AIRLIFT IS KEY TO LOGISTICS ECONOMY

Air Force Reports Air Transportation Saved $9.8 Billion on High Value Items

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Military air transport, one of this nation's most strategic resources is, for the most part, an enigma to the general public and an absolute logistics requirement to the Army, Navy, and Air Force.

To the general public, military air transport simply implies fast and "luxurious" transportation of personnel from one base to another either here in the United States or to any of the military's far flung installations on the other side of the world.

While air transport may be considered luxurious in comparison to surface travel, the reason for increasing air transport of military personnel, reduced to its common denominator (excluding war emergency), is the cost factor. Civil air carriers, for example, under contract to the government to move personnel in excess of the military "space available" air transport, alone, in 1955 produced a net gain to the government of more than $900,000,000 in terms of per diem pay saved in rapid transport. The savings in man-hours productive time amounted to 20,165,301.

These are savings in time and money to reckoned with. Military air transport equivalents are not available but it is safe to say that they would be even more dramatic since they carry the bulk of personnel transported.

However, the savings effected in the air transport of military personnel is only a fractional part of military air logistics. For example, the Air Force determines that out of 725,000 inventory items, a scant 2% of them account for 40 per cent of the money value. At the same time, most of these high value items share some other common characteristic—low bulk weight, critical production lead time and susceptibility to damage in transit.

Airlifting these items, military experience has shown, provides a fast, safe, distribution system with an added premium of reducing a large inventory requirement for items in transit to, stored at, forward areas.

In this connection, the Air Force recently reported that airlifting high value cargo had already saved $9,000,000,000—a figure exceeding the total outlay for aircraft and missiles for all the armed services in the 1958 military budget. Thus, by concentrating on air transport of high dollar-value items, air logistics is more than pays for itself.

Military air transport has made a significant contribution to the peace.

(See TRUE GLOBAL, Page 7)
Turboprop Engines To Power Ship

Some time this Summer a strange looking ship should be making a test cruise in the coastal waters off the southeastern United States. The vessel—an ex-Liberty ship—will be propelled not by customary ship's engine, but by four aircraft turboprop engines mounted on 40 millimeter gun mounts placed in pairs fore and aft on the deck.

If all goes well, the ship, with all propellers generating 20,000 horsepower, will move majestically through the waves at a speed of eight knots.

This is "Project Dumbo," which got its start last January in the Navy's Bureau of Ships. Since aviation engineering was definitely involved, the Navy's Bureau of Aeronautics was also called in on Project Dumbo.

Representatives of aircraft engine and propeller companies also took part in the novel idea of propelling a seagoing vessel by aerial means.

The moral of the story is obvious. If you have a problem in propulsion, bring it to the aircraft industry, which probably knows more about propulsion than any other industry.

Air Quote

"By word and deed the Soviets are challenging us in aviation. They are building more aircraft than we. They are training more aeronautical engineers and scientists than we. Perhaps most significant, there are unmistakable indications that they are overtaking our greatest advantage and are closing the technological gap. Vigorous research and development programs are the key to technological supremacy. We must redouble our efforts to maintain our technological lead.

"We will never start a war. I am convinced that the Soviets will not start a premeditated all-out war until they are satisfied they have established technological superiority and believe they can win.

"What we do now will determine our deterrent power tomorrow. Every dollar spent on fundamental research and development to gain leadership in weapons technology today will, in the long run, save many more dollars and possibly many lives."—Dr. J. H. Doolittle, Chairman, National Advisory Committee for Aeronautics, February 21, 1957.
A NEW sound of air power progress will become more apparent as America opens its doors to the summer season, and more supersonic aircraft are delivered to the military services. This sound is the sonic boom — man-made thunder. It is one of the most widely misunderstood phenomena of high-speed flight, and has been blamed for damage that couldn’t have been inflicted by an atomic bomb.

The U.S. Air Force recently reported some initial findings of a study of sonic booms to find out how they are caused, the damage they can do and, even more important, the damage they cannot do. The study was made by scientists and structural engineers of the Wright Air Development Center, largely based on investigations of claims from citizens who thought, correctly in a few cases and incorrectly in most cases, that their homes had been damaged by the sonic boom.

The researchers found out many things, but it should be a matter of relief to the citizenry that the study proved the sonic boom, from usual operating altitudes:

**Cannot** crack foundation walls or pavement.  
**Cannot** crack plaster walls installed according to most building codes.  
**Cannot** cause roofs to buckle or crack.  
**Cannot** do any structural damage, but under some circumstances can damage glass panes and improperly installed doors.

There is nothing mysterious about the sonic boom. In fact, muleskinner in my state of Arizona once created booms of a minor variety when they cracked their whips over the teams. The tip of the whip actually exceeds the speed of sound and causes the characteristic sharp crack.

Basically, sound is wave lengths of various pressures hitting the ear, and they result from any surge of energy. The strong arm of
Shock waves created by aircraft flying faster than sound are roughly comparable to the waves created by a boat speeding through the water. The wavelets follow to nose of boat just as the shock waves do.
specially designated areas under close supervision. These regulations governing training missions are also applied by the aircraft industry in conducting test flights of new aircraft.

By simple arithmetic, the pressure produced by the usual sonic boom is less than one-twentieth the pressure required to cause structural damage to a flimsy structure. The behavior of homes and industrial buildings of brick, block and frame construction tested by nuclear explosions reveals that it takes pressure on the order of 150 to 300 pounds per square foot to cause damage ranging from plaster cracks to wall and roof cracks. The WADC engineers made a calculation study of a wood stud wall with a plaster inside surface. The walls were between eight and ten feet in height and constructed from 2 by 4 studs. Suppose we overlook the strength contributed by the sheathing, siding and plaster and assume that the stud takes all the load. On a single stud the load is about 67 pounds. The maximum tension in the stud at the middle is 200 pounds per square inch of stud.

Most building codes require that the stud be fastened to the plate by three 12-penny nails. These nails provide the shear resistance. The shear strength of the nails is about 300 pounds and the tensile strength of the wood is at least 1,000 pounds per square inch. Building authorities say that in order to prevent plaster cracks, the deflection at the middle of the beam should not exceed 1/360th of the span length.

As long as a ten-foot stud does not bend more than one-third of an inch at the middle from its normal position, the wall plaster will not crack. By calculation, the deflection of our wall stud under the heaviest load imposed by a sonic boom would be only 30 per cent of the deflection required to crack the plaster.

Calculations of this kind can be extended to various elements of the house—roofs, side walls and porches. The sonic boom falls far short of causing sufficient load to crack plaster, floors, roofs and walls. The force exerted by the boom is like a giant giving the whole house a very light and very quick touch. So far the structure has been discussed as if it had no openings. Now let's take a look at the windows and doors. The sash and frame of a window, of course, are more than strong enough to withstand the relatively minute force of the boom.

The window glass is another matter. Glass, in one sense, is a strong material, but it is brittle compared to other building materials when used in thin sheets. The methods by which it is manufactured are apt to produce internal “lock-up” stresses. In addition, the glass may be bent ever so slightly when it is installed. Thus a light, sharp blow can shatter a glass pane.

I do not want to imply that a sonic boom will always break windows. Ordinary window glass, properly installed, will break at pressures of 10 to 70 pounds per square foot, a much greater force than the boom produces. In fact, the Air Force, in a recent demonstration, directed sonic boom at a large plate of glass held in a frame. Five successive sonic booms failed to shatter the glass and only when the glass was loosened in its frame did the boom cause it to shatter.

Doors, with the exception of their glass area, are strong enough to resist boom forces. The weak points are the lock and hinges. If a lock is loose fitting, the impact of the boom may be sufficient to jar the opening and cause the door to slam against the wall. Under this condition, or if the door is slightly ajar, the hinges might pull loose or cause a split in the door jamb.

Bricks, plaster and mortar do not have any measurable ability to “creep” or move along its surface. When laid up into walls or ceilings, they also get locked up stresses which are caused by curing of the mortar or plaster, shrinkage due to the drying out of mortar or plaster and the effect of expansion and contraction between hot summer and cold winter temperatures.

These materials have very little “give” or resilience. They stand these force combinations indefinitely or fail after one or two seasonal cycles. If the boom forces were appropriate, brick, block or plaster stressed near the point of failure by a combination of locked up or seasonal forces might be overloaded; but since the boom force on a structural element is far less than a good stiff windstorm or, in most cases, less than that of a healthy boy jumping on the floor, it is difficult to see how a wall could remain poised just at the point of failure for any length of time without being tipped in or broken by other more frequent forces.

Ground vibrations are another matter subject to misunderstanding for very good reasons. For example, it was reported to the Air Force that structures were shaken violently and the ground was jumping up and down an inch or two when large aircraft flew overhead. Even the scientists sent to investigate the matter admitted to this feeling. Yet, measuring devices with the most sensitive...
instruments available indicated no movement, but slamming a screen door drove the measuring device completely off the scale.

The scientists found that we get false perceptions of movement because the sense organs in the skin only require pressures measured in a millionth part per square inch to cause a sensation of movement. It is difficult for anyone to believe there is no vibration, but the most exciting scientific tests have proven there is none.

The sonic boom will not cause ground vibrations that could damage basement walls, floors or concrete walks and driveways. Investigations of nuclear explosions which produce many times the pressure of a sonic boom show that there is very little effect on the ground near the point of impact or on pavements, pipes, or foundation footings.

The question then arises as to why structural damage is claimed after a sonic boom.

The Air Force has a dual responsibility on damage claims. It is the policy of the Air Force to make prompt payments for damage caused by its operations. At the same time, the Air Force has a tremendous obligation to the taxpayers to expend each dollar appropriated in a proper manner. The great bulk of the claims received are from people who are honestly convinced that the damage was caused by Air Force operations. The Air Force completely respects the right of the citizen to claim this damage, and a thorough investigation is made. But the scientific knowledge acquired by their investigations of what a sonic boom can do and cannot do must be considered in denying or approving the claim. This is evidence that cannot be ignored.

There are, of course, cases where the claims are patently ridiculous. During a recent demonstration, several sonic booms were deliberately made. One man's residence was located thirteen miles from the airport where the boom was directed. The atomic bombs dropped on Hiroshima and Nagasaki did not cause damage to Japanese residences beyond an eight-mile radius. This fact, however, didn't stop the owner from claiming damage from a sonic boom at almost twice the damage limit of an A-Bomb.

A man with two business establishments and a house located in a triangle seven, five and two-and-a-half miles apart, with the closest corner of the three buildings located four miles from the airport, promptly put in a claim for damage on all three buildings.

The Air Force, like all government agencies in a democracy, is highly responsive to the demands of the public it serves. Protests to the commanders of air bases across the nation and to the Pentagon are given prompt attention and remedial action is sought. In many cases, a simple fix is possible; in other cases, the Air Force cannot eliminate the cause of the protest without serious damage to operations.

It is difficult to readily identify the aircraft causing a sonic boom. This is due to the high altitudes where most supersonic operations are conducted, and a sonic boom created at high altitude may be heard 20 to 30 miles away from the path of the plane. Atmospheric conditions play a significant part in the propagation of these sound waves.

Although Air Defense Identification Zones are in existence, aircraft operating within them, once identified as friendly, receive no further attention. These zones are established to identify aircraft entering the zone from an outside point.

Absolute identification of the aircraft causing the sonic boom is further complicated by the fact that, except for certain required position reports en route, a jet aircraft may not be known to be in a designated area at a certain time.

The Air Force now has under consideration the development of an instrument that would automatically record the time, position and flight direction of a plane when it exceeds the speed of sound. Such an instrument will be vital in fixing the responsibility for any damage a boom may cause.

The noise created by turbojet engines is a thorny problem in the relations between the Air Force and the citizens of cities they defend. But the Air Force started an intensive program of public education on jet noise.

Community leaders were invited to the air bases for tours; they talked to the commanders and the pilots of the jet aircraft. Landing patterns were re-arranged so that the least inhabited areas were in the flight path. The Air Force explained that a jet taking off at two o'clock in the morning was not prompted by the desire of a pilot to get his flying time. An unidentified plane had been reported and the jet was ordered to make an interception.

Once these points were explained, the complaints on jet noise dropped. In fact, jet noise complaints apparently reached their peak last year and the Air Force estimates that fewer complaints will be received this year despite a growing number of aircraft entering service equipped with high-thrust jets. The noise of the jet planes still exists and will continue to exist for many years, but the annoyance has been lessened through public understanding.

Public appreciation of cause and effect, of necessities that far outweigh inconveniences is an invaluable national asset. Certainly we would not want to equip our Air Force with supersonic aircraft and then forbid the pilots to fly at these speeds. Pilots must know the performance capabilities of their aircraft if they are to be employed some day against the enemy.

The sonic boom is a new noise that we must accept as part of freedom's price.
and security of the free world. It was the means of winning the first battle of the cold war with Russia—the airlift—a saving of $8,900,000, or 83 percent, in cost of civilian live food, fuel, and medicine. Present air craft could not deliver the air cargo in time to save the situation.

Military air logistics became even more significant in the next scene of battle—Korea. The logistical airlift of forces, ammunition and supply, in the first year, far surpassed the Berlin record.

Today, the most pressing need for military air logistic operation is for a long-range transport that can provide real global mobility to the combat forces. Such a transport must be capable of flying non-stop from the United States to overseas areas avoiding the use of en route refueling bases. Non-stop routes are time-critical, where lives and lives are at stake—and bases of this type would be extremely vulnerable to enemy action in the event of war. While a number of transports have been designed primarily for military operations, examination of the present military air logistics fleet reveals that the bulk of the fleet is passenger-type aircraft. In the main these planes were built to meet commercial specifications and then modified to meet military necessity.

It requires eight and one-half years between the decision to build a modernized air logistics and the time when a new cargo and personnel carrier is delivered to the military services. Therefore, if this country does not step up modernization of its logistics transport fleet now, it will face a great need for a new airlift to meet military needs and strategy ten years from now.

A Senate Armed Services Subcommittee report to Congress put it this way: "The United States has insufficient airlift capacity to maintain mobility of the current U. S. Army and to enable the latter to meet overseas commitments, nor do plans include provisions for adequate airlift.

The Air Force now has a requirement for a new giant transport for which, unfortunately, it does not have the funds with which to put the plane into production. This completely modern transport could carry a payload of 100,000 pounds nearly 2,000 miles at 600 miles an hour. Such a plane could well be a base for a new era of air logistics for commercial aviation as well as in military air operations.

If an emergency arose and the Department of Defense found it necessary to move a single division of troops and their combat equipment 3,500 nautical miles, it would require 340 of our present air transports—four days—and a direct operating cost of $8,900,000 and do it. Present aircraft could not perform the mission at all if intermediate bases were not available.

The same mission could be accomplished by 130 of the 100,000-pound, 450-mile-an-hour transports for $6,000,000 saving of $2,900,000 plus ground maintenance for the fewer number of planes; fewer flight crews; faster mobilization; and savings in pay and housing.

Consider material: When supplies for overseas bases can be delivered in a few days (and it can take up to 100 days by ship), huge stocks of items which may never be used need not be warehoused at our outlying bases, but can be delivered from the zone of the interior on demand. Huge savings can thus be realized in inventories.

The modernized airlift, fully equipped divisions can be delivered in concentrated force overnight to any point around the world in a matter of hours from the zone of the interior. We will have tremendously more effective manpower with small- er, often smaller, and at greatly reduced cost.

In addition, the quicker supply of spare parts will keep a greater proportion of our equipment overseas combat-ready. Also, by decreasing the stockpiles of critical and expensive material at our bases, modernized airlift will eliminate the danger that surprise attacks would wipe out important segments of our military power.

The Air Force Budget, currently under Congressional scrutiny, could be augmented to enable it to continue plans to modernize its air transport services, so that it would be able to quadruple the productivity of logistic aircraft within the next three years. In three years, our capability to transport men and matériel throughout the world on intercontinental missions, measured on the basis of airlift, will be three times what it is today. The value of the weight of the cargo of a C-47 is now $800,000. The new 100,000-pound energy fuel plant is now under construction.

Versatile ‘Copter Takes Over Tugboat Job

To the helicopter’s long list of achievements in aviation history, another can now be added—its ability to operate as a flying tugboat.

In a recent series of tests off San Diego, conducted in cooperation with the U. S. Navy Amphibious Base, a military helicopter successfully demonstrated its capability of towing a large-sized landing craft and landing craft.

Here are some of the tests performed by the helicopter during the tests:

An LVT (Landing Vehicle, Tank) was deliberately immobilized on the beach, but the helicopter hugged it out of its sandy trap, into the water and onto a “safe” beach. A two-and-a-half ton amphibious “Duck” was pulled off shore with ease during a simulated invasion maneuver.

The helicopter maneuvered to shore and anchored a 200-foot pontoon causeway, then hauled an LCU (Landing Craft, Utility) laden with Caterpillar tractors and on and off a surf-washed beach. The whirling bird towed a 3,000-ton LST (Landing Ship, Tank) at five knots, about half the LST’s normal cruising speed. The ship was found to be more maneuverable under tow by helicopter than it is under its own power.

New High Energy Fuels Yield Greater Speed, Payload, Less Weight

Super high energy fuel for aircraft and missiles is being developed for the Navy by the Armour Research Foundation of Illinois Institute of Technology. A combination of boron, carbon and hydrogen, the new fuel is expected to extend the range of an aircraft, reduce the weight of its airplane, increase the payload and improve both speed and climb. It can also be effective in engines that burn hydrocarbon fuels, and it is expected to cut down on emissions.

Heavy Breathing Weighs Less These Days

A new type of personal oxygen system for crews of high altitude aircraft which weighs just a fraction of conventional oxygen systems, has been developed by the aircraft industry.

Liquid oxygen, the weight-saving innovation, represents the most compact method of storing and carrying oxygen, and results in a weight saving of approximately 75 per cent over systems using natural oxygen.

This system, which converts liquid oxygen to gaseous oxygen as the altitude or cabin pressure needs it, consists of a small insulated tank for the liquid oxygen surrounded by a coil of uninsulated tubing through which the liquid oxygen into the usable gaseous state.

The oxygen system is so compact that a single low pressure oxygen cylinders weighing only 55 pounds when filled, replaces eight high pressure oxygen cylinders weighing a total of 176 pounds.

AUSTRALIAN CIVIL AVIATION LEADER VISITS U. S. — Donald G. Anderson (center), Director General of Civil Aviation for Australia, conferred with Oral R. Cook, (left), President of the Aircraft Industries Association, and James T. Pyle, Civil Aeronautics Administrator. Mr. Anderson got a meeting of the Export Committee of AIA that Australia buys American-built aircraft because “we want to buy the best in aeronautical equipment and know the high quality of American workmanship.”

Boy from City Finds ‘Farmer’s Wings’

For the sly parent bent on giving junior a dose of painless instruction, we recommend The Farmer’s Wings, an exciting adventure story of a city boy who spends his summer vacation on a farm.

This is one of several booklets published by the National Aviation Education Council, a non-profit organization dedicated to increasing the student’s comprehension of aviation and its relation to the varied pursuits of American life.

The Farmer’s Wings opens a whole new world to any city child who thinks of the farm as a simple, rustic place comprised of tired horses to watering troughs, or an elemental dependence on chance for a successful crop. Children will share with Bob, the city boy who visits his country cousin, the thrilling revelation of modern farm life, and the integral part played by the plane in operating a large farm.

Every day is an aviation adventure for Bob, from the time he lands at the Wichita airport, where he is flown to the farm in his uncle’s ‘puddele jumpa,’ until he is back at school in Chicago, regaling his classmates with his summer experiences. These include: watching the process of aerial photography from the cockpit of the plane itself, observing aerial spraying and dusting first hand, and going “fence riding” with a modern cowboy, who flies along the fence to locate breaks in the wire, as well as stray cattle.

Richly illustrated with sketches and actual photographs, this four-color booklet for 10 to 14-year-olds may be obtained by sending 50 cents to the National Aviation Education Council, 2035 Connecticut Ave., N. W., Washington 6, D. C.
The straight wing is familiar in subsonic and supersonic aircraft but it is used in advanced flight for its structural simplicity. The swept wing moderates an increase when the heavy, nearly square wing compresses the waves of sound into shock waves.

**shape of flight**

Many things determine the performance of an airplane, but one of the most important is the shape of the wing or airfoil. This is why the shape of the wing of a bird or an airplane has always been the subject of intensive research and development by the aircraft industry. A wing design that produces lift efficiently at low speed might be incapable of lifting supersonic speed, so aerodynamicists are constantly seeking the compromises necessary to satisfy the requirements of widely varying speeds. The objective is to produce designs that attain maximum lift, low drag, and good performance over a wide range of speeds. For low landing speeds and high crossing, at the same time, for top speeds into the supersonic for military tactical operations.

One condition must be present for the wing to produce lift. The air pressure above the wing must be less than the pressure below it. The result of the difference between upper and lower pressures is the upward force of lift. Threats produced by the engine or propeller moves the wing forward to produce enough difference in pressure to equal or exceed the weight of the plane.

Because of the exciting requirements of shape and size, the search for new aircraft designs involves huge expenditures for wind tunnels and other laboratory devices for computers to solve elaborate problems of mathematics, for staffs of scientists, engineers and technicians, and finally for prototypes of the aircraft for flight testing.

The aircraft industry, working in close cooperation with such basic research agencies as the National Advisory Committee for Aeronautics, has met the challenge of supersonic flight, and is now preparing greater advances for the air world of tomorrow--a world that will see speeds for above the supersonic and altitudes well beyond the limits of the earth's atmosphere.

Aviation's history has been written in the characteristic shapes of aerodynamics. Shown here are some notable shapes of past and present, including the first powered airplane, the shapes for transonic and supersonic flight, and one shape being investigated for flight faster than five times the speed of sound--more than 5000 miles an hour.

Supersonic flight has created the need for extremely thin wings. Some of the newest American aircraft have wings comparatively as thin as razor blades. The progress toward thin wings has introduced a host of problems for designers and manufacturers. Extremely thin wings usually are milled from solid pieces of metal to provide great strength. The tremendous power of modern turbojet and rocket engines has made supersonic and hypersonic flight possible. This power brought about the demand for new airfoils, new shapes of flight.

Now under are the powered more closely study speeds in the range for rocket or more as capable of speed of the far supersonic zone. If this is the case, the times the mile set by the boys who managed the glider would be built by school, it would be built by school, the limits of the earth's atmosphere, and the speeds of the supersonic and hypersonic conventional airplane.