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MAJOR IMPROVEMENTS IN AIR FORCE SUPPLY MANAGEMENT

10 December 1956

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Major General Mark E. Bradley, Jr., USAF, Assistant Deputy Chief of Staff, Materiel, Office, Deputy Chief of Staff, Materiel, U. S. Air Force, was born in Clemson, S. C. on 10 December 1907. Graduating from the U. S. Military Academy in June 1930, he was commissioned a second lieutenant of Field Artillery and then entered flying school for one year. His initial assignment as an Air Corps officer was with the First Pursuit Group at Selfridge Field, Michigan. Upon graduation from the Air Corps Technical School in 1934, he was assigned to the 18th Pursuit Group at Hawaii. He entered the Engineering School at Wright Field in 1936, and after graduation was assigned duty in the Flight Test Section as a Test Pilot. He was appointed a project officer in the Pursuit Branch in January 1940; named Chief of the Fighter Branch in 1943, and in September 1944 assigned duty as Chief of the Flight Section. His overseas duty included assignment as Deputy Commander of the First Tactical Air Force Service Command (January 1945), assignment to the Intelligence Section of the U. S. Strategic Air Forces in Europe, and a tour in Japan as Deputy Chief of Staff of the Fifth Air Force. In December 1946, he became an instructor at the Armed Forces Staff College. Joining the Air Materiel Command, in April 1948, he was assigned duty in the Office of the Director of Procurement and Industrial Planning at AMC Headquarters. In December 1951, he was named Director of Procurement and Production, AMC. In April 1953, he transferred overseas and became Assistant Chief of Staff for Materiel, U. S. Air Force in Europe (USAFE), and later Deputy Commander-in-Chief, USAFE. General Bradley assumed his present position 10 July 1956.

MAJOR IMPROVEMENTS IN AIR FORCE SUPPLY MANAGEMENT

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GENERAL CALHOUN: So far in our studies of material management we have examined the Army supply system in some depth. Today we look at the Air Force.

The Air Force supply system is of particular interest to us, because of the rapid obsolescence and high cost. Then, too, the distribution problem is magnified substantially because of the widespread alignment of Air Force units worldwide.

We are fortunate in having with us today the Assistant Deputy Chief of Staff, Materiel, of the Air Force, who will speak to us on the subject "Major Improvements in Air Force Supply Management." It is a privilege to welcome to the college and to present to this class Major General Mark Bradley, United States Air Force.

GENERAL BRADLEY: General Hollis, General Calhoun, members of the Industrial College, and guests: It is a pleasure for me to be here today. Today is a rather unique day. This speech coincides with a very important milestone in my own personal career. So if any of you up on the top row should get fed up with what I am passing out down here and feel that you would like to say: "What do you think this is, your birthday?", you're right. It is.

I have been asked to talk to you about major improvements in the Air Force supply system. I am going to broaden the subject just slightly and talk about major improvements in our logistic system, because to me the details of improvements in supply systems are the most boring things in the world. I want to stick to the big part of this and not get down into those nuts and bolts. As a matter of fact, I don't understand them very well anyway.

You all know as well as I that this modern situation that we are living in, with its new developments in weapons, supersonic speeds, the development of missiles, of nuclear power and nuclear warheads, and electronic means of communicating--all of these things have required that we do something about our logistic system. We simply have to find better ways to get needed materials to the man that needs them, and get them there faster. To do this the Air Force has attacked the problem in three simple ways.

First, we have decided that we must get the message to the place that can furnish the material by the fastest means possible. That, of course, means by electronic transmission--not by mail, no matter what kind of mail. Second, we have decided that we must take the article back to the man by the fastest means possible, especially if this article is of high value or is badly needed. Third, we have decided very definitely that we have to mechanize the operation of our depots, so that the paperwork can be carried out quickly and not be the bottleneck in the whole system.

Our objective is to provide a logistic system that will permit our combat aircraft to be combat-ready twenty-four hours a day. We have to do that, because of the present system under which war might start.

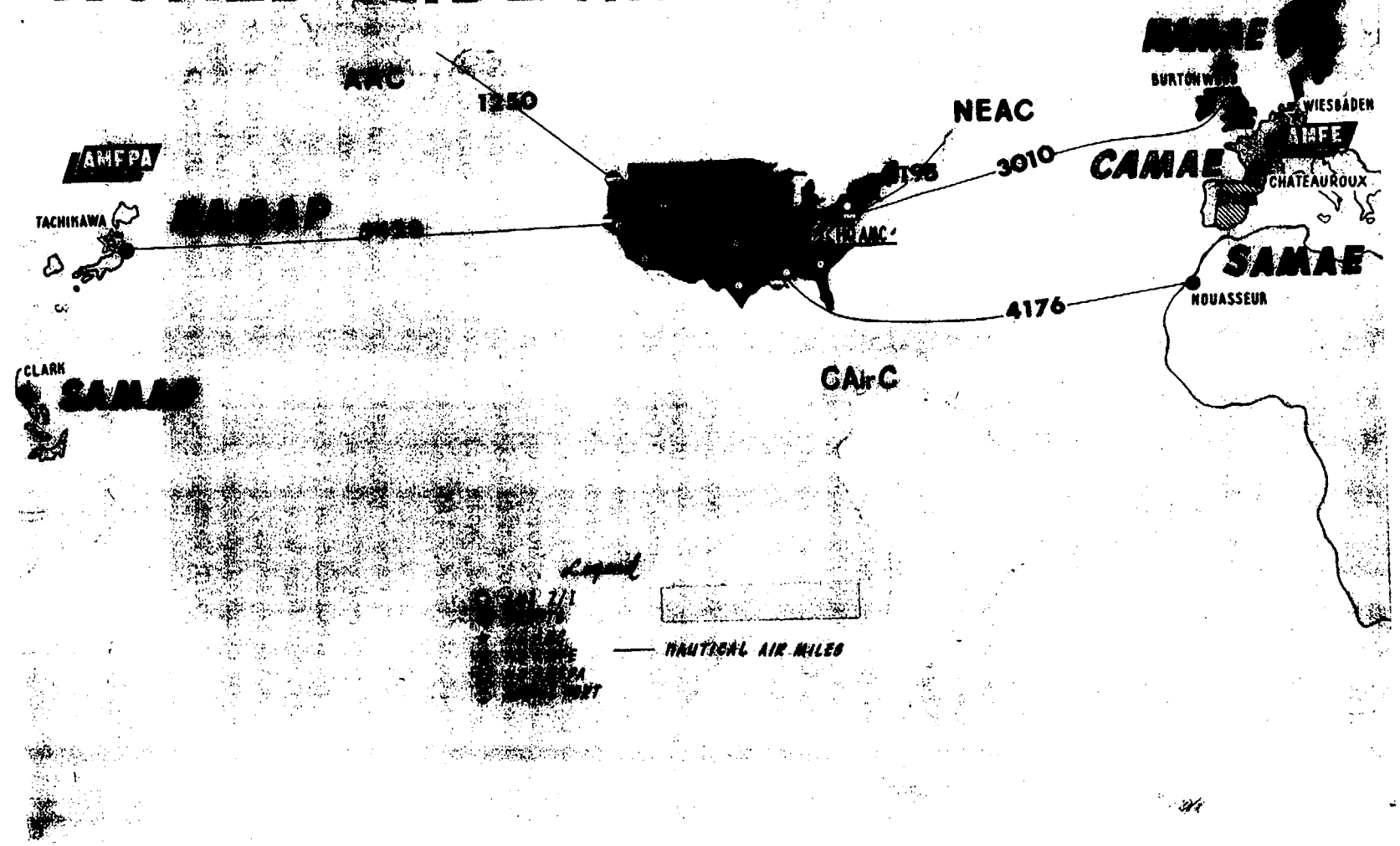
So I propose to cover today five general subjects in order to try to explain this thing to you broadly. First, the Air Force organization for logistic support; second, what the Air Force is trying to do to compress the resupply cycle; third, our new methods of supporting combat units overseas; fourth, what we are doing to lick the maintenance problem--that ties in with supply, of course, because you have to have the supplies there in order to do the maintenance--and, fifth, a few additional problems that we foresee either now or in the future due to our more distant developments.

I am sure you all recognize that the Air Force is not alone in these logistic problems. You all have them--Army, Navy, Air Force, and Marines. We all have much more complicated technical equipment today, and it costs so much money that it is absolutely essential that we get the necessary parts to it in a hurry in order to keep it working. We can't have so many of these things sitting around that we can afford to have half of them out of commission.

Chart 1, page 3.--The first thing I am going to do is outline the Air Force organization for logistic support. As you probably know, the Air Force does not have a number of logistic agencies. We have only one--the Air Materiel Command. The headquarters of the Air Materiel Command are located at Dayton, Ohio, at Wright-Patterson Air Force Base. It contains 15 Zone of Interior depots, and 5 overseas depots. We show on this map the 15 depots in the continental United States; the three depots in England, France, and North Africa; and two in the Far East.

CHART 1

WORLD-WIDE AIR DEPOT COMPLEX



This depot system furnishes the necessary logistic support for the entire Air Force. These 15 depots in the States are all coequal in supply activity. They all have the responsibility for figuring requirements, for procurement, and for distribution worldwide. Eight of these fifteen depots have other responsibilities. They are called AMA's, or Air Materiel Area Commands. These eight area commands have large overhaul capability for engines, aircraft, and accessories. They also furnish technical assistance in the area in which they are situated for the tactical units therein.

The system that we are talking about is divided into two parts: the Eastern and the Western Zones. This is done for a number of reasons. In the first place the depots in the Western Zone and the Eastern Zone have, with certain exceptions, duplicate supplies. So we do have some dispersal of our supply system. The depots in the Western Zone, to the west of the Mississippi, are charged with support of all the bases in the Western part of the United States, as well as furnishing support to the forces in Hawaii, Alaska, and the Far East. The Eastern Zone furnishes support to the Eastern bases in the United States and to Europe, North Africa, and the Caribbean area.

About four years ago it became quite evident that the job that AMC had to do, the headquarters particularly, was too great for one centralized activity. General Motors, General Electric, and a number of other corporations have recognized this problem. So while we decided to leave AMC in charge of this logistic organization, it became necessary to decentralize a sizable amount of the responsibility and authority over the program. This was done by picking out certain depots and giving them complete responsibility for certain commodities, with only control and management being retained at headquarters, AMC.

In the same way, certain depots were made the primary depot and control point for specific weapon systems. For instance, the B-47 aircraft has its complete weapon system control at Oklahoma City. In this way headquarters AMC manages the overall system, sets up controls, and checks on compliance and progress, but the depot commander at Oklahoma City is actually responsible for the support, both technically and supplywise, of the B-47 weapon system.

This way I think we are going to get more out of our resources and be able to manage even a bigger job than we have in the past with

not many more people. There have been some growing pains in this kind of program, I am sure you recognize. Those of you who have been in it know this. One of the biggest things, of course, was the fact that when you decentralize these things, the number of people that were able to do the job at Dayton can't be spread over all these various places. So you have some training to do. It has been in effect now about four years, and I think they are beginning to see some dividends.

Another change that has taken place in our logistic organization was the placing of the depot systems overseas under the Air Materiel Command. Up until last year these five depots were under the theater commander. The theater commander actually operated them, with only technical control from the Air Materiel Command. However, the shape of modern warfare and its impact on the way the job has to be done all over the world, the fact that we were finding out that our supply system resulted in large stacks of stuff overseas with never quite the right balance that we needed there, made us decide that maybe this wasn't the right thing.

So last fall, after considerable study, the depots in the Far East were put under the AMC in October. Then in January the depots in Europe were put under AMC. This gives them capability for worldwide inventory control, for worldwide generation of consumption data, better programming worldwide, a quick capability to shift resources worldwide in case we are short in one area and over in another, and, finally, a capability to reduce the size and extent of these overseas depots. More about that later.

Again, this change was not accomplished without considerable debate, and I happened to be right in the middle of it. But now I think it is settled, and it looks like the theater commanders and AMC are getting together and that we are going to have a good operation.

Several years ago there was a study made by the Air Force called "Logistics for '56." Time has overtaken this study, because, as you know, 1956 is almost over. But actually, Logistics for '56 was to try to take a forward look at logistics operation systems and see what was to be done about them in order to meet the current requirements.

This study came up with a survey of our supply cycle from the time a man put in for an item until it got back to him, and concluded

that the rate of progress in obtaining this item was 3.5 miles per hour. This was the average rate throughout the Air Force of obtaining a needed article--3.5 miles an hour. It has been my experience that some of those boys didn't look at all of the data. I have seen some take a lot longer.

But in any case, even if we accept 3.5 miles an hour as being the average, we have airplanes flying today at 1400 miles an hour. We have transports that are going to be flying at five and six hundred miles an hour, and which are actually flying that fast now. We can't support a system with that 3.5 mile pace. That pace was just a little bit faster than it probably could have been done right after the War Between the States; and you know I say "War Between the States" advisedly.

That is what the Air Force started to work on--to cut down its resupply pipeline time. The first step was to put in a transceiver network.

Chart 2, page 7.--This chart shows the system of the transceiver network in the United States and leading overseas. The brown lines indicate the network now in place and operational. The blue or green lines indicate the system which will be in effect by the end of the fiscal year 1958.

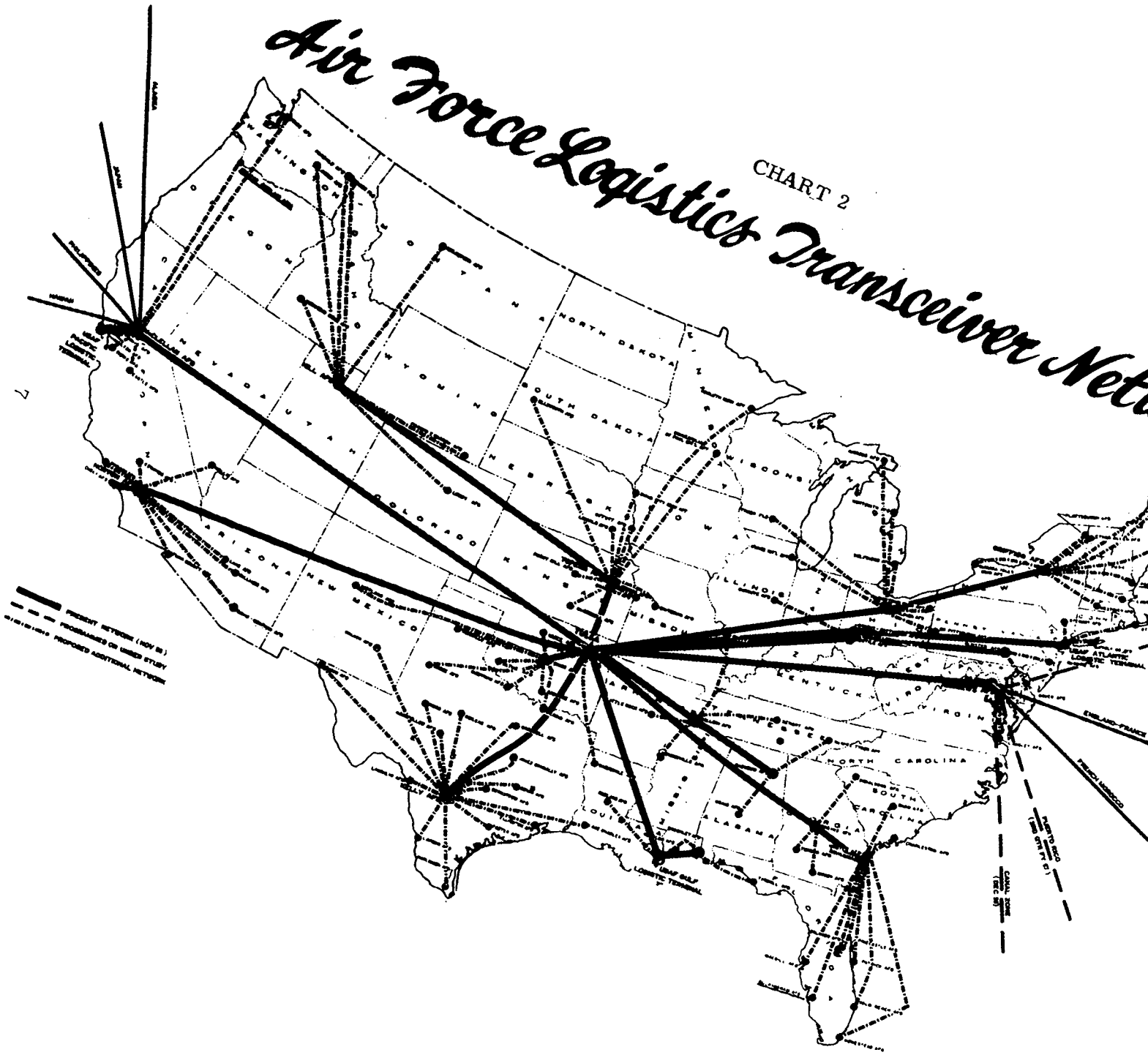
Maybe I should define a transceiver. This is a very fancy new name. I notice since I got back from overseas that we have a lot of new names for things, but they are not really any different than things were before. This particular one is simply a machine that goes on the end of either a radio line or a wire line, phone or telegraph. You put a punchcard in the machine at one end and it makes the same punchcard at the other end. It also checks this punchcard at the time it receives it, so it doublechecks it to be sure it has the right data.

This is a simple way to send requisitions. That is what this system is for--primarily to submit requisitions; so that all of our outlying stations can type out a card, put it in the machine, send it over to wherever it has to go, and it will be there in a matter of minutes.

This present system now in effect, as you can see, all ties into one point at Tulsa, Oklahoma. In the same way there is a gateway

Air Force Logistics Transceiver Netw

CHART 2



at McClellan Field in California and one at Andrews here in the East to the overseas area. Neither the overseas, nor, as you can see, the continental, is complete yet; but it is expected to be complete within about a year.

A typical example of the operation of this sort of system is this: We actually ran a test and in eleven minutes from the time that a requisition was punched out, it was in the Zone of Interior depot. Two hours later the items were on an airplane going back to the aerial port of embarkation. Now, if we can get airplanes that run all the way, not just to the aerial port of embarkation but a system that allows airlift direct from the depot to the user, we can cut the time down still further.

This system can also furnish supply extractions between depots. In other words, it can pass a requisition to another depot. It can advise as to advance information on shipments to depots, can check the status of something that has been ordered previously, can give stock balance and consumption reports, and can forward Federal Catalog changes. Things of this nature are ideally suited for this message-passing system. Of course you can see how much time this would save.

This system is still under development. It looks like it will cost about 1.5 million dollars a year to operate it. That is pretty expensive, but right today our experience indicates that it has cut the pipeline time by from ten to eleven days; and our estimates are that each day of pipeline time is worth about two million dollars. So that it is going to pay for itself very rapidly.

We have now been able to process the requisition to the depot, and the depot has run out of being able to do it expeditiously. The method of processing paperwork by hand has gone down the drain. So we are trying to put in an electronic data-processing system to get these items out of the depots.

These computers are very expensive, big machines. We can't afford to have a complete computer system at all depots. The plan is to set up some electronic data-processing centers, several throughout the United States. These centers would be assigned item responsibility for particular items. All the data on stock control, stock levels, reorder points--everything the depot needs to know or the customer needs to know about that item--would be maintained on

cards in these data-processing centers. Whenever a depot wanted an item, it would simply ask for the information from the processing center.

These things are actually not in operation yet, but certain of our depots do have a sizable amount of their data-processing mechanized.

These things will still require trained people. They will require good input. I hope that all of you who go out to work on such a system will recognize this, because it has been my experience in the past that we have a tendency to put in these machines and think they are going to do our thinking for us. I assure you that they won't think one particle.

Now, we have gotten the requisition into the depot, we have it filled, and we want to get it back. In the past, airlift was used mainly to overcome mistakes in planning and for emergencies or supply breakdowns. Somebody ran out of something completely and we had to get it to him in a hurry, so we used airlift. But more and more in the past few years airlift is becoming the method for shipping high-priority cargo.

It was my privilege over the past several years to be in Europe and to take part in setting up an airlift system over there. General Tunner, of whom you have all heard, the Berlin airlift man, is a very airlift-minded person. He recognized immediately the need for air distribution in Europe. We were having pipeline trouble just like these data indicate. It was worse actually than 3.5 miles an hour.

We had three wings of troop-carrier aircraft over there. One of his jobs was the delivery of supplies and material to battle, and the other was dropping troops when necessary. Instead of boring holes in the air practicing this navigation, General Tunner determined that he would use these airplanes to deliver the cargo and carry it out throughout the theater. He set up a regular airline system over there for both passengers and materiel. After three years of operation, last year they carried 70,000 passengers and 50,000 tons of cargo. They run on regular schedule. About 25 C-119's, plus about 15 to 20 C-54's and C-47's were in this operation every day.

This operation reduces the vulnerability of the whole theater by requiring less stockpiles. It gets the stuff, after it gets over there

via MATS, in a hurry to the man that needs it. We do have some problems, because we are constantly having alerts and all kinds of emergency operations, like the Hungarian problem and the snow in Italy last winter. All these things require some emergency assignment of airlift, and in those cases we have a little problem keeping our supply system going. However, so far we have been able to do it and do a better job than we were doing before.

But back to shipping our supplies from the United States by air. For instance, about four years ago the pipeline time for surface movement of aircraft engines overseas was 212 days. The present pipeline based on airlift ranges from 88 to 116 days, depending on the location. That is still too long, but that is what we are betting on right now. Engines cost up to $250,000 apiece. At that price it is easy to see how some saving in pipeline requirements can pay for this airlift operation.

We also computed the engine requirements for the fiscal year 1957 program in two ways. We computed them one way for airlift and one way for regular surface lift. We needed to spend 622 million dollars for surface lift and 490 million dollars for airlift. After subtracting the difference between surface and airlift, we came up with a 109 million dollar profit or saving by using airlift as a standard method of distribution.

We also reviewed procurement of the J-57 jet engine, which is the biggest part of our jet engine program at the present time. It is used on the B-52, the KC-135 (the tanker for the B-52), in the F-100, the F-101, and the F-102. That's a lot of engines. We found that had we computed requirements on the basis of surface movement according to the old rule, we would have had to buy 2,610 more engines than we did. So we are not talking about peanuts.

We don't, of course, limit our airlift to engines alone. They are one of the most expensive items we have, but there are other high-cost items in the Air Force inventory as well, and we also airlift those. Right now we are in the midst of a program--and we are going to ask the other services to join us--of trying to see that we do airlift only these high-cost and high-value items. Our airlift system has a tendency to get bogged down, because all of us put things in there that shouldn't be in there.

Now, how do we do this airlifting? As you all know, we have MATS. It works for all four services. MATS' capability has almost

doubled in the last two years and still they are constantly short on airlift. They have increased their capability from 600 million ton-miles in 1954 to over a thousand million ton-miles in 1956. This has been done with only a 5 percent increase in the number of aircraft.

The main reason for this is that we replaced the C-54 with the modern C-124, C-121, and C-118. If we could get the money and get the airplanes produced, we could replace our lower-priority or more obsolescent types of transport with jets. Then, if we could get one quarter of the number, we could do the job for one half the cost. That is simply a matter of arithmetic--lower the ton-mile cost due to speed, lack of having to stop, and so on. I don't know when we will get the money, though.

The ton-mile costs are decreasing, however. While they are still high and out of proportion to the cost of surface transport, airlift still pays in these high-cost items. In 1954 the average ton-mile cost was 40 cents by air in MATS. In 1956 it had dropped to 27 cents. The C-124, the big Globemaster, is one of the more efficient of our cargo carriers, and its cost is 21 cents a ton-mile. The C-132, which is this big Douglas turboprop transport that is now on the drawing board and being started, would cost only 9 cents per ton-mile. Compare these with about one cent per ton-mile average cost for sea transport and you can see we still have quite a way to go.

The next subject is our overseas unit support. We found that the old method of supporting our overseas units simply didn't work. We have tactical units stationed overseas in Europe and the Far East, and we have units from the Strategic Air Command being rotated overseas. The old method for supporting these Strategic Air Command rotational units was to have the unit take with it a flyaway kit. That was a kit of parts, the most critical items, calculated to last about 30 days. Then the Air Materiel Command would draw up a table of supply that was supposed to be a backup table. The stuff in that table either had to go with the unit or else it didn't do them any good. But it was bulky. A lot of the things in it were never used. So the system simply didn't work. The unit went over, tried to live out of its flyaway kit, used it up, and got some help out of the overseas depots, but generally not enough.

So a couple of years ago they came up with a system called "Volume 16." Volume 16 support is simply electronic requisitioning, by

either transceiver or message, and then air delivery. A unit takes with it a flyaway kit; and as soon as it gets in place, starts reporting consumption by air to a control point established by AMC in the States. This control point has all of the parts necessary to support this particular airplane assembled at various places, and ships them out by air immediately to support this unit.

It worked so well for our first units that a couple of years ago we asked for it to be applied to some of our newer types coming over to Europe permanently. The F-100 and the F-84-F have both had their supply flown over to them in the last year. That is a total of over 500 airplanes over there. And the AOCP (aircraft out of commission for parts) rate, instead of being 15 to 20, as it used to be when we got a new type in the theater, has run 4 to 5 percent. So this thing definitely pays off, and it is a part of the system which I have previously explained.

One more word on this. This Volume 16 seems to me to spell pretty much a death knell for overseas depots, because if we can support them as well as we are now, and if we can spread this system over the entire overseas areas, we can gradually pull these overseas depots down and do away with them. About the only thing they will be carrying now is very bulky stuff, and there is no reason that I can see why that can't be stored at ports or on bases. It will take a long time, of course, but that is going to be the Air Force objective.

We have been working considerably on inventory control. I am not going to go into these items in detail, because I understand that General Baker is going to talk about this a little later. He is in charge of procurement and production out at AMC. But there are two things that are being done in this area that will limit inventory. One is to expand local purchase, and the second is the high-value item control system.

Local purchase expansion is self-explanatory. By increasing the number of items coded for local purchase, we can eliminate that many items from the supply system. People will buy them wherever they happen to be located. They will use the distribution system that is furnished by the manufacturer or the people that handle these items. The Air Force has coded over a hundred thousand items out of the supply system and into local purchase over the last five years. This reduces the stockpiles that you have to keep in depots and cuts down all the necessary transportation, eliminates duplicate ordering, and in general is a cheaper way of doing the thing.

There are some little problems that come up. There are a lot of places that Air Force units are stationed where local purchases cannot be made. I must admit that some of the people that set this thing up didn't seem to think about that. So we have had to set up some special arrangements for people like those in North Africa or Saudi Arabia for their local purchase, because the possibility of local purchase there is negligible.

On high-value items we found that it is a very simple thing to spend too much time on shoelaces and things like the sailmaker's palm and not enough time on knowing where our engines are. I say "sailmaker's palm" advisedly, because I remember the first supply system I took over was a squadron supply of a pursuit squadron at Selfridge Field. We had a little supply room there and I was designated supply officer. So I got my list out and checked it. One of the items that was in there the whole two years I had this supply was this sailmaker's palm. I had never heard of such a thing before, but I finally found it and looked at it. It was just a little gadget that fits over your hand and has a little leather thing in the middle that you use to push a needle through some heavy canvas. This was what they used, I suppose, at some stage of the game in covering wings and tail surfaces. I don't think that thing was ever used, but it was carried and accounted for just the same as the Wasp engines in the airplanes. It took just as much paperwork to keep track of it as it did the Wasp engine. Well, that was sort of a ridiculous situation, but it didn't seem to change much over the years until people started talking more about the thing and got to work on it.

But now we definitely are working out two systems. One of the things we have done about it is to set up a country store type of operation on our various bases, where a man can go and find all the supplies laid out like a ten cent store. He just fills out a little slip, signs it, and walks out with the stuff without any other paperwork. It's working out very much better.

I said I was going to talk a little bit about maintenance, because maintenance has such a close tie-in with supply. It seemed to me that it took us much too long to wake up to the maintenance problem. I can remember seeing some German equipment during the war--a radio compass or something out of one of their aircraft. It had a plug-in on it for external testing. It also had a little dial which turned to four or five different places. If you got a red light at any one of those, it meant that that particular little cell of this gadget was not working.

To me that made a lot of sense. The Germans had worked that thing out so that his boys who didn't know electronics from anything else could go there, stick this tester on this thing, and turn the dial. If everything worked, fine. If it didn't, he would pick out a box that showed red, see that it was marked number two, get a number two and put it in there, and that's all he had to do. We are finally getting some things about like that now, and the Germans must have designed that about 1933. So I don't think we should be too complacent about what we have done in this area. We are working on this design for maintenance.

We have a large modification and modernization program on aircraft. The bigger the aircraft gets and the more complicated, the more these things cost. We have to go ahead with the safety modifications, of course, and we do. But we have recently instituted a system of grouping the other modifications, such as increases in performance or a change that would make the aircraft a little nicer or a little easier to handle, and consolidating those into a batch. We look at them about once a year to see whether in view of the total cost of this thing it is worthwhile to modify it, or whether we ought to think about buying another one instead of wasting a lot of money on this old horse. We have some old horses around too, and we still seem to have to fix them; but we are setting up a system whereby we don't put more money into one of these things than it is worth.

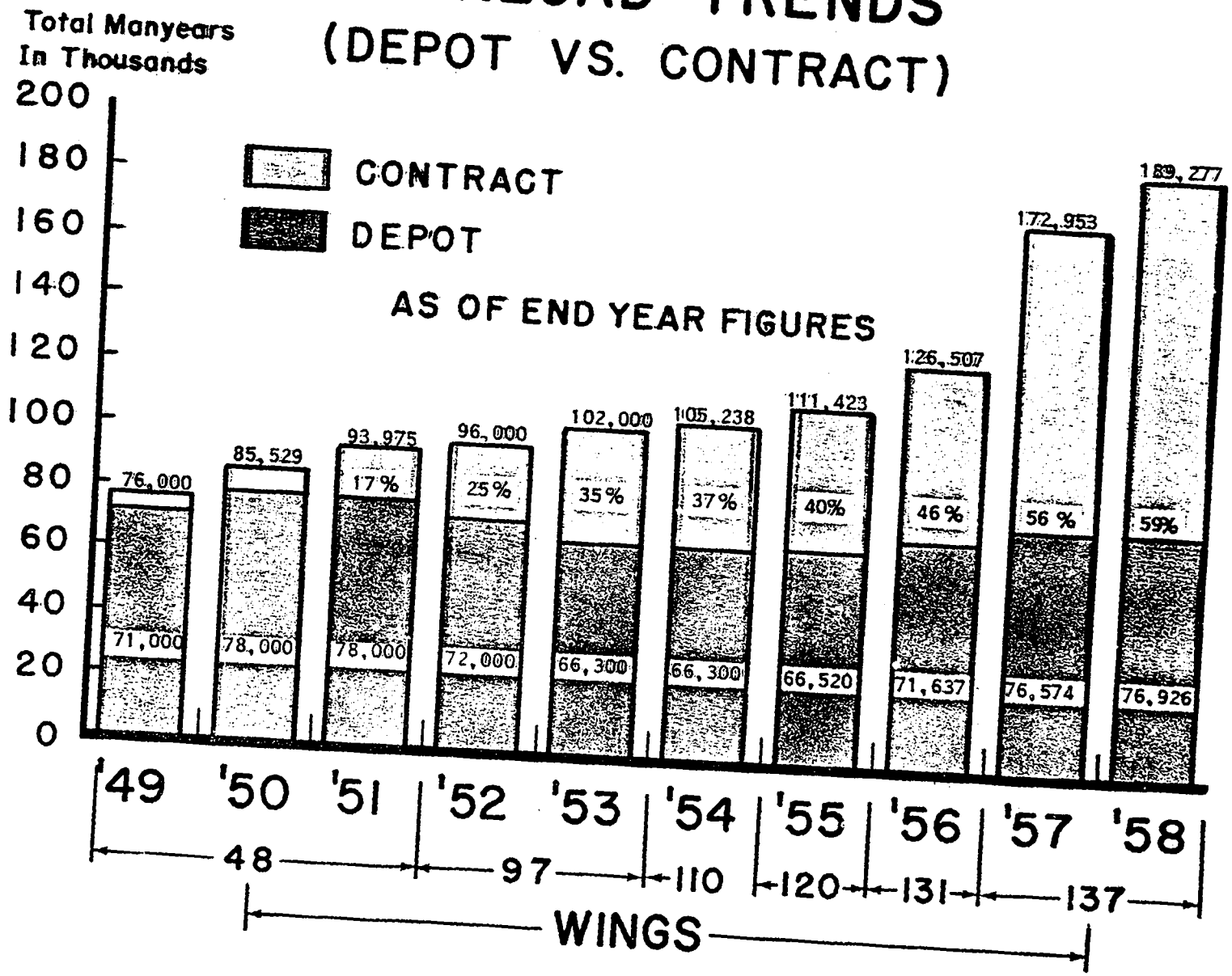
Chart 3, page 15.--This is just an information item. It shows you the extent that we have gone into contract maintenance. This is the overhaul and modification of aircraft engines and accessories. As you can see, by fiscal year 1958 we are going to be doing about 60 percent of it by contract.

We find this to be a very satisfactory method of doing this maintenance, because it keeps Uncle Sam from having to put up too big a capital investment. It also furnishes some necessary work to many of our contractors who are in a somewhat lean procurement period. It has some flexibility. If we had to, we could put a little more into the depots. But in general we like this system.

It also provides us with a system whereby we can aim at having the depots do the quick type of modification to the combat aircraft. In other words, say that a B-47 needs certain particular fast modifications in a hurry. To keep from having too many of them out of commission at a time, we would like to do that in a depot. We would like

CHART 3

WORKLOAD TRENDS
(DEPOT VS. CONTRACT)



to save the contract work for the long-run production-line type of thing, that can be done more efficiently by contract.

Now for a brief look at the future problems. We have talked about the nuclear power, the speed of these airplanes and missiles, and whatnot.

Chart 4, page 17.--This is a very simple little chart. We have temperature on the left side, and the mach number, which is speed, on the bottom. We come out with about mach 2 right there now. That means that at mach 2 we are getting about a 200 degree Fahrenheit rise in skin temperature on the airplane. Well, aluminum in general is satisfactory at that speed.

We come to mach 3, and we have airplanes designed for that speed on the drawing board today, and you can see that it goes up to around 700 degrees. Mach 3 is getting along toward the end of titanium. It is just about to pass aluminum in critical areas.

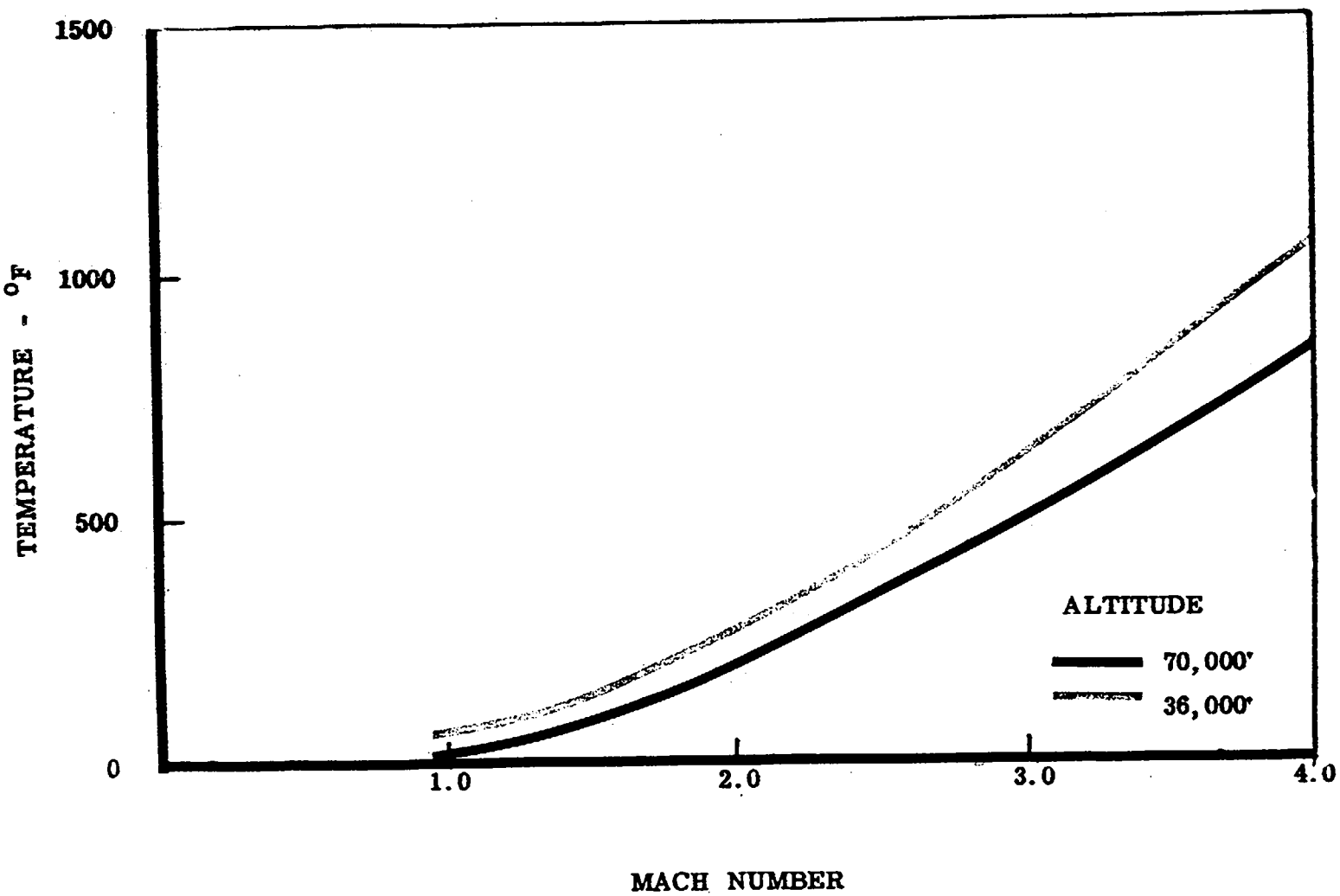
Titanium is not good for much more than about mach 3 or 3.5. From there on up we are going to have to use steel. We are experimenting with steel aircraft now, to see what is involved in building them.

Another problem that is facing us involves fuels. We already have a bunch of complicated fuels that are presenting all kinds of logistic problems, both in supply and in handling. For instance, the ICBM and the IRBM require a tremendous amount of liquid oxygen. This stuff has a boiling point of minus 362 degrees Fahrenheit and it can't be confined. So it boils off. You can't store it very well. It looks like the best thing to do with that will be to make it right at the site where you are going to fire it.

Some of the future fuels are interesting. Fluorine, for instance, has been considered. It has good heat capacity, good performance, and good flame speed; but it's a universal solvent. If it drops on the ground it will react with organic material in the soil and catch fire. If it touches a metal part where there is a fingerprint, it will eat up the metal. I don't really see much future for this one, but the scientists may.

Solid propellants look a lot better than that. They are things that we like to go to. But so far the solid propellants, as a lot of you

CHART 4
TEMPERATURE VS SPEED
(APPROXIMATE)



probably realize, don't put out the power and the heat value that these liquid things do.

Some of you may have heard of Zip fuel. This is one of the high energy fuels we are working on. However, it is not a petroleum base fuel. Various fuels in this class have energies 25 to 50 percent greater than present jet fuels. They are also more combustible, have higher flame speed, and in general look quite attractive for future application.

One drawback of these fuels is that the early production problems indicate that ultimate cost will be quite high compared to present fuel costs.

Even in large-scale production it doesn't look like it will come much under a dollar a pound. That sounds awful to me when we talk about jet fuel at two cents a pound. But they say--and I can see that it is possible--that if we can get the substantial increase in energy anticipated, which can be translated into greater range, we can regain a portion of this cost in reduced aircraft size and weight. So it may be that in the future we will be using this fuel for certain missions.

A quick touch on nuclear aircraft. Radiation and weight, of course, will be the big problems there. We are working on these things and worrying about the logistic implications. Right now Pratt and Whitney and General Electric both are working on the development of engine hardware. Lockheed and Consolidated are studying the aircraft problems.

Logistically we will have to have parking places that can be decontaminated. We will have the problems of fueling and maintaining the aircraft, and disposing of contaminated waste. There will be many other unique problems which the logistics people will have to face.

There have also been some studies of nuclear rockets, which leave me completely out in the cold. I am glad I am as old as I am when I look at them. The animal would be extremely large. I don't even know what the logistic implications of that would be, but we have a book about it.

In conclusion, I hope that I have told you something about the studies and progress that the Air Force has made and is making in

trying to achieve a better logistics system. I believe that we have things in the mill that will speed this up. I am sure that right now we are somewhere between 3.5 miles per hour and mach 3.5, we are closer to the 3.5 miles per hour than to the mach 3.5, but we are on our way up.

Thank you very much.

(20 February 1957--250)B/feb