NACA technician uses a micrometer to check vital internal dimensions.

Last month the President signed into law a $5 million appropriation for FY-55 construction at the three NACA laboratories in Cleveland, Langley, Va., and Moffett Field, Cal. The government-sponsored group's facilities are already valued at more than $250 million. With them NACA focuses much of the research and development of government and industry in a concerted effort.

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NUCLEAR power for aircraft, promising as much as two million pounds worth of thrust for a pound of uranium, is literally one of the nation's hottest projects. NACA, cooperating with the companies already contracted to produce an atomic engine, last week defined the problem.

Despite the promised reduction in fuel weight, unlimited range of an A-plane still hinges on the weight of the reactor engine itself.

Conversion of the extreme heat of the atomic reaction to usable thrust for a conventional jet engine offers several possibilities. Among them, a system of circulating a coolant between the reactor and the engine, then releasing the heat through the jet is promising.

Finding a coolant to do the job however is a puzzle. Air has poor heat transfer qualities. Liquids (including liquid metals) may be possible coolants but so far none has been found which does the job without corroding the engine parts.

SHIELDING the atomic engine to block dangerous radiation from crew members is another thorn in NACA's scientific side. Paraffin, cadmium, boron and lead each stop different types of radiation but a shield which will stop all of them and still be light enough for use in an aircraft is not yet available.

Material for the reactor parts also must have special properties not called for in current jet engines. Many metals absorb so many neutrons they interfere with the atomic reaction. Aluminum does not but it is weakened at high temperatures. Iron absorbs more neutrons is heavier but is stronger under heat. Some iron-based alloy may be the answer.

Conventional jet engines and fuels pose their own question as the engineers push toward higher and higher Mach numbers. Compression of the air in a jet is tied closely to its efficiency. Compression is now done by many closely spaced rotor blades (each a small air foil) spinning within the engine. Engine weight can be cut and speed of planes raised by using fewer blades and spinning them faster.

The higher speed of the compressor though puts more stress on the blades. Like any air foil, they are subject to stalling and can actually be destroyed by their own vibration. Redesign of the compressor is called for, the scientists think.

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NEW FUELS can double the power of even present day jets, NACA says. Its scientists are probing the molecular structure of such fuels as propylene oxide, to develop more efficient synthetics. Propylene oxide has a flame speed (an index of fuel efficiency) twice that of normal jet fuels. This means it can burn at higher speeds and lower pressures without failure. Other special fuels, already tested, are even more promising.

Screech, the unsteady operation of jets at high temperatures, is another barrier to higher Mach speeds. The phenomenon, which can ultimately destroy an engine, involves a high-pitched screaming sound. To study it and its cause, NACA uses tiny water-cooled probe microphones and photocells to test the sound and flame characteristics.

WIND TUNNEL tests at NACA's Flight Propulsion Laboratory at Cleveland put this one quarter scale ram-jet missile model through simulated flights at 50,000 feet with speeds ranging to 1300 miles per hour. The study will include measurement of lift, drag and pitching of the craft.

Metals and their reactions to heat are another part of NACA's quest for the ingredients of tomorrow's ultra-sonic flight. Progress into speeds above today's record (about Mach 2.5) demands far sturdier metals for aircraft construction. Even the Mach 2.5 speed of the X-1A would have destroyed it if it had held it for more than a few seconds.

The high speeds considered for some long range missiles (above Mach 10 or 6600 miles an hour) would produce heat enough to melt any known materials. Such a missile would climb quickly out of the earth's atmosphere and heating would not be too serious at this point. But, on reentering the atmosphere it would quickly reach heats enough to vaporize diamonds.

Studies at NACA's Langley lab show aluminum is the best material up to about Mach 2, that titanium is best between Mach 2 and 3 and that steel is best for still higher speeds. Langley's search for even better metals includes testing in devices capable of reaching temperatures above 4000 degrees F. within seconds.

Testing facilities at all three NACA labs include supersonic wind tunnels at the Ames lab in California (to be enlarged with FY-55 appropriations), and at the other centers. They also include labs for testing whole engines, breaking down fuels, torturing metals, firing rockets on the ground or in flight, and banks of electronic brains for computing and analyzing data.

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Problems begging solution were not the only items in NACA's "stock holders report." Break throughs already have come in areas which were equally baffling years or even months ago. Their solutions, some still in the classified category, are already finding practical application in production aircraft. Other improvements will soon be ready for industry.

Crash-fire and survival research, for instance, is already paying off in lives saved during crashes. By scuttling service-weary C-82s (forerunner of the C-119) in intentional take off type crashes, the Lewis lab has learned much about fire and injury prevention.

Jets, unlike piston aircraft, remain hot enough to set fire to spilling fuel several seconds after a crash. Turbo jet engines, also unlike piston engines, continue to run, drawing air and the escaping fuel vapors through the hot combustion chamber.

By color-filming intentional crashes, scientists learned the nature of the fuel spillage and the engine hotspots which ignited it. They developed a pressure system which automatically sprays water on the parts, forming steam and cooling them. Later crash tests showed that even when engines were torn off the planes and vapor continued to enter the intake, no fires resulted.

Crew survival is studied in the same crashes to find the impact on personnel of sudden stops.

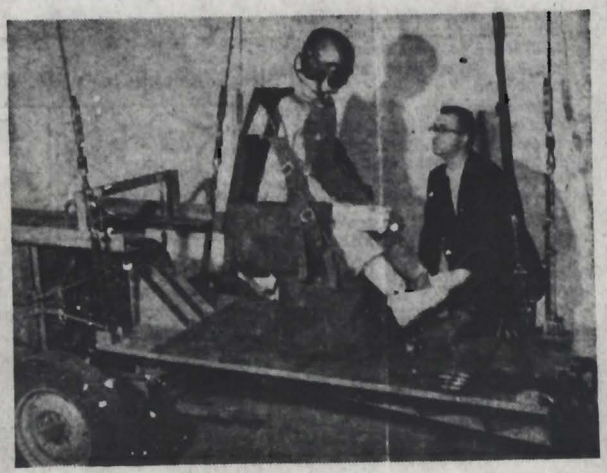
Tests with dummies showed that humans might survive the impact but present plane seats could not. Needed, and under development, are seats which (1) can hold the passenger in place (2) are elastic enough to absorb the shock (3) return to position without creating a new shock of their own and (4) are soft enough to prevent injury if passengers are thrown against them.

Rubber inflated seats will be run through future crash tests.

Stopping jets on short runways or short of possible crashes is another area where progress has already been made. Large mechanical wheel brakes make a weight problem. Parachute brakes are costly and otherwise unsatisfactory.

Under NACA study is a method of reversing the thrust of the jet engine. By opening veins in the tailpipe and redirecting the thrust forward, an NACA pilot last week calmly taxied his jet fighter backwards for the visiting "stock holders."

The reverse device still must be refined because it cuts the thrust of the aircraft in flight. But, the development promises to cut landing runs and adds another safety factor in crash prevention.



IMPACT TESTING is done on this apparatus. The seat has an inflated back, arms and seat pan made from rubberized fabric. A body or head striking these parts would be well cushioned and there are no metal parts to break into sharp puncturing or cutting edges.

Uranium and Cheap Cigars They're Both Involved in Job Of Creating A-Powered Plane

By JAMES CROSSLEY
NEA Staff Correspondent

CLEVELAND—(NEA)—You are doing okay in the job of creating your atomic-powered airplane.

There are still a lot of headaches. The job looks simple, but when it comes to getting the power plant down to the weight a plane could carry, that's something else again. And then there's the job of keeping the pilot from being drilled like Swiss cheese with deadly radiations.

This is a report to you on research into this project in which you have a vital part—even though you might not have known it. Your tax money makes it possible. It is based on a tour of the Lewis Flight Propulsion Laboratory in Cleveland, one of the installations of the National Advisory Committee for Aeronautics (NACA).

The scientists who were handed the job of improving planes early in the days of flight are battering down the atomic plane problems. They are doing many other things, including some worrying about the guy who steps up to the window and buys a ticket for a plane flight.

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It will also come as a pleasant surprise that the men with the microscopes have even found a use for cheap cigars soaked in oil.

The NACA layout, sprawled on the edge of Cleveland's airport, is a scientific paradise.

Equipped with everything from tremendous blocks-long wind tunnels to instruments for photographing the freezing of droplets of water (they freeze from the bottom up, incidentally) the men who work here are on the very frontier of human knowledge.

The jackpot in aviation, at this point, is the atom plane. The military services, the Atomic Energy Commission and NACA all have their brain cells quivering in pursuit of it.

AT NACA FLIGHT LABORATORY, this dummy makes its living by going through simulated plane crashes. The seat is the latest research design to let a human survive the shock of a crash.

THIS MULTIPLE SANDWICH being adjusted by an NACA technician is a test unit to furnish data in designing heat exchangers which may some day be used in reactor for an atomic plane.

One pound of uranium would produce as much heat as firing up two million pounds of gasoline. That single pound has energy amounting to three and a half million pounds of coal—that is 32 carloads. Mind you, the uranium would be a one and one-half inch cube.

With nuclear energy a plane could make a non-stop, faster-than-sound trip to anywhere in the world and return.

Though pressing the attack on many fronts in airplane theory—the problems of super-speed flight heat which would melt even the toughest materials in the world, such as diamonds, or the screeching of jet burners which can wreck motors with vibration, for example—the atom plane is still the dream.

The disintegration of uranium when smacked with neutrons gives off heat, the NACA scientists explain. This heat could be used instead of present fuels to burn air in jet planes.

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But until some method is devised to conduct the heat, the machine is too bulky. The hunt is on for a chemical, perhaps even a molten metal, which can act as a conductor, something like the gas that circulates in your refrigerator, working in reverse.

Here, the lab wizards have hit on a valuable shortcut. They enclose test materials in metal ring tubes and rotate them inside like swishing a highball around the lip of the glass. By alternate heating and cooling at different positions on the ring they study another of the atom plane problems, corrosion of the materials used.

The scientific hounds also are on the trail of a perfect insulator to protect the pilot from radiatio A number do different jobs b no single one does everything.

That atom plane you are pre paring to create is not going t fly until the metals, chemicals an other materials catch up with th visions of engineers. NACA report to you is that its scientis labor mightily every day to im prove and invent better material as well as methods.

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There were other wonders pu on display. A jet plane backe across a hangar ramp. That's a improvement. Unless some way is found to reverse the airflow from the rear of a jet plane, runways would some day have to be as long as the distance from downtown to the airport.

There was a new seat to save passengers in crashes. Air cushions and sections which flex allow tons of shock to be absorbed in the least damaging way.

A great deal of the research involves probing into the invisible —vapor fumes, shock waves and such. That's where the cigars come in. One method of studying air flows is to introduce smoke fumes which can be seen. They found the best smoke is produced by burning oil-soaked cigars under forced draft. 6-7-54

DAILY NEWS PAGE
New York, June 7, 1954

NACA Unveils Jet Reverse Thrust; Studies Problems of Nuclear Engines

A demonstration of a jet propelled aircraft taxiing backwards was given to approximately 1500 representatives of the Armed Services and industry who attended an inspection of the Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics this week.

The problem of landing jet aircraft on icy or wet runways where use of wheel brakes is impossible is a big one. Propeller aircraft use reverse thrust. Other ideas have been put forward for jet aircraft, but the NACA has now come up with a system whereby a double set of blades are located inside the tail pipe. When not in use, the blades are closed to cut down drag, but when opened they divert a portion of the blast forward so as to reduce the speed of the aircraft. The NACA system also has the advantage of being able to divert the flow to avoid hitting airplane parts. At the Lewis demonstration an airplane was actually driven backwards on the runway to demonstrate the force of the reversed flow.

The visitors also were shown the results of studies to increase the efficiency of jet engines. Smaller compresssors with longer blades and fewer stages of compression were demonstrated, as well as redesigned combustors permitting higher air flows without flame outs.

The many problems involved in the design of jet engines using nuclear fuel instead of gasoline were also discussed. It was shown that one pound of uranium would be equal to 2,000,000 pounds of gasoline. Investigations are proceeding toward the determination of suitable shielding, coolants, and structural materials for such engines.

Of particular interest for the supersonic aircraft of the future were the studies underway in the structural effects of aerodynamic heating. It was pointed out that experimental aircraft which have attained speeds in excess of mach-two did so for only a few seconds. If they had maintained those speeds for more than a minute the heat would have risen so high that the metal in the plane would have been seriously deformed. At mach-two plus, for example, aluminum is no longer dependable. At mach-four titanium is useless so that the much heavier steels must be used. When speeds as high as mach-10 are attained even diamonds would vaporize.

Col. McAfee to Netherlands

Col. Broadus McAfee, XVIII Airborne Corps Deputy Chief of Staff, is leaving Ft. Bragg, N.C., 15 June for duty in Washington, D. C., prior to assignment as U. S. Military Attache to the Netherlands.

Arriving at Bragg in May 1952, Col. McAfee served as Post and Corps G-1 until May of last year when he was appointed Deputy Chief of Staff.

Army Navy Air Force Journal - June 5, 1954

J. S. Working 'All Out' on Atomic Plane Engines

CLEVELAND, Ohio, June 2 — The Government's top eronautical research agency oday ended secrecy on an urent U. S. effort to design tomic power plants for airraft before Russia or any ther does it.

The National Advisory Comittee for Aeronautics also isclosed that research is ointed toward inter-contiental guided missiles that ill travel 6600 miles per hour, r more than 10 times the peed of sound.

Atomic power plants, the NACA said flatly, will enable aircraft to fly non-stop at supersonic speeds to any point on the globe and return.

The agency said, "Industry, the Atomic Energy Commission, the military services and the NACA are participating in vigorous, sustained attacks on the formidable technical problems that must be solved."

Details on the previously secret NACA atomic program were disclosed at an inspection of the committee's $100,000,000 research facilities here by 400 Government and industry officials, military leaders and heads of educational institutions.

The NACA said the fuel requirements for supersonic warplanes will be so vast that long range cannot be achieved with today's chemical fuels. Scientists said a single pound of uranium will produce the heat of 2,000,000 pounds of gasoline.

No official estimate was available as to how soon an atomic engine can be tried out in a flying machine.

Dr. Hugh L. Dryden, NACA director, pointed out that Russia is diverting more and more of her youth into technical training and has introduced a steady stream of new aircraft models.

The atomic engine envisioned here would be similar to present day turbojets, with heat from a reactor replacing conventional combustion chambers. The reactor would work in the same general way as that in the Navy submarine Nautilus.

Heat from the reactor would be transferred by a liquid "coolant" to air rushing through the engine, expanding the air through the engine's tail pipe and thrusting the airplane forward.

Scientists, discussing long-range, high-speed missiles, said presently known materials would melt at the 6600 MPH speeds now being considered.

Various "high melting point" metals and combination of metals, ceramics, cooling and insulation are being investigated.

Army Navy Air Force Journal, June 5, 1954

Research and Progress. It would be most beneficial for the country and the National Defense if all members of Congress, or at least the members of the Appropriations Committee, could visit the laboratories of the National Advisory Committee for Aeronautics and get a more complete understanding of what that organization is doing for the future.

Some Congressmen, fortunately, were among the 1,500 guests who attended the inspection tour of the Lewis Flight Propulsion Laboratory at Cleveland on 2, 3, and 4 June. Like the representatives of industry, the Armed Services, and the press who were shown the work of the laboratory, they now know that the research in progress there at this time will be reflected in safer, faster and more efficient aircraft five or more years from now.

Unfortunately, too little is known of the fine work of the NACA. The vertical rising aircraft built for the Navy by the Consolidated-Vultee and Lockheed Companies, for example, reflect studies and test work by NACA dating back to 1948. It was NACA that determined that such vertical risers could be controlled close to the ground and that they could make the transition from horizontal to vertical position for landing.

Today, as shown in this week's inspection tour, NACA at the Lewis Laboratory is working to reduce the hazard of fires in jet plane crashes, to reduce the chance of passenger injuries in forced landings or crashes, to solve the problems of excessive heating in supersonic flight, to increase the speed and reduce the fuel consumption of jet engines, to make nuclear propulsion of aircraft feasible, and many other projects to keep the United States in the forefront of aviation.

It is simple mathematics: the more research such as NACA is doing the more progress we will make in both aerial defense and civil aviation—without it we will stagnate.

NEW YORK HERALD TRIBUNE, PARIS, FRIDAY, JUNE 4, 1954

Atomic Plane Engine Being Sought by U.S.

By the United Press

CLEVELAND, June 3.—The government's top aeronautical research agency yesterday lifted the secrecy curtain on an American effort to design atomic power plants for aircraft.

The National Advisory Committee for Aeronautics also disclosed that current research is pointed toward inter-continental guided missiles that will travel 6,600 miles an hour, or more than ten times the speed of sound. Atomic power plants, the NACA said flatly, will enable aircraft to fly non-stop at supersonic speeds to any point on the globe and return. Range will be only a matter of human desire and endurance.

"With so large a gain the goal," the agency said, "industry, the Atomic Energy Commission, the military services and the NACA are participating in vigorous, sustained attacks on the formidable technical problems that must be solved."

Facilities Inspected

Guarded details on the previously secret NACA atomic energy program were disclosed at an inspection of the committee's $100,000,000 research facilities here by 400 government and industry officials, military leaders and heads of educational institutions.

The NACA said that the power and fuel requirements for tomorrow's supersonic warplanes will be so vast that long range cannot be achieved with today's chemical fuels. In a series of briefings approved by the Atomic Energy Commission, aeronautical scientists said that a single pound of uranium will produce the heat of 2,000,000 pounds of gasoline, or the energy of 3,500,000 pounds of coal.

Consequently, these scientists picture nuclear energy — despite the tremendous problems still to be solved—as the answer for long-range supersonic aircraft.

Evidence of Progress

No official estimate was available as to how soon an atomic engine can be tried out in a flying machine. But the fact that the government was willing to strip secrecy from the research effort was taken as evidence of good progress.

The atomic engine envisioned here would be similar to present-day turbojets, with heat from a reactor replacing conventional combustion chambers. The reactor would work the same general way as that in the Navy submarine Nautilus.

Heat from the reactor would be transferred by a liquid "collant" to air rushing through the engine, expanding the air through the engine's tail pipe and thrusting the airplane forward.

NACA research is concerned with transferring heat from the reactor in useful form, devising means to prevent corrosion of the mechanism at high temperatures and finding shielding materials light enough for aircraft and adequate to guard against radiation.

Scientists, discussing long-range, high-speed missiles, said that presently known materials would melt at the 6,600-mile-an-hour speeds now being considered.

The missiles will climb rapidly above the earth's atmosphere and, on re-entering the atmosphere, will reach "temperatures sufficient to vaporize diamonds."

Various "high melting point" metals and combinations of metals, ceramics, cooling and insulation are being investigated.

The Cleveland Press

The Newspaper That Serves Its Readers

NO. 23978 | CLEVELAND, WEDNESDAY, JUNE 2, 1954 | Phone CHerry 1-1111

City

56 Pages—7 Cents

METAL DOUGHNUT (scientists call it a toroid furnace) was developed at NACA's Lewis Flight Propulsion Laboratory here for studying corrosion in atomic engines.

Atom Plane to Fly Globe Being Developed Here

By CHARLES TRACY, *Aviation Editor*

Research on an atomic energy power plant that will make possible nonstop round-trip flight to any point on the face of the earth, is underway at the Lewis Flight Propulsion Laboratory of the National Advisory Committee in Aeronautics.

Scientists at the laboratory today put aside security wraps and described their work on nuclear propulsion as some 1200 aeronautical leaders of the world gathered for a three-day inspection of the $100,000,000 government installation.

"Just when supersonic flights to anywhere and back will be possible isn't exactly known now," said Edward R. Sharp, director of the laboratory.

"But plane builders working on the project are expecting to do it within 25 years. However, our national security requires that the research and development of nuclear power plants for aircraft be carried forward with unceasing effort."

The inspection of the big NACA installations at Cleveland Hopkins Airport is the top gathering of aviation scientists for 1954. The inspection-tour is held here every three years.

In addition to their research into atomic-powered flights at supersonic speeds, Sharp and his engineers unveiled for the visitors these developments:

AN EXPERIMENTAL safety seat designed to improve an airline passenger's survival chances in a crash landing accident.

DEMONSTRATION of a jet thrust reversal device to cut down the length of runway needed for landing jet planes.

DEMONSTRATION of aerodynamic heating problems with model planes melted by friction from air passing over them at speeds of from 1600 to 2000 miles an hour. The point at which a plane will melt from high-speed air friction is called the "thermal barrier." Breaking through this barrier must come before atomic-powered high-speed flights are possible.

PASSENGER SAFETY in jet plane crashes.

The demonstration of the problem of building planes that will not melt at supersonic speeds was a "first" for the visiting aviation leaders.

The tests were conducted in the wind tunnel of the laboratory and films were made of the model as the wind speed reached such proportions that the nose of the model melted.

Research into the problem is aimed at ways of circulating refrigerated air through the skin of the plane—much as hot air now is blown through the wings of planes to prevent icing.

Of top interest in the three-day program was NACA's research into corrosion problems in atom-powered engines for airplanes. The corrosion is caused by cooling liquid circulated through the reactor.

Possible solution of this problem, under study by the NACA engineers, is the transfer of the heat to the air in the engine with a liquid coolant. Until the corrosion problem is licked nuclear theories cannot be applied to aircraft, scientists agree.

Present fuels and engines have just about reached their limits for driving planes beyond the speed of sound. It takes five times the power to put a plane through the sound barrier—762 miles an hour—as it does to come up to it.

Goal of engineers is to make use of the total energy that can be obtained from the "burn up" of a single pound of uranium, which equals the energy in 3,500,000 pounds of coal. Yet the uranium would be a 1½-inch cube against 32 railroad cars of coal.

Daily Press Fri.4/9/54

Wind Tunnel Parts Loaded At Shipyard

Massive parts for a California wind tunnel, too large for shipment by rail, were being loaded aboard ship at the Newport News Shipbuilding and Dry Dock Co. yesterday.

The parts for an 11-stage axial flow compressor, built at the shipyard, will be installed in a giant supersonic wind tunnel of the Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics at Moffett Field, Calif.

The compressor, believed to be the world's largest rotating object, will travel aboard the SS Marine Fiddler. The compressor parts weigh 2,600,000 tons and were built at a cost of more than $2,000,000.

One of the parts is a 374,000-pound upstream supporting housing, the largest object ever machined in the shipyard's shops.

Operating on a single shaft, the compressor will be capable of producing winds with a velocity of more than 2,000 miles per hour, or in excess of three times the speed of sound. The rotating portion of the compressor is composed of 11 large rotor discs with machined slots o ntheir rims for attachment of blades.

All of the details of loading the more than 140 major items were worked out in advance by the use of scale models of both the compressor parts and the ship. Two 70-ton floating derricks and lighters supplement the yard's cranes in the loading operation.

Dickinson To Talk

NACA Works On A-Engine For Non-Stop World Flight

By VERN HAUGLAND

Cleveland, June 2.—(AP)—The National Advisory Committee for Aeronautics disclosed today that it is conducting research here to develop an atomic engine that could fly an airplane nonstop around the world.

The agency also called for increased emphasis on the application of nuclear energy to aircraft.

Eugene J. Manganiello, assistant director of NACA's Lewis Flight Propulsion Laboratory here, said this nuclear project is "of extreme urgency and necessity from the standpoint of national security."

Edward R. Sharp, director, told visitors to the laboratory that airplane builders working in this field believe a nuclear powered aircraft may be achieved within 25 years.

Manganiello, addressing the opening of a three-day inspection of the $100,000,000 laboratory, said that the use of nuclear energy is the obvious way to extend the range of supersonic aircraft.

He said that fission of a single pound of uranium will produce as much heat as the burning of 2 million pounds of gasoline.

"Stated another way, the total energy which can be obtained from the burning of a single pound of uranium equals the energy in 3½ million pounds of coal, yet the uranium would be a 1½-inch cube against 32 railroad cars of coal," he said.

Also as part of the laboratory inspection, NACA:

1. Gave the first public demonstration of the achievement of reverse thrust for jet airplanes.

A NACA pilot backed an F84 jet fighter down a runway by accelerating the jet exhaust which normally speeds the airplane in a forward direction. This was done by opening a double set of blades inside the airplane's tail pipe to reverse the direction of the exhaust flow.

2. Demonstrated the problems posed by heating of airplane skins at extreme speeds. In one wind tunnel test, the metal nose of an airplane model melted and blew away in air rushing past at supersonic speed.

B. W. Rosen, NACA engineer at the Langley, Va., laboratory, told the visitors that had the Bell X1A research airplane, which already has flown almost 2½ times the speed of sound, maintained that speed for only a few minutes, its temperature would have approached 400 degrees.

Daily Press, Thurs. June 3, 1954

Cleveland Plain Dealer
June 2, 1954

1,500 Experts Due at NACA's Lab

Annual inspection of the Lewis Flight Propulsion Laboratory today will offer a glimpse of "some problems" related to the harnessing of nuclear energy for aviation power plants.

Demonstration also will take in projects which strive for improved rocket and turbojet engines.

About 1,500 industrial, aeronautical and governmental officials are expected to attend the "open house" today, tomorrow and Friday.

Here from Washington for the event are Dr. Hugh L. Dryden, director of the National Advisory Committee for Aeronautics, and John F. Victory, executive secretary.

Inspection of the vast governmental installation will not be open to the public.

Cleveland News
June 4, 1954

Creep-Screech Problems Hit Air Lab Here

BY RALPH G. PLATT

The words "screech" and "creep" have been added to the lexicon of aviation researchers to describe two new nightmare problems to be surmounted in the development of supersonic airplanes, visitors at the triennial inspection of the Lewis Flight Propulsion Laboratory were informed today.

Scientists and engineers at the lab said screech is the shrill, intense tone produced in the afterburner of turbojet and ramjet engines as pressure and temperatures increase.

It has caused afterburners to disintegrate, and constitutes "a most vexing problem," they said.

Creep is the tendency of the skin of supersonic aircraft to warp or buckle as a result of heat generated through atmospheric friction.

Research has shown that these thermal stresses at extremely high speeds can result in structural failure and destruction of an airplane.

Military and industry leaders attending the "open house" at the sprawling research facility at Cleveland Hopkins Airport were told that much of the work at the lab is in the field of aerodynamic heating—attempting to reduce air friction against fast-moving aircraft, and the find new and stronger heat-resistant materials.

CLEVELAND NEWS
June 2, 1954

Atom Aircraft Power Studied at Lewis Lab

BY RALPH G. PLATT
News Aviation Editor

First official disclosure that scientists at the Lewis Flight Propulsion Laboratory here are conducting extensive research into nuclear power for supersonic aircraft of the future was made today.

The announcement was made as the first of three groups of about 1,200 top government, industry and educational technical experts assembled at the $100,000,000 research facility at Cleveland Hopkins Airport for the first "inspection" conducted since 1951.

Working closely with the Atomic Energy Commisson, the Lewis lab researchers have tackled the problem of coolants and corrosion which result at the extremely high temperatures generated by nuclear reactors.

Simulate Temperatures

Corrosion of reactor material by the coolant circulated through the reactor is one of the hardest problems to be surmounted in the building of an atom-powered airplane.

Specifically, the Lewis lab technicians have devised and constructed a "toroid," or "doughnut pump," with which they can simulate the temperatures in a nuclear-reactor system and study the effects of corrosive coolants used to dissipate the heat.

To illustrate the tremendous heat generated by a nuclear reactor, they asserted that the fission from a single pound of uranium will produce as much heat as burning 2,000,000 pounds of gasoline.

Or, using another comparison, the energy obtained from the "burn-up" o fa pound of uranium equals that of 3,500,000 pounds of coal. Yet the pound of uranium be a one and a half-inch cube, as compared with 32 railroad cars of coal.

Landing, Safety Devices

This saving of weight and bulk is lost, however, by the size and weight of the reactor and shielding material necessary in an airplane capable of non-stop supersonic flight to any point on the face of the earth and return.

Other research projects on which the veil of secrecy was lifted at the triennial inspection included a demonstration of a jet-thrust-reversal device to shorten the landing requirements of jet fighters, bombers and transports, and a revolutionary new safety seat designed to improve an airplane passenger's survival chances in a crash-landing accident.

The visitors also were treated to a first-time showing of a film of missile models in a supersonic wind tunnel—at simulated speeds so high that the nose of the model melts under the heat generated by friction of the air.

CLEVELAND NEWS
June 3, 1954

Lab Work Here Puts New Kick in Jet Fuel

BY RALPH G. PLATT
News Aviation Editor

Two new aviation research developments—one to makt jet planes fly faster and the other to slow them down—were shown to visiting scientists and industry leaders today at the triennial inspection of the Lewis Flight Propulsion Laboratory at Cleveland Hopkins Airport.

Officials of the National Advisory Committee for Aeronautics, which operates the huge research facility here, said chemists at the Lewis lab have developed several new fuels which provide added "kick" for jet aircraft.

One of these is a petroleum derivate called propylene oxide which has a flame speed—index to a fuel's efficiency—of more than twice that of ordinary jet fuel.

Big Boost in Power

Although propylene oxide is "by no means the most promising" of the special fuels thus far developed and tested, it makes possible jet engines almost twice as powerful as those in today's operational fighter planes.

The other development, which might aptly be termed a jet air brake, is a jet-thrust-reversal device which can bring a sleek fighter to a stop—and even make it back up—in less than half the runway distance normally required.

It is particularly effective on wet or icy runways, when use of the device enables a jet pilot to stop his plane in approximately one-third the normal distance.

Turn Exhaust Flow

Essentially, the device consists of curved vanes installed in a jet tailpipe. In use, the tailpipe opens into two side sections and the vanes move out into the stream of exhaust gases.

The vanes turn the jet flow forward and downward under the horizontal stabilizer and away from any parts of the plane which might be damaged by the extreme heat of the exhaust.

CLEVELAND PLAIN DEALER
June 4, 1954

Aviation's Nerve Center

It may have been pure luck or the act of a psychic makeup editor that made yesterday's Plain Dealer carry two stories side by side—one on the triennial inspection of the Lewis Flight Propulsion Laboratory here, the other concerning the first public flight of the "Pogostick," Convair's unearthly vertical take-off fighter.

Indeed, there never would have been a "Pogo" without the Lewis lab or its companion research facilities that the National Advisory Committee for Aeronautics also maintains at Langley Field, Va., and Ames, Cal.

Dr. Hugh L. Dryden, who directs NACA in its efforts to solve the heady problems of high-altitude flight, recently observed with forgivable pride that all existing airplanes "embody principles or design features discovered or refined in NACA laboratories."

Europe's top aviation brains would be the first to back Dr. Dryden in this. It often has been said that Americans excel only in applied science, but this line of argument falls completely flat in connection with the basic research achievements of NACA.

They talk a strange language at NACA. It involves such terms as Mach numbers, Froude numbers, boundary layer control, Reynolds numbers, Schlieren photographs and a host of expressions quite incomprehensible to the layman (that's us).

The sound barrier? That's old stuff at NACA. Now it's the thermal barrier which has them puzzled but not stymied. To illustrate: the metal surfaces of our supersonic plane that attained 1,650 miles per hour last year would have become heated to a temperature of 350 degrees Fahrenheit had that speed been sustained much longer.

Aluminum alloys lose close to 25% of their strength at that point. NACA showed how missiles disintegrate at greater velocities. Stainless steel, improved aluminum or titanium may fill the bill in time. Or they may pour cooling air along the skin of the wing. NACA found that this could be done with warm air for de-icing purposes.

NACA also unveiled a device that permits a jet engine to reverse its thrust. Now city airport managers, who feared that their airfields could not handle fast jets, may relax. Jets can land shorter and with far more safety on wet, icy runways. Nor will the huge expense of enlarging present strips or building new ones be involved.

Already NACA talks of an atomic-powered plane capable of circling the globe at supersonic speed without refueling—within 25 years. If we were to make book, it would be less than that.

Success, however, depends on continued public support of NACA, as well as the military and civilian aviation industry that it serves. No one can afford to equivocate about a $100,000,000 air lab—or 20 of them—if it means our lives.

NEBRASKA TAX (Cont.)

nesota could tax the entire fleet of Northwest Airlines even though other states might be taxing a portion of the fleet. NWA is headquartered in Minnesota and has its operating base and head offices in the state. The present case differs in that it involves an airline with its principal place of business in another state. The tax is not on the entire fleet, but is imposed according to a formula.

In the majority opinion, Justice Stanley F. Reed said the principal question was whether Braniff's schedules serving Nebraska gave the state sufficient grounds to tax the planes. "We think such regular contact is sufficient to establish Nebraska's power to tax, even though the same aircraft do not land every day and even though none of the aircraft is continuously within the state." The Air Commerce Act of 1926 did not "expressly exclude the sovereign power of the states," he added, pointing out that federal power over navigable streams did not prevent states from taking action consistent with that power.

Justices Felix Frankfurter and Robert H. Jackson dissented from the opinion. Justice Frankfurter said the ruling might lead to "diverse and fluctuating exercise of power by the various states" that might place an undue burden on interstate commerce. While Nebraska might have one tax plan, other states might have others, he said, adding that in the absence of a national formula he opposed approval of the Nebraska system.

* * *

NACA DEMONSTRATES REVERSE THRUST DEVICE

Cleveland (Special) -- National Advisory Committee for Aeronautics' Lewis Flight Propulsion Laboratory scientists today unveiled a new type of reverse thrust devise which, they said, would impose only a two percent loss of thrust during normal flight, would add only 150-200 pounds in weight to a plane in a production version, and would permit reversal of 50-60 percent of forward thrust on landing.

The hydraulically-operated device was demonstrated installed on a Republic F-84 and succeeded in causing the plane to go backwards as the Allison J35 delivered more and more thrust. NACA's device differs from previously announced projects in that a double set of blades remain closed. On landing, they form a 140-degree wedge, directing the reversed air flow away from the airplane.

It was also disclosed that NACA research on special jet fuels to replace JP-4 to give afterburners more kick could result in making existing jet engines almost twice as powerful. One such fuel, propylene oxide, has a flame of 2.29 feet per second compared with JP-4's 1.12 feet per second. Use of propylene oxide, it was said, means that a flame can be maintained at much higher air velocities than with JP-4.

* * *

ALPA SAYS 8-HR. RULE THREATENED WITH DESTRUCTION

Air Line Pilots Association this week claimed the problem before CAB in the eight-hour flight rule controversy is not a "narrow issue," as contended by American Airlines, but "is broad and involves the destruction of flight time limits." Answering AA's latest document, ALPA claimed the airline "attempts to oversimplify this problem and hence mislead the Board."

American admits, ALPA told CAB, it will have to go to nine hours in the summer and 9½ hours in the winter for its westbound non-stop transcontinental schedules. United, the pilots group continued, asked for a waiver of the eight-hour rule up to 12 hours, and TWA "requires 10:53 to fly its Lockheed 1049's from New York to San Francisco. It is obvious therefore, that the issue before the Board is broad and involves the emasculation of the historic 8-hour law."

ALPA also argued that the position of CAA, which supported waiver of the eight-hour rule for AA's DC-7's, "has no force in this proceeding."

Meanwhile, there still was no fixed date for the return to Washington of CAB Vice Chairman Harmar D. Denny, who reportedly holds the tie-breaking vote in the dispute. Denny's office said he would "perhaps be back Friday" but there was no certainty about it.

CLEVELAND PLAIN DEALER
June 3, 1954

A-PLANE BY 1979 IS LEWIS LAB AIM

Nuclear Craft Would Fly Nonstop Around Globe

(Photos on Picture Page)

BY EUGENE SEGAL

An atom-powered plane, capable of nonstop flight around the world, may be achieved within 25 years as the product of research under way at the Lewis Flight Propulsion Laboratory, Dr. Edward R. Sharp, director, said yesterday.

Dr. Sharp made the disclosure at the opening of a three-day inspection of the $100,000,000 NACA laboratory by industrialists, the military, government officials, university teachers and the press.

Eugene J. Manganiello, assistant director, told the visitors that the nuclear project is "of extreme urgency and necessity from the standpoint of national security."

The use of nuclear energy, he said, is the obvious way to extend the range of supersonic aircraft. The fission of a single pound of uranium, he explained, will produce as much heat as the burning of 2,000,000 pounds of gasoline.

Jet Reverses Self

"Stated another way," he added, "the total energy which can be obtained from the burning of a single pound of uranium equals the energy of 3,500,000 pounds of coal, yet the uranium would be a one and a half-inch cube compared with 32 railroad cars of coal."

Using equipment, movies, and skillful models and mockups, scientists demonstrated problems, methods and achievements of the laboratory.

Included was the first public demonstration of reversing a jet-propelled plane with a double set of louvres inside the ship's tail pipe which open to reverse the direction of the exhaust. The practical use is to slow the plane when landing.

Also demonstrated was research done at the laboratory to reduce the hazards to passengers in crash landings. A flexible seat which changes its form to absorb shock was exhibited.

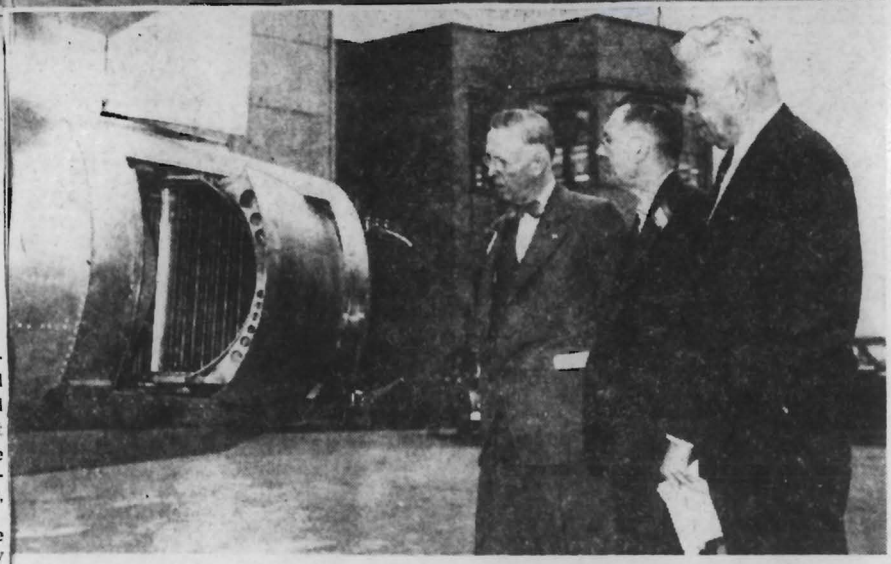
Show Heat Problems

Scientists demonstrated problems created for aerodynamic engineers and designers by heating of airplane skins when subjected to supersonic speeds. A movie showed a section of airplane wing scorched and then disintegrated in a wind tunnel. In another picture sequence the metal nose of a model guided missile melted and blew away in wind encountered at supersonic speed.

B. W. Rosen, NACA engineer at the Langley (Va.) laboratory, said that if the Bell X1A research airplane, which has flown almost 2½ times the speed of sound, had maintained that speed for a few minutes its temperature would have approached 400 degrees.

The scientists reported work on new and more efficient fuels for jet engines. One of these, "propylene oxide," derived from petroleum, is more than twice as efficient at high speeds as jet fuel commonly used.

About 1,400 visitors are expected at the laboratory in the three-day inspection. The lab will hold open house for families of personnel Sunday.



AIR RESEARCH CHIEFS. Among top men at the inspection yesterday of the Lewis Flight Propulsion Laboratory were (left to right) John Victory, executive secretary of the N. A. C. A. and its first employee, Dr. Hugh Dryden, N. A. C. A. director, and Dr. Edward R. Sharp, directory of the lab. They are seen with a jet fighter plane equipped with a new device which reverses the flow of exhaust and slows the ship in landing.

TIMES HERALD - NEWPORT NEWS -
Hampton-Warwick
June 3, 1954

Times Herald, Newport News-Hampton-Warwick, Thurs. June 3, 1954

NACA Says Screech, Creep Among Major Problems In Trying To Harness A-Energy To Supersonic Plane

By VERN HAUGLAND

Cleveland, June 3—(AP)—Scientists and engineers trying to harness atomic energy to the supersonic airplane identified "screech" and "creep" today among the nightmare problems they must solve.

The National Advisory Committee for Aeronautics said screech is the shrill, intense, sometimes musical tone produced in the afterburner of jet aircraft by high velocity and high temperatures in exhaust gas.

NACA SAID it has caused afterburners to disintegrate and is "a very serious problem"

Creep is the tendency of the skin of supersonic aircraft to warp or buckle and become permanently deformed, because of heat from atmospheric friction at extreme speeds. Research has shown that this buckling, at speeds faster than sound, can destroy an airplane.

Officials of the top U. S. aviation research agency described the work they are doing toward flight at ever increasing altitudes and speeds, at an "open house" at NACA's Lewis Flight Propulsion Laboratory here.

Once every three years the laboratory is opened for inspection, and for reports on progress being made on a large number of for-the-most-part secret projects. About 1,200 invited guests—top military and civil aviation officials and industry leaders—will tour the facility during the three-day showing.

Edward R. Sharp, laboratory director, told the guests that the laboratory is seeking means of using nuclear energy to provide "nonstop supersonic flight to any point on the face of the earth and return."

HE SAID a single pound of uranium—a one and one half inch cube—could provide as much heat as two million pounds of gasoline or 3½ million pounds—32 railway cars—of coal.

"With so large a gain the goal, industry, the Atomic Energy Commission, the military services and the NACA are participating in vig-

Continued on Page 16; Col. 4

NACA Says Screech, Creep Among Major Problems In Trying To Harness A-Energy To Supersonic Plane

Continued From Page One

orous, sustained attacks on the formidable technical problems that must be solved," he added.

Sharp said the laboratory is studying various ways of converting heat generated in a nuclear reactor into power or thrust, and of shielding plane and crew from radiation.

Eugene J. Manganiello, assistant director, said the Lewis laboratory is devoting its greatest effort to improvement of jet engines.

"As a result of this effort, breakthroughs have appeared at several points," Manganiello said.

"New and powerful means have been uncovered for increasing greatly the performance of military aircraft.

"Some of these improvements represent steps forward in the progress of supersonic aircraft propulsion that are revolutionary rather than evolutionary."

NEW DEVELOPMENTS displayed included:

1. The use of "reverse thrust" to brake a jet airplane on its landing roll, and even to force it to roll backward. Somewhat different from techniques under development in Europe and by several U. S. aircraft companies, NACA employs a lightweight double set of blades which, when opened up inside the tailpipe of an F-84, caused the jet fighter to go into reverse. Heretofore one disadvantage of the jet airplane has been the difficulty of stopping it, especially on icy runways, as contrasted with the efficient braking power of reverse propeller pitch on piston engine airplanes.

2. Use of a water-spraying system, automatically turned on upon impact, to prevent fuel fire after a jet-plane crash. In four test crashes there was not a single fire, although in one case the engine tumbled through a cloud of fuel spray.

3. "Encouraging" designs in seats built to reduce the chances of injury in a crash.

4. IMPROVED JET compressors of greater air capacity and lighter weight. These have resulted in considerable gains in thrust through increasing the air flow through the engine, and through an increase in the gas temperature at the turbine inlet.

Much of the laboratory's work is in the field of aerodynamic heating—attempting to reduce air friction against fast moving aircraft, and to find stronger heat—resistant aircraft materials.

The laboratory found that at the speed of 6,600 miles an hour, or 10 times the speed of sound, considered for some long-range missiles, temperatures reach 8,000 degrees Fahrenheit, which is enough to melt any materials now known.

The report showed that at about five times the speed of sound aluminum melts, and that at twice that speed diamonds vaporize.

CHICAGO DAILY
TRIBUNE
June 3, 1954

SCIENCE HUNTS SUPER-METAL FOR A-BOMBER

Research Carried On at Cleveland

BY LLOYD NORMAN
[Chicago Tribune Press Service]

Cleveland, June 2 — Secret research into new metals holds the key to the world race for air superiority that will be won by the nation that builds the first atomic powered bombers, government scientists disclosed today.

Studies into metals that can shield atomic radiation, hold up under intense heat of more than ,100 degrees, and efficiently transmit atomic heat in jet engines are being carried on at the 100 million dollar Lewis flight propulsion laboratory here, officials of the national advisory committee for aeronautics told reporters.

500 at Demonstration

The committee, a government agency which conducts basic aeronautical research, unfolded its latest developments to more than 500 representatives from industry and the military services on the first of a three day annual demonstration at its laboratory.

Altho Defense Secretary Wilson last year deferred plans for the construction of the first atomic powered plane, the research project on the atomic aircraft engine has not been sidetracked. It was learned Wilson's decision was based on the belief that insufficent progress has been made on the development of a lightweight atomic engine to justify spending defense funds on the building of an aircraft frame to carry it.

Working with AEC

The NACA is working with the atomic energy commission and the defense department in its effort to find a light weight metal that will shield the atomic engine's rays from the crew, an efficient liquid metal to carry the heat from the atomic furnace to the air expansion chamber of a jet engine, and a metal for the engine's parts that will not melt and buckle under intense heat.

Government scientists here envision the future atomic engine as a type of jet engine in which the atomic furnace provides the heat that fires up the compressed air that is blown out as exhaust, creating the powerful thrust that pushes the plane thru the air.

With jet engines now turning out 10,000 pounds of thrust [10,000 horse power at 375 miles an hour] and research engines being designed at 15,000 pounds of thrust, aviation engine research is looking for more powerful engines for the supersonic bombers of five and 10 years from now.

Called Obvious Source

NACA officials estimate that it takes five times as much power to push a plane thru the air at speeds faster than sound [660 miles an hour at 30,000 feet] than to power it at current speeds of about 500 miles an hour.

"It has become increasingly apparent that if supersonic aircraft are to possess the long range capabilities required, a way must be found to breach the fundamental limits inherent in engines using chemical fuels," Lewis engineers said.

They said atomic power is the obvious source of greater energy. One pound of uranium will produce as much heat as 333,333 gallons of gasoline, they added.

The laboratory also is studying chemical fuels, especially to provide an extra "boost" for present day jet fighter planes and higher speed ram jet engines [simplified jets without compressors]. One of the new fuels being evaluated is propylene oxide, derived from petroleum, which permits speeds more than twice those of ordinary jet fuels.

High Speeds in Offing

Edward R. Sharp, director of Lewis laboratory, said in a statement that with research planes now flying at speeds 2½ times the speed of sound or about 1,650 miles an hour, much higher speeds are in the offing. He said the need for greatly improved power plants has become critical.

"New and powerful means have been uncovered for increasing greatly the performance of military aircraft," he said.

The faster than sound speeds have created new problems, NACA engineers said. Aluminum, titanium, and steel buckle, weaken, and twist under intense heats. At 6,600 miles an hour the 8,000 degree fahrenheit heat melts any known metal or other materials. This heat would be reached by an intercontinent missile.

The intense heat created by the friction of the atmosphere against the metal skin of a rocket or missile would vaporize diamonds. The engineers said that the Bell X-1 research plane that reached speeds of 1,650 miles an hour hit temperatures of nearly 400 degrees and would have suffered serious harmful effects to its metal skin if it had stayed in that heat range for a few minutes. Demonstration of the heating effect of high speeds shows that ordinary aircraft wings buckle and disintegrate.

Can Back Up Jets

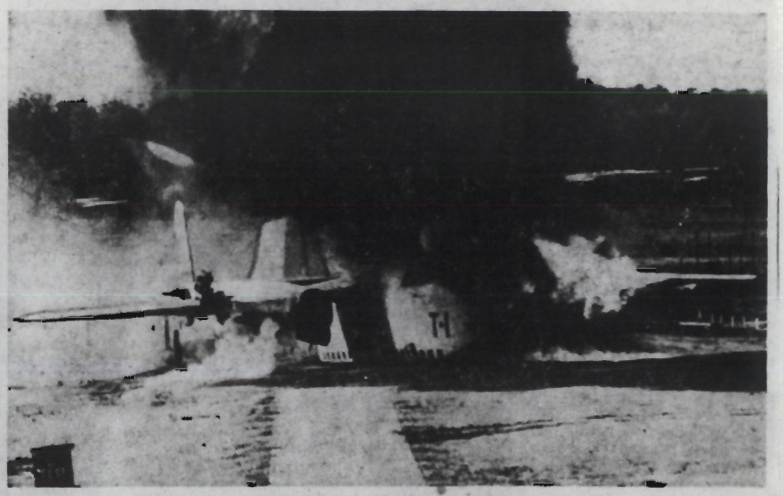
The laboratory also demonstrated its flight safety studies, including an F-84 jet fighter with a reverse jet device in its tail pipe which can slow the plane's landing speed and actually back it up. The jet reversal experiments were undertaken to find ways of stopping high speed planes on limited runways. The jet thrust is reversed by deflecting it forward with a series of rings that can be moved into the jet stream.

Other safety studies involve a new safety aircraft passenger seat and a water spray system to prevent fires in airplane crashes by cooling the heated engine that normally ignites spilled fuel. The safety seat is built to absorb heavy shock without throwing the passenger violently forward or to the sides.

CLEVELAND PRESS
June 3, 1954

Display Air Crash Safety Aids

AIR FILLED RUBBER SEAT is the latest safety feature designed by NACA scientists here to protect passengers aboard planes that crash. It cushions the impact. Test dummy here takes 2400-pound jolt from rear.



CRASH-FIRE TESTS like this have helped NACA scientists devise ways to prevent such fires and safeguard passengers aboard disabled planes. Here jet engines mounted beneath the wing replace conventional piston type on war-weary C-82.

By CHARLES TRACY
Aviation Editor

Greater safety for airline passengers in the next few years will result from elaborate experiments underway at Lewis Flight Propulsion Laboratory of the National Advisory Committee for Aeronautics.

Showing outstanding progress in research aimed at saving lives of passengers trapped aboard flaming planes after crash landings, scientists today demonstrated these latest safety features designed and built here:

WATER SPRAY SYSTEMS to prevent crash fires in both jet and piston engined planes.

AIR FILLED rubber seats to carry passengers safely through tremendous impacts.

REVERSE THRUST UNITS to slow jet airliners quickly after landing, cutting runway length.

1200 See Projects

Demonstrations were staged for some 1200 aeronautical leaders here for a three-day inspection of "Buck Rogerish" projects being tried in test cells and wind tunnels of the 200-acre government facility.

Ordinary water and 20 pounds of plumbing to spray it on hot spots of engines in a crashed plane, solved the fire hazard. But it took a series of some 50 crashes staged with war-weary, full-size C-82 Flying Boxcar planes before Irving Pinkle, project engineer and his aides figured where and when the water should be sprayed.

Spinning jet engines sucked air and raw fuel into their red-hot interiors even after crashing to complicate the problem, but Pinkel couldn't make them burn when the water spray was used in recent tests. This was shown on films made at the laboratory's Ravenna test station.

While running the crash-fire tests, Pinkel and engineers gave much thought to what would happen to passengers in the big planes smashed in 100-mph ground runs.

Designed Rubber Seat

They hit on the idea of an all-rubber seat, filled with air. Fitted with a seat belt it was made strong enough to hold a 200-pound passenger through an impact 12 times his weight.

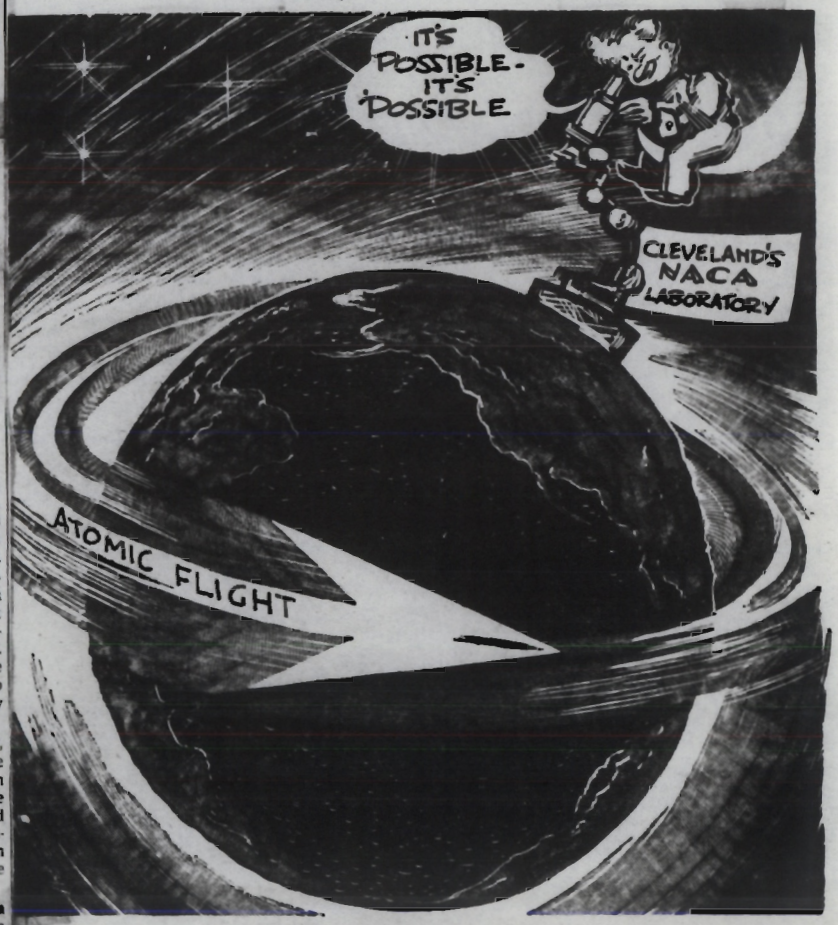
Its "spring back" qualities had to be dampened so it wouldn't rebound the passenger through the plane's roof. It was fitted to a round base looking like a barber chair so it would take shocks from any direction.

Visitors to the inspection saw, for the first time, a jet plane actually back up under its own power in demonstrations of the jet reverse unit. This was fitted to the tailpipe of an F-84 fighter but is primarily for use on large multi-jet planes like the Boeing 707 airliner.

In use it will permit such a plane to land with safety in 4000 feet of runway space by bending forward some of the jet thrust from the tailpipe.

This is done by two sets of curved vanes carried inside the tailpipe.

CLEVELAND PRESS
June 3, 1954



NEW YORK HERALD TRIBUNE
June 4, 1954

6,600 M.P.H. Guided Missiles And Atom Planes U. S. Goal

CLEVELAND, June 3 (UP).—Government scientists today guardedly revealed evidence of American progress in a global race for development of trans-ocean guided missiles and atomic aircraft engines.

Urgent research goals disclosed at the laboratories of the National Advisory Committee for Aeronautics are: lightweight atomic power plants able to drive warplanes at supersonic speed "to any point on the face of the earth, and return," and inter-continental guided missiles with speeds up to 6,600 miles an hour, or ten times the speed of sound.

Three-Hour Inspection

Government and industry officials and military leaders are receiving information on those and other high-priority aeronautical research projects during a three-day inspection of the N. A. C. A.'s $100,000,000 facilities here. The inspection ends tomorrow.

Dr. Hugh L. Dryden, N. A. C. A. director, warned that Russia is stepping up technical training for its youth, producing "large numbers" of aircraft and steadily introducing new models.

The government's top aeronautical research agency said in a statement cleared by the Atomic Energy Commission: "Our national security requires that the research and development of nuclear power plants for aircraft be carried forward with unceasing effort."

Scientists gave censored demonstrations of how the N. A. C. A. is seeking to transfer the heat from nuclear reactors into useful form for turbo-jet engines. Research also is concerned with lightweight shielding against radiation and liquid "coolants" that will not corrode reactor parts at high temperature.

Fuels a Problem

Tomorrow's supersonic combat planes will have such vast power and fuel requirements that they will have limited range if they rely on today's chemical fuels, it was said. Hence the urgent need on the part of industry, the A. E. C., military services and the N. A. C. A. for "vigorous, sustained attacks on the formidable technical problems that must be solved."

Problems just as formidable appeared to face the inter-continental guided missile researchers. At the 6,600-mile-an-hour speeds now being investigated, temperatures from air friction would be enough to vaporize diamonds and melt presently known missile materials.

The problem would come when the missile, fired like a bullet and climbing out of the earth's atmosphere, re-entered the atmosphere over its target. High-melting-point ceramic and metallic materials, water cooling and insulation are being studied.

CLEVELAND PLAIN DEALER
Sunday Morning, June 6, 1954

With the Help of God and the N. A. C. A.

THE WALL STREET JOURNAL
June 4, 1954

Reverse Thrust Device Tested to Stop Jets From Skidding Off Icy Runways

BY RICHARD P. COOKE
Staff Reporter of THE WALL STREET JOURNAL

CLEVELAND — Outside a hangar of the National Advisory Committee for Aeronautics, Government research group, a Republic F-48 fighter plane revved up its jet engine and began to move. But it rolled back instead of forward. It was a preview of a method worked out by the N.A.C.A. to stop fast jet transports from running off icy runways and to solve one of the major prospective headaches of air transportation.

On an ice-coated runway a jet transport plane would roll 11,000 feet, or two miles, if it had to rely on its brakes. But with the N.A.C.A. device, which reverses the thrust of the gases roaring out the tailpipe, even a 100-ton plane could be brought to a stop in only 4,000 feet. That's considered to be about maximum allowable for safety on most airfields. On a dry field, even, the roll of a jet plane would be more than 6,000 feet. This could be cut to about 3,000 with the N.A.C.A. gadget.

Weighs 250 Pounds

The device consists of a set of vanes, resembling curved venetian blinds, which open like a clamshell when the pilot wants to slow his transport plane touching the runway at 110 miles an hour. The vanes act like a backstop from which the hot gases rebound, shooting off almost in reverse of their original direction. A backward push of only 35% of the maximum forward power is needed to do the job, but N.A.C.A. technicians say up to 60% ultimately may be deflected backward, almost stopping a plane on a dime. They add the size of the plane doesn't make much difference.

The N.A.C.A. gadget, developed by the committee's Lewis Flight Propulsion Labratory, weighs only about 250 pounds in its experimental form, but probably can be cut to 150 or 200, a weight which won't be too much of a burden. The device also cuts about 2% or 3% from the forward power, but that's a small price for an airliner operator to pay for added safety.

The French and Swiss also have built reverse thrust devices, and Boeing Airplane Co., builder of the prototype 707 jet airliner, likewise has been experimenting. The N.A.C.A.'s system, though, is different and stands a good chance of being used both in military and commercial jets.

Although Boeing had a reverse thrust device on its new prototype 707 jet airliner which broke a landing gear on its initial taxi tests a week or so ago, it's probable the N.A.C.A. plane is the first in the U.S. actually to have backed up using jet power. Only a few years ago engineers thought the jet slow-down problem was almost insoluble. They shook their heads ominously about the need for using parachutes for brakes.

Air Force pilots have relied on parachutes behind big Boeing B-47 jet bombers to slow them on small, slippery or rainy runways. Piston-powered airliners today rely on reversible propellers to brake them fast after they land. But there's no such assistance available for the jet.

The N.A.C.A. scientists demonstrated the dangerous effects of high temperatures on the metals for which supersonic planes or guided missiles are constructed. At temperatures of 400 to 800 degrees, which will be encountered in the stratosphere at extremely high velocities, metal skins will buckle like parchment, and whole wings might be torn off as they are weakened by these high temperatures. One vivid film showed a small model of a guided missile melting in a wind tunnel at a simulated speed of nearly 4,000 miles an hour.

Would Melt Steel

But missiles of the future, designed to traverse oceans, may go two or three times that fast, producing temperatures which would melt steel or titanium, toughest of aircraft metals. Even diamonds might be vaporized at some of the extreme speeds envisioned by aerodynamic scientists.

The N.A.C.A. told a group of visitors about their work on problems surrounding the atomic airplane engine. The nuclear aircraft engine of the future will probably be much like a jet engine, except that heat will be supplied to the incoming air from the reactor instead of by burning gasoline or kerosene. One pound of uranium, the basic atomic fuel, can provide the same amount of propulsive energy as 2 million pounds of gasoline.

The N.A.C.A. technical men declared the big problem is to get the heat from the atomic pile transferred to what corresponds to the combustion chamber of the jet engine. Liquid metals are the best bet, although it's tough to find a metal which won't interfere with the operation of the pile and can stand the high heats and the intense radiation involved.

But if liquid metals are used to exchange the heat from the pile to the air, the reactor for planes can be made much smaller than if the air were to be heated directly. A small reactor means the shielding to protect nearby human beings from radiation also can be made smaller. Two kinds of shielding will be needed. One type must be of a heavy material, like lead, to stop the dangerous gamma rays emanating from the pile. The other might be of a light material like paraffin which stops the neutrons zipping out of the reactor. Water also can stop the fast neutrons.