C O P Y

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

1724 F Street, N.W., Washington 25, D.C.

FOR RELEASE:

10:00 a.m. Tuesday
September 28, 1948

NACA ANNOUNCES NEW GIANT SUPERSONIC TUNNEL

Cleveland, Ohio, September 28, 1948:—At its annual inspection of the Lewis Flight Propulsion Laboratory, the National Advisory Committee for Aeronautics, the government's aeronautical research agency, unveiled the largest supersonic wind tunnel in the world, to be placed in operation soon. The test section is 8 feet high and 6 feet wide, providing the first opportunity to study large models of turbo-jet and ram-jet engines in operation at speeds up to twice the speed of sound, under conditions of temperature and pressure simulating flight conditions near 35,000 feet altitude.

The 8- by 6-foot supersonic tunnel draws its air through the largest air dryer built in this country which is capable of drying 2,200,000 cubic feet of air per minute down to a dew point of -10°F. by passing the air through beds of activated alumina. Reactivation of the alumina is accomplished by passing heated air through the drying beds for several hours.

The dry air is then forced through the tunnel by an 18-foot diameter axial-flow compressor having seven rotor stages and nine rows of stationary blading with a total of approximately 1,000 blades. Three large electric motors coupled together on a single shaft provide a total of 87,000 rated horsepower to drive the compressor at speeds that can be controlled from 770 to 880 rpm.

The speed of the air in the tunnel test section is controlled by means of an adjustable throat built of two flexible side walls of stainless steel 35 feet long and 8 feet high, which are automatically flexed to the desired wall profile by means of hydraulic jack screws.

Air from the test section is discharged to the atmosphere through a large conical diffuser surrounded by a heavy concrete enclosure and fitted at its discharge end with an exhaust muffler to hold the noise within acceptable limits. The operation of jet engines within the tunnel will so contaminate the air and increase its water content that it was considered unfeasible to recirculate the air within the tunnel.

Flow around the models will be observed by a schlieren apparatus through windows in the test-section side walls. The optical equipment for this purpose is so designed that photographic records can be made or the images can be transmitted from the test chamber through periscope or television apparatus to the remote control room where engineers control the tunnel speed and operating conditions and record research data. Aerodynamic forces on the model are recorded by means of a large balance system located in the test chamber.

When the tunnel is complete, an extensive program of research on flight propulsive systems to be used in supersonic aircraft will be initiated to augment and extend the research already completed at the NACA Cleveland laboratory in the altitude wind tunnel, in flight, and in smaller supersonic wind tunnels.

September 23, 1948

C O P Y

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

1724 F Street, N.W. Washington 25, D.C.

FOR RELEASE:

10:00 AM, Tuesday
SEPTEMBER 28, 1948

NACA PROPULSION LABORATORY RE-NAMED IN HONOR OF THE LATE DR. LEWIS

Cleveland, Ohio, September 28, 1948:--In an impressive ceremony the Flight Propulsion Research Laboratory of the National Advisory Committee for Aeronautics was re-named the Lewis Flight Propulsion Laboratory today in honor of the late Doctor George William Lewis, for 27 years Director of Aeronautical Research for the NACA.

Following the opening remarks of NACA Chairman, Dr. Jerome C. Hunsaker, a commemoration address reviewing Dr. Lewis' life and his contributions to aeronautics was made by Vice Admiral Emory S. Land, U.S.N. (Ret.), now President of the Air Transport Association and past Member of the NACA.

J. F. Victory, Executive Secretary of the NACA read the resolution adopted by the Committee re-naming the vast Laboratory after Dr. Lewis. Mr. Victory also paid tribute to the former Director on behalf of the NACA employees.

Dr. Lewis came to the NACA in 1919, when the Committee had one wind tunnel and 43 employees. He dedicated his life to developing aeronautical research in this country, and by the time of his death in July 1948, he had helped build the NACA to the stature of the world's outstanding aeronautical research organization with three major laboratories and 6,700 employees.

September 24, 1948.

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

1724 F Street, N.W. Washington 25, D.C.

FOR RELEASE:

10 AM, TUESDAY,
SEPTEMBER 28, 1948

NACA REVEALS RAM-JET FLIGHT RESEARCH AT SUPERSONIC SPEEDS

Cleveland, Ohio, September 28, 1948:--A 16-inch diameter ram-jet engine, enclosed in a configuration that may be used for supersonic flight, has provided performance information in free fall at speeds up to 2.4 times the speed of sound. The test engine is carried up to 30,000 feet by an F-82 Twin Mustang to be dropped. Ram jet thrust plus the force of gravity accelerate the vehicle, while radio-telemeter apparatus beams temperature and pressure data to the ground. The tests are carried out as a joint project of the Lewis Flight Propulsion and the Langley Aeronautical Laboratories of the NACA, the government's aeronautical research agency.

The engine used has a combustion chamber diameter of 16 inches and is 14 feet long, including the telemeter antenna. A central body located inside the inlet section houses the radio transmitter, fuel and all controls. Four fins are attached to the jet exit at the rear to provide aerodynamic stability.

With exception of the rocket, the ram-jet is probably the simplest conceivable engine. It has no large moving parts and consists principally of three elements; and inlet to slow down and compress the incoming air, a combustion chamber where fuel is injected and burned, and an exhaust nozzle where the gases are accelerated to provide thrust.

Operation of the ram-jet depends on forward velocity. At zero air-speed, no useful thrust is obtained. However, as forward speed increases, the ram air compression increases, giving increasing thrust and efficiency of operation. This relationship of increasing efficiency at higher speeds makes the ram-jet attractive for flight at supersonic speeds in the neighborhood of M 2.0 or more.

By conducting combustion and performance studies in free flight, an evaluation of engine performance is made over a wide range of speed. Moreover, investigation is made on an engine configuration as it may actually be used in supersonic flight. Results obtained indicate a critical relationship between combustion chamber performance and efficiency of the air inlet. Research will be continued both in flight and in supersonic tunnels to provide detailed information on this interaction and on control of the shock wave formation at the inlet. Shock waves that occur ahead of the inlet cause large losses in compression. Research so far has shown that these losses can be minimized by appropriate design and that pressure recoveries within a few per cent of the theoretical maximum are possible.

September 23, 1948

NATIONAL ADVISORY COMMITTEE FOR AERONAUTICS

1724 F Street, N.W. Washington 25, D.C.

FOR RELEASE:

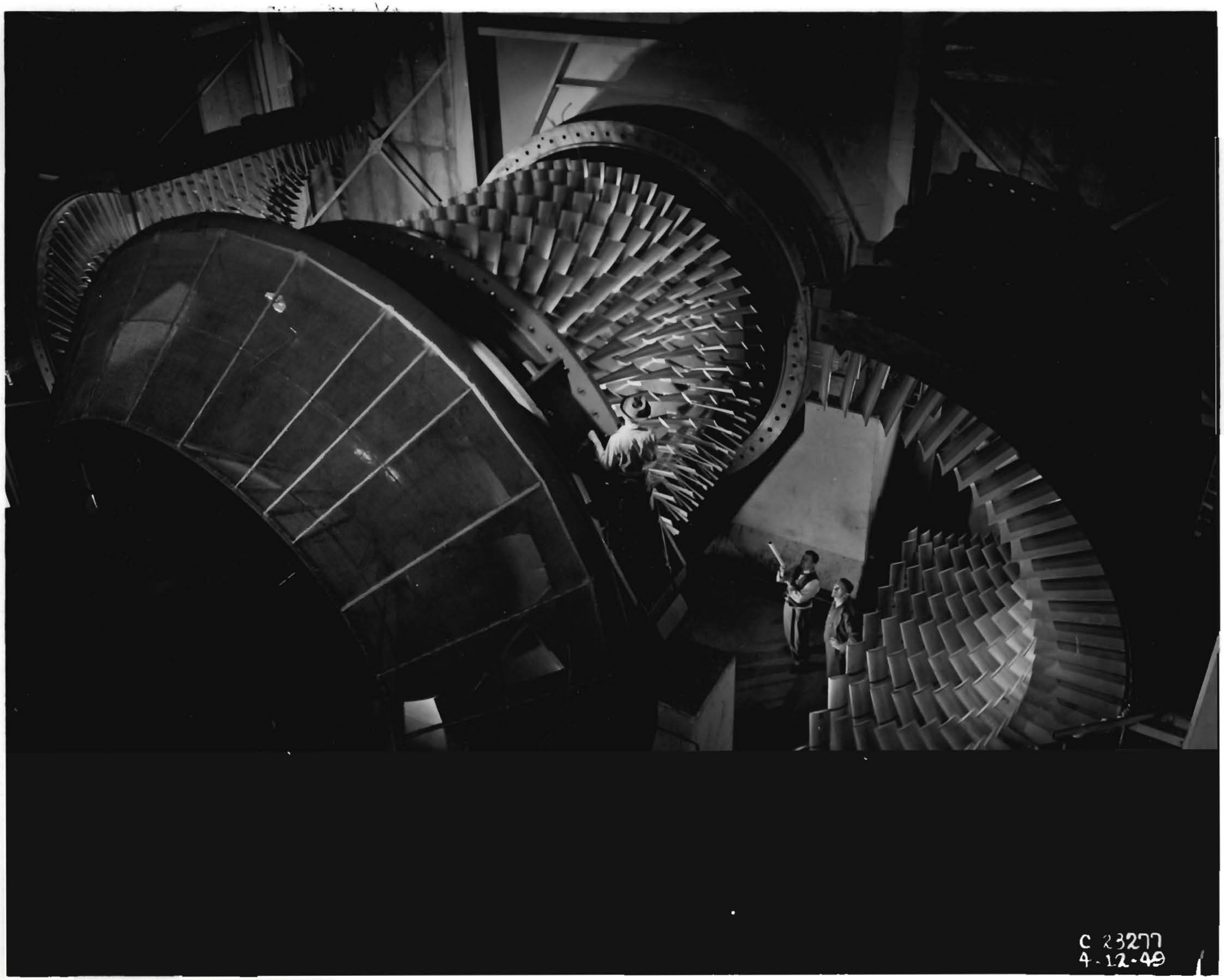
10 AM, TUESDAY,
SEPTEMBER 28, 1948

FIVEFOLD INCREASE IN COMPRESSOR OUTPUT SEEN IN NEW NACA SUPERSONIC COMPRESSOR

Cleveland, Ohio, September 28, 1948:--Results obtained on an experimental compressor have indicated that a single rotating blade row of the new NACA supersonic compressor may accomplish the work of five rows of the ordinary axial-flow compressor. This means either that the output of present jet engines might be achieved with a smaller, lighter compressor, or that using present sizes, the power may be greatly increased.

When conventional blades are rotated at supersonic speeds, a piling up of pressure impulses on the leading edges of the blades creates a "dam" to the flow of air. This "dam", generally referred to as a shock wave, has been an obstacle in the way of attaining supersonic speeds in compressors, as it was with supersonic flight.

Intensive study by the NACA in the field of supersonic aerodynamics has resulted in a compressor designed to operate at supersonic speeds. The compressor rotates so fast that the balde tips travel in excess of 1,000 mph. It is so designed that the shock waves occur not at the leading edge of the blades but well inside the compressor. The energy absorbed by the shock wave, instead of being lost to the process, is used to compress the air to the desired high pressure. By using this energy, the size of a compressor to produce a given pressure increase is greatly reduced. Substantially greater gains are expected to result from the research now being conducted by the NACA. The reduction in compressor size which can be realized by use of this new compressor type will mean a substantial saving in time, cost, and material required for making jet engines. It will result in large saving in length and weight of jet engines.



NACA

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
AM_s, Thursday,
September 22, 1949

Capable of handling two million cubic feet of air per minute, this is the compressor of the 8- by 6-foot Supersonic Wind Tunnel, the world's largest faster-than-sound tunnel, which is now in operation at the Lewis Flight Propulsion Laboratory. In this photograph, the two halves of the stator blade housing have been opened, to show the rotor blades on the massive shaft. Representatives of the Department of Defense, the aircraft industry and educators are being given an opportunity to see this huge installation during the Inspection of the NACA research center, today through Thursday.

Photo number C-23277


C-23522
5-16-49

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
AM_S, Thursday,
September 22, 1949

Research Scientists at the Lewis Flight Propulsion Laboratory complete installation of a model in 8- by 6-foot test section of the world's largest supersonic wind tunnel. Under construction for more than a year, this tunnel recently began producing useful information, it was disclosed at the Inspection of the NACA research center. Speeds of from 1.4 to 2.0 times that of sound can be reached.

Tuesday, September 20, 1949

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

Note to Editors: -

On behalf of the Lewis Flight Propulsion Laboratory, and especially, Dr. Edward R. Sharp, Laboratory Director, welcome.

During the next three days, more than 1,000 representatives from the Department of Defense, the government, the nation's aircraft and engine manufacturers, and the country's educational institutions will visit the Lewis Laboratory to see and hear a report on research progress made during the past 12 months on propulsion problems.

The advent of supersonic speed - yesterday in research airplanes; tomorrow in other aircraft - has given added urgency to the quest for information which will enable design and manufacture of the more powerful engines needed in the attainment of sustained faster-than-sound flight.

Enclosed are several photographs and press releases. To assure as fair as possible a division between morning and evening publications, release dates have been used. A press room, in the Laboratory's administration building, has been set up, and every effort will be made to serve you completely and quickly.

Yours,

Walt B

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
PM_s, Wednesday,
September 21, 1949

Lewis Laboratory Studies Strategic Materials

Fuels, to Determine Jet Engine Availability

Ways of manufacturing the great numbers of jet engines which would be needed in a time of emergency, from metals which would be available at that time, are being sought by the Lewis Flight Propulsion Laboratory, it was announced yesterday at the Annual Inspection of the NACA research center. Another closely related investigation now in progress concerns development of a specification for the most suitable jet engine fuel which could be furnished during such an emergency period.

In a single year of the last war, scientists of the National Advisory Committee for Aeronautics pointed out, 257,000 aircraft engines were built. Even if an emergency arose calling for manufacture of jet engines at a rate of 100,000 a year, it would require careful review of the metals used in the manufacture of these engines. Columbium, tungsten, cobalt, chromium and nickel, all considered critical in supply because they are not available domestically in sufficient quantity, are used in the manufacture of jet engines.

NACA's attack on this problem is three-pronged. First, research seeks development of non-strategic, or domestically available, materials suitable for jet engine manufacture. Second, establishment of design methods resulting in a reduction in the use of critical materials is sought, and finally, work is focused on development of cooling methods, which would make possible use of lower-temperature non-critical alloys.

Substantial progress has been made by manufacturers of jet engines, it was said, toward reducing the total amount of material used in making turbine disks, one of several jet engine parts where strategic materials have been used. This has been made possible by a growing knowledge of stresses and how to design for them. The Lewis Laboratory is continuing studies on this problem, so that further reductions in the use of critical materials can be made.

Present jet engines, used in today's fighters and bombers, burn either a kerosene-type fuel or, because of greater availability, gasoline. But when a barrel of crude oil is refined, only 6% of the resulting products is kerosene, not enough to supply the large number of aircraft operating in time of emergency. Nor is it desirable, if another suitable fuel can be developed, to burn large quantities of highly refined aviation gasoline even though this is potentially available as 40% of the barrel of crude.

A maximum availability, equaling 50% of the products refined from a barrel of crude, was suggested for the new jet fuel. This would mean utilizing all the kerosene, all the gasoline, and about 1/4 of the Diesel and heating oils available from a barrel of crude. As a result of NACA's work, new jet fuels have been specified, meeting this availability requirement, which measure up as substantially equal or slightly better, in respect to all specification characteristics, than the kerosene-type fuels now used.

# # #

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
AM_S, Thursday,
September 22, 1949

World's Largest Supersonic Tunnel

Now Operating at NACA's Lewis Laboratory

Under construction for more than a year, the world's largest supersonic wind tunnel has been operating for the past three months to produce useful research data, it was disclosed yesterday at the Annual Inspection of the Lewis Flight Propulsion Laboratory, where the tunnel is located. This newest of the National Advisory Committee for Aeronautics' research tools is capable of speeds, in the test section, of from 1.4 to 2.0 times the speed of sound (approximately 760 mph at sea level).

Despite its great size and the innovations contained in its design and operating techniques, the "shakedown" period for this new research tool was shorter than might have been expected. Already, operation of the tunnel has greatly broadened the horizons of the supersonic propulsion research program being carried forward at the Lewis Laboratory, it was said.

Similar to all the supersonic tunnels at the Laboratory in that it is of the non-return-passage type to permit burning fuel and air in the engine under actual operating conditions, the new tunnel has a test section measuring 8 by 6 feet. Air passing through the tunnel must be extremely dry to prevent condensation and velocity disturbances in the test section. At maximum operating conditions, as much as two million cubic feet of air per minute - weighing almost 75 tons - are drawn into the tunnel. Air is dried by passing through beds of activated alumina, which on a hot day remove as much as a ton of water each minute.

Taken from the dryer building, the air moves into the inlet of the compressor, which is powered by three electric motors providing 87,000 hp and connected in tandem. The air leaves the compressor at pressures up to 1.8 atmospheres but at low speed, and then is expanded to produce the desired velocity in the test section. This speed can be varied from 1.4 to 2.0 times that of sound.

Moving into the minimum area of the tunnel throat, the air reaches the speed of sound, and as the tunnel passage is expanded, accelerates until the desired supersonic speed is reached. The amount of area expansion downstream of the minimum section of the nozzle is controlled by flexing the stainless steel side plates, 35 feet long, 8 feet high, and 1 inch thick. To do this flexing work, 14 hydraulically operated screw jacks on each side are employed.

The 8- by 6-foot test section provides the first opportunity to study large models of turbojet and ram-jet engines in actual operation at speeds up to twice that of sound, and under conditions of temperature and pressure the same as would be found at 35,000 feet altitude.

As the air moves around the model in the test section, the flow pattern is observed by means of a schlieren apparatus, through thick glass windows in the side walls of the tunnel. The optical equipment is so designed that photographic records can be made. Aerodynamic forces on the model are measured and recorded at the same time by means of an intricate balance system.

# # #

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
AM_S, Wednesday,
September 21, 1949

More Powerful Rocket Fuels, Altitude Starting,

Research Problems at NACA Propulsion Laboratory

Intensive study of new, more powerful rocket fuels is being conducted at the Lewis Flight Propulsion Laboratory, it was announced at the Inspection yesterday. Other work being done at this NACA research center in the rocket field includes an attack on the problem of starting rocket engines at the high altitude and extreme cold conditions which are being met as use of rocket power is broadened. Engine cooling is also being investigated.

Unsurpassed as a "heat engine" wherever high thrust is required for short periods of time, the rocket develops the greatest thrust per unit of engine weight with the smallest frontal area per pound of thrust, of all engines used in aircraft propulsion. It is the only power plant whose performance does not decrease with higher altitudes because it carries its own oxygen supply and does not depend on the earth's atmosphere.

Its specific fuel consumption, however, is much greater than that of any of the other engines used, which explains the research to secure the highest possible thrust from a unit of fuel. Lewis Laboratory scientists, both on paper and experimentally in the laboratory and with engines, have determined the extent to which improved fuels will exceed the specific impulse given by gasoline-nitric acid fuel. This program, which has already studied fuels 2.5 times as powerful, is being extended to include propellents with still higher energy potentials.

Its ability to provide super performance, although for only short periods, has caused the rocket engine to be used as a primary powerplant for military missiles and upper atmosphere research vehicles. It has been used as an auxiliary powerplant for launching missiles, especially those powered by a ram-jet, because the ram-jet is incapable of delivering appreciable thrust except at high speeds.

The rocket has been used for assisting take-off of aircraft, and for thrust augmentation of airplanes for high climb rates or high speeds. Despite its short period of operation, because of high fuel consumption, the rocket permits long range for vehicles that are brought to high speed and then allowed to coast, following a trajectory path like a projectile.

The heat release of a rocket engine producing 1000 pounds of thrust can be 520 million Btu/hr/cu ft, compared to 25 million for a turbojet engine. Temperatures up to 6000° F are produced, and cooling must be provided to keep the rocket chamber walls from melting. Progress is being made to secure such needed cooling, and work is continuing on this problem.

Rocket fuels, which at low altitudes and moderate temperatures ignite spontaneously and rapidly upon contact, at high altitudes may refuse to ignite, or ignite in explosive fashion destroying the rocket engine. Two solutions are being worked on at the Lewis Laboratory: (1) keeping the engine and fuels sufficiently warm to insure prompt, safe starting, and (2) use of additives to the fuel to shorten the ignition lag.

# # #

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
PM_s, Tuesday,
September 20, 1949

Lewis Laboratory Seeks More Powerful Engines

for Airplanes to Fly Faster than Speed of Sound

Research effort at the Lewis Flight Propulsion Laboratory is being intensified to solve the basic supersonic propulsion problem, how to obtain engines capable of developing the extremely large powers required, it was reported today at the Inspection of NACA's research center. Accomplishment of short duration supersonic flight speeds by full-scale research aircraft, together with the imminence of sustained flight speeds faster than sound, gives urgency to this program, it was said.

Displayed were models of hypothetical airplanes, flying at speeds up to 1500 mph, which showed the increased power needed to fly at the faster speeds. A subsonic airplane of about 50,000 pounds capable of flight at 400 mph at 30,000 feet would require engines developing 3000 hp. An airplane of this same weight reaching a speed approximately 1000 mph at 50,000 feet would need an engine providing 15,000 hp, while an airplane of this weight reaching speeds of 1500 mph at 70,000 feet would need about 45,000 hp. Even greater power would be required if the 1000 mph and 1500 mph airplanes were to fly at the 30,000 foot altitude.

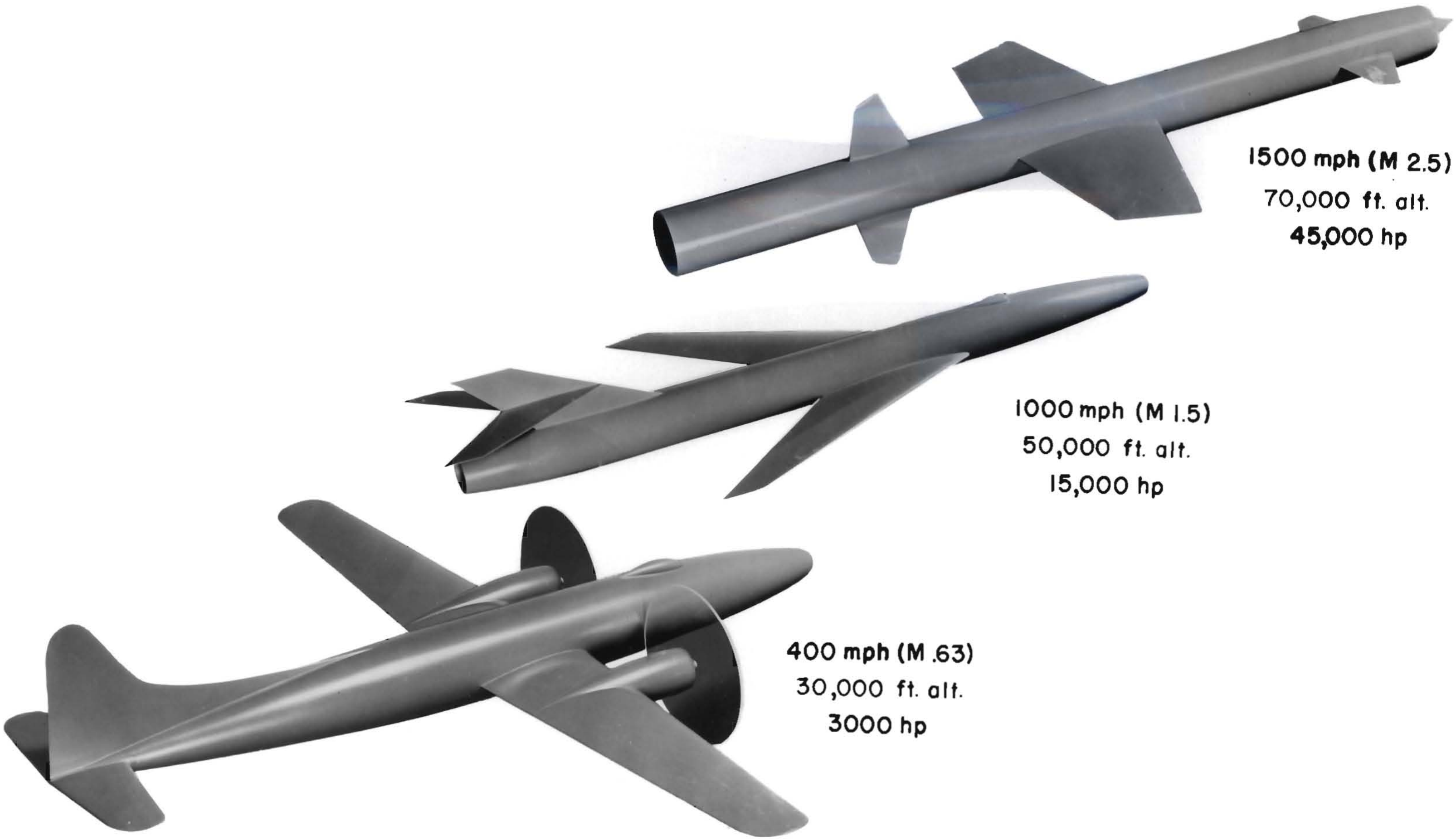
Because they can "handle" large quantities of air, relative to their size, and because their power increases with speed, turbo-ram and ram-jet engines are suitable for supersonic flight, it was pointed out. Problems of these engines are being studied intensively at the Lewis Laboratory.

Problems of supersonic engines include efficient compression of the air, combustion of the fuel, aerodynamic efficiency of the engine, and the interrelation effects between engine and airplane. NACA's three research centers - the others are located at Langley Field, Va., and Moffett Field, Cal. - are investigating the compression problem at supersonic speeds. Although considerable improvement at all speeds has been achieved, research is continuing to bring actual compressions closer to the theoretical maximum compressions.

Because air in a ram-jet engine passes through the combustion chamber at high speed, there is a tendency for the flame to blow out. Operating the engines at high altitudes with resulting low pressures also makes combustion difficult. Since 1945, it was announced, the velocities at which good combustion efficiencies can be maintained have been increased almost three-fold and further progress is expected. Similar progress has been made in increasing the altitude limits for satisfactory combustion, a result of intensive research on flame-holding devices, fuel-injection methods, and combustion chamber design.

At supersonic speeds, the problem of designing engines having the lowest possible drag becomes important, and much research on this subject is required. Air flow disturbances induced by the engine inlet or exhaust jet may seriously change the effectiveness of the lifting and control surfaces of the airplane, whether the engine be located in its own nacelle or totally buried in the fuselage. Supersonic propulsion systems no longer can be studied separately but must be investigated with the whole airplane.

# # #



NACA
C-24139
9-16-49

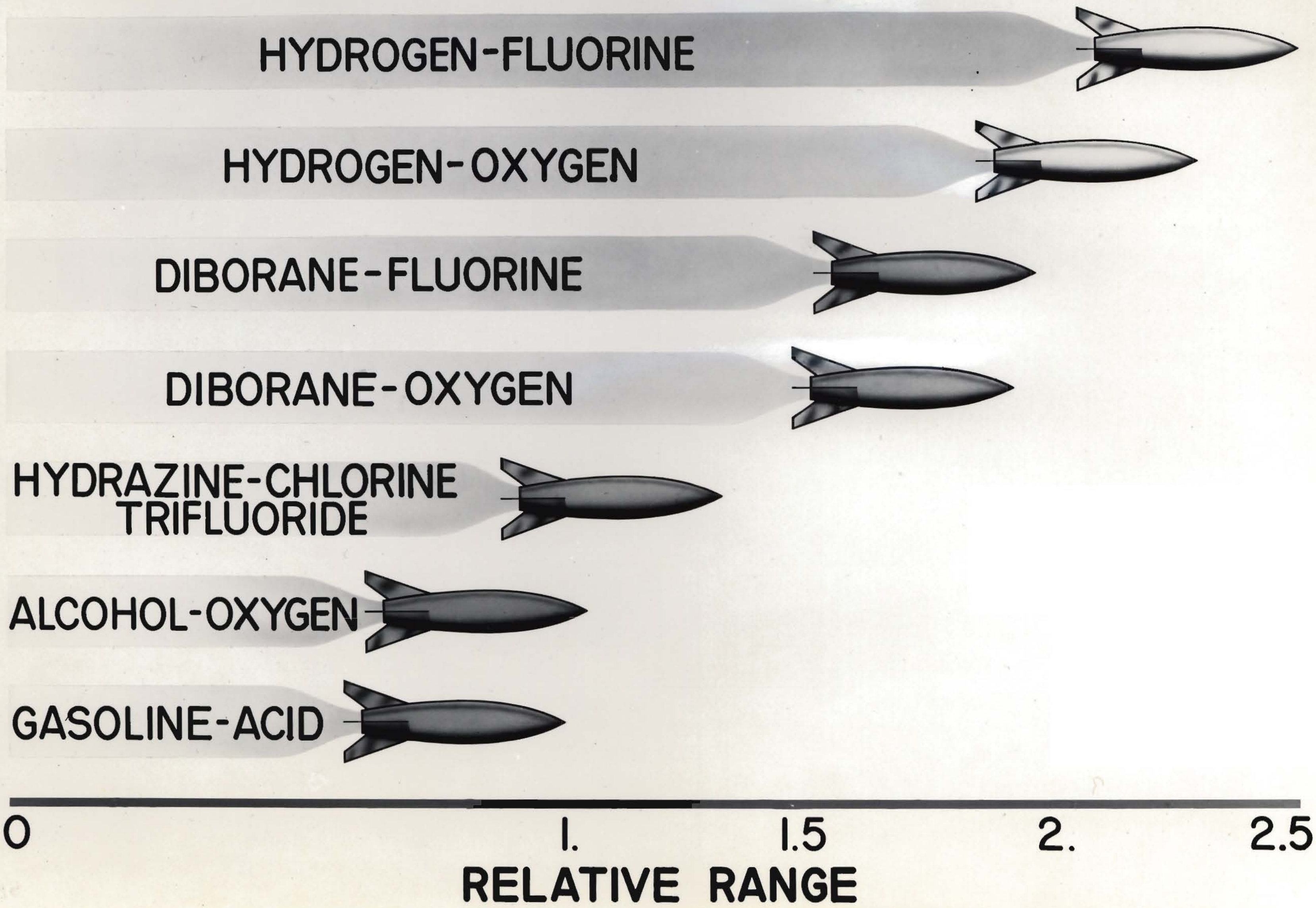
Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
PM_s, Tuesday,
September 20, 1949

Speed requires power. These artist's conceptions of three hypothetical models displayed at today's Inspection of the NACA's Lewis Flight Propulsion Laboratory show that an airplane flying at 1500 mph at 70,000 feet would need 15 times the power of an aircraft with the same weight, flying at 400 mph at 30,000 feet. An airplane flying at 1000 mph at 50,000 feet would require 5 times the power of the slower aircraft. If the 1500 mph and 1000 mph airplanes were to fly at 30,000 feet, even more power would be required.

Photo number C-24139

THEORETICAL RELATIVE BALLISTIC RANGE



NACA
C-24036
9-14-49

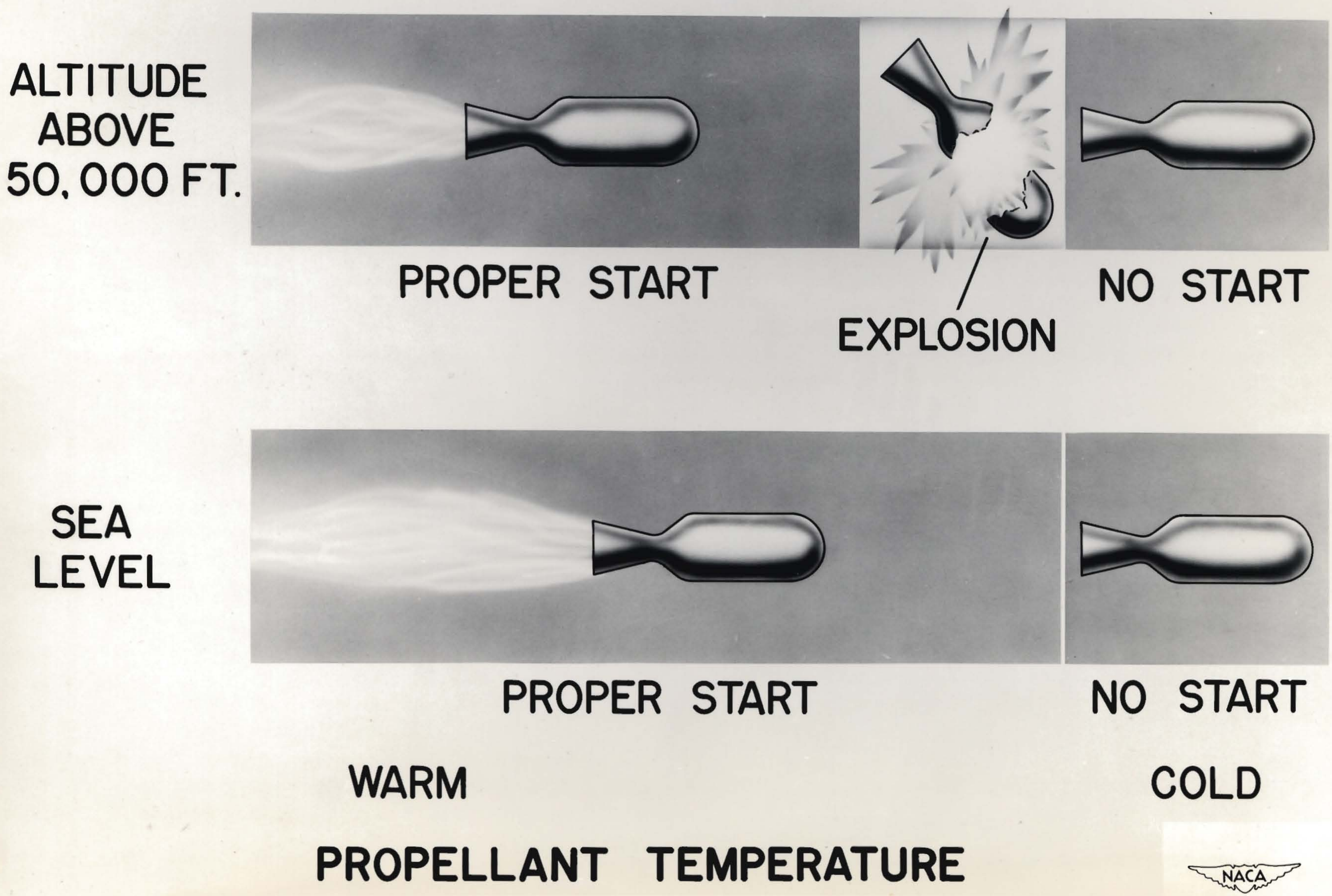
Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
AM_s, Wednesday,
September 21, 1949

Rocket fuels 2.5 times as powerful as the gasoline-acid and alcohol-oxygen mixtures now generally used are being studied by the Lewis Flight Propulsion Laboratory, it was disclosed at the Inspection of the NACA research center yesterday. This effort to secure the highest possible thrust from rocket engines, is being extended to include investigation of propellants with still higher energy potentials, it was said.

Photo number C-24036

ALTITUDE STARTING



NACA
C-24035
9.14.49

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
AMs, Wednesday,
September 21, 1949

Broadening use of rocket power plants at high altitudes and low temperatures has prompted research at the Lewis Flight Propulsion Laboratory on the problem of starting such engines under these conditions. Rocket fuels at high altitudes may refuse to ignite or explode destroying the engine. Two possible solutions, discussed at the Inspection of the NACA research center yesterday, are keeping the rocket engine and propellant warm enough to insure fast, safe starting, and use of additives to shorten the ignition lag.

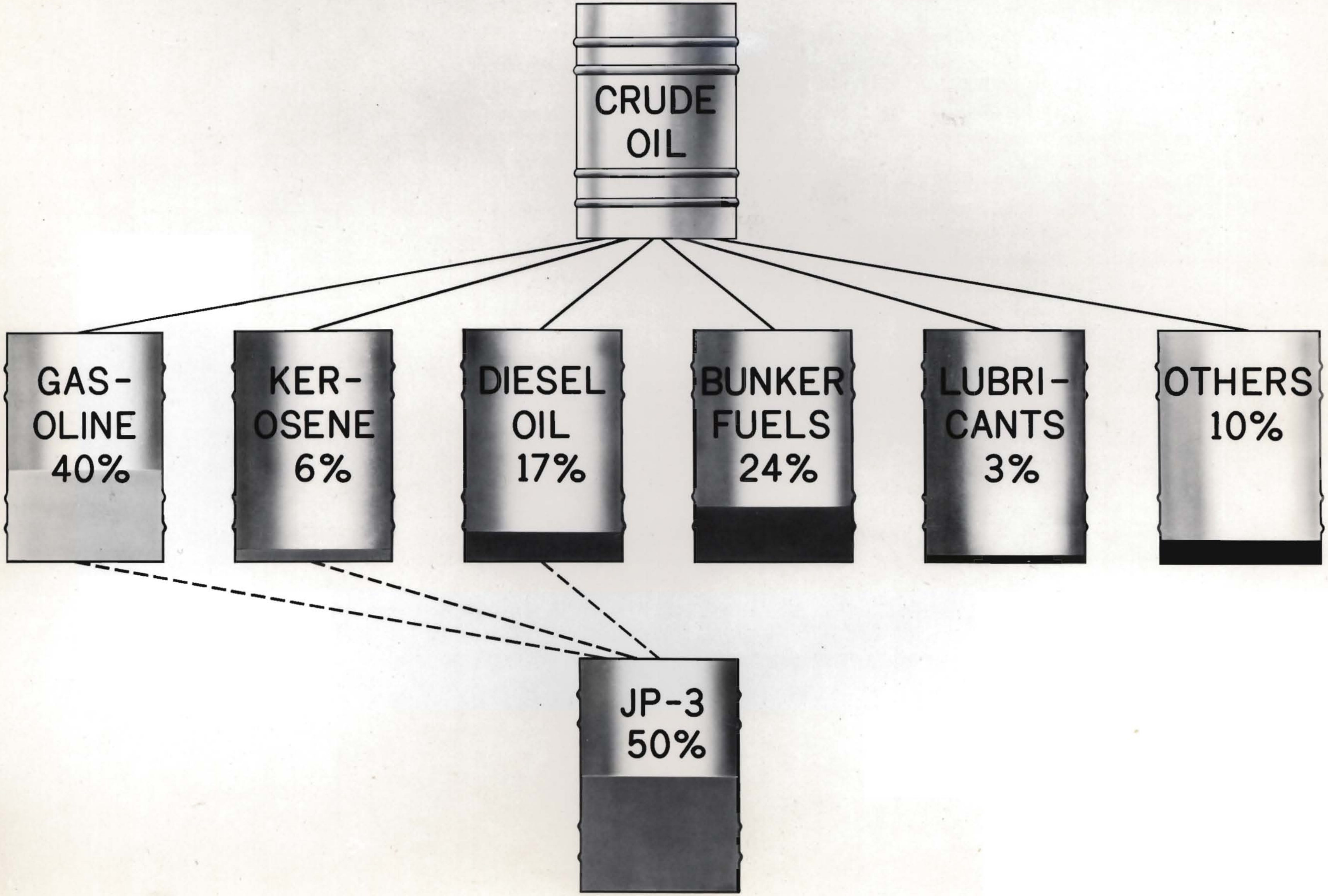
Photo number C-24035

Lewis Flight Propulsion Laboratory
National Advisory Committee for Aeronautics
Cleveland, Ohio

For Release: -
PMs, Wednesday,
September 21, 1949

Present jet engines burn either a kerosene-type fuel or, because of greater availability, gasoline. From a barrel of crude, only 6% kerosene is obtained, not enough to supply the large numbers of jet aircraft which would be operating in time of emergency. On the chart is shown the availability of the new JP-3 jet fuels, discussed at today's Inspection of the Lewis Flight Propulsion Laboratory, one of NACA's three research centers.

PRODUCTS FROM CRUDE OIL



NACA
C-24041
9.14.49