

AIR TRANSPORT
12 April 1946.

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DR. SNELL:

I must apologize for not having distributed an outline for this lecture, but I have been away on a two-week trip and just returned the other day. However, I shall try to emphasize the major points in such a fashion that they will be readily apparent as I go along.

Our subject is "Air Transport". Let us look at the principal characteristics of air transportation, the same introduction that I used in presenting the discussion of motor transport.

First, air transport consists of unit transportation, meaning that an indivisible unit is used and when capacity of that unit is reached another complete unit with crew and powerplant must be provided. This compares with the train type of operation characteristic of railroads. There have been attempts, as you know, to use trailers in the form of gliders for certain military operations. Considerable success has been achieved, but so far, commercial transportation has not used that method, probably because of reduction in speed, present small volume of business, higher cost and the problems of experimentation in general. Eventually the industry may experiment with aerial trains but so far it has tended to ignore them.

A second characteristic is speed, unquestionably the most important characteristic of air transport. Here are some recent speed records, most of which, I imagine, are familiar to you.

The Douglas Mixmaster XB-42, which had a "little trouble" after it arrived in Washington, left Long Beach, California, at 1:22 P.M., Eastern time, and landed at Washington the same afternoon at 6:39, an elapsed time of five hours and 17 minutes, an average speed of 432 miles per hour for a nonstop flight of 2,295 miles. While it was not strictly a commercial plane, the commercial version is designed to carry 48 passengers and some cargo and the Douglas Company hopes to have it ready for commercial operation shortly.

The Boeing C-97 Stratocruiser, prototype of a 100 passenger four-engine transport commercial version of the famous B-29, flew nonstop from Seattle to Washington in six hours and three minutes.

These ships are forerunners of what is coming, in the field of both passenger and cargo transportation. Cruising speeds of 300 miles per hour will be common even with planes in local service. The speed of the airplane is even more outstanding over difficult terrain.

Here is an interesting fact gleaned from military experience. Some of you may be familiar with the Port Moresby-Buna area in New Guinea. Between these points, a good transport plane took twenty minutes; it took two weeks by pack train. From your own experiences you can cite probably hundreds of similar examples.

The speed advantage is especially noteworthy commercially in such areas as the Andes, Rockies, Alaska, China or similar regions where ground transportation is extremely primitive, or almost nonexistent; in such areas the airplane has assumed a predominance over forms of ground transportation for every kind of commodity movement that no other form of transport can equal. Although costs are high, ground transport is costlier.

A third characteristic is that of terminals generally inconveniently distant from commercial centers and terminals becoming increasingly costly and elaborate. Such distant location forces extensive reliance on ground transport, making it essential to air transport at the present time. The airplane does not come up to the loading dock as do railroads, trucks, or steamships, in most instances, and that means some form of ground transportation must be introduced for almost every operation. Another airport problem is that, under the present form of air transport, long runways for landplanes or water areas of considerable size for flying boats are needed, which results in extremely expensive terminals. As the volume of air transport grows, the cost of terminals will grow until we have a problem faced by the railroads, namely, high terminal costs. As volume increases the Nation faces a vast expenditure for terminals which may make air transport anything but a cheap form of transportation.

Most of you know of the Idlewild Airport now under construction by the City of New York. It will cost somewhere between two and three hundred million dollars, approximately the same as Pennsylvania Railroad Terminal and approaches. Other airports in other parts of the United States will reach comparable figures, which means for more than 6,500 airports a tremendous expense.

So much for these two terminal factors, expense and distance from centers of traffic origination!

A fourth factor of importance for air lines is that maintenance needs per unit of work performed are greater than for other forms of transport.

It is hoped that as the airplane develops, as designers improve the extremely complicated motive power now used, if, perhaps, jet planes or rocket devices of some kind may be increasingly used, that the necessity and cost of maintenance may decrease.

Analysis of the overseas operations of such an operator as TWA, in the service of the United States Army, indicated that the average plane, even in most intensive shuttle service, was on the ground about 15 hours per day. In other words, out of the 24-hour day, planes were actually working less than 50 percent of the time. Compare that with the performance of trucks or high-speed rail equipment or the best type of ocean vessels and you will find that airplane availability is considerably less than competitive forms of motive power. This does not mean that it cannot be more; it merely means, at the present time, that maintenance standards are such, the safety factor is such, that planes must have a greater amount of maintenance and attention to fly safely.

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Many of you also may know of the record made by the service air lines after VE-day and VJ-day. As soon as most of the skilled maintenance men were pulled out by demobilization, promptly the number of accidents to Army and Navy planes jumped alarmingly. In other words, skilled and constant maintenance is necessary.

Another characteristic is that of flexibility, being able to go virtually anywhere by any route. I emphasized flexibility when lecturing about motor transport. Actually the flexibility of an airplane is potentially as great or greater than that of highway transportation; but because of the necessity of extensive airports and maintenance requirements, actual flexibility is not so great as that of highway transportation. Airplanes must have terminals. As for highway vehicles, they virtually can go anywhere, pick up anywhere and unload anywhere.

The sixth characteristic is that of manpower requirements. The statement has often been made, with more or less accuracy, that for every man or pilot in the air, at least eight or nine men are needed on the ground; and while it may not be as true for air transport quite to the extent that it is for combat planes, the manpower requirement is still present. One of the major problems of the cargo airplane, at present, is to mechanize and improve the handling of freight. There are also some unsolved problems of passenger loading and unloading.

Another characteristic has to do with the airplane's lack of capacity. I am not enough of an engineer to discuss extensively with you the problems of increasing pay load relative to the amount of gasoline and the total weight of the plane, but, at the present time, you must consider that a plane like the Constellation burns somewhere between thirty-five hundred and forty-five hundred gallons of gasoline in a transcontinental flight. Such fuel weight cuts down cargo capacity, and if it flies nonstop, its pay load is even more materially reduced. The Constellation is at present a poor cargo plane. Lockheed has designed a belly tank for cargo that can be attached and detached quickly. So far as I know the really efficient low operating cost, high cargo capacity speedy plane is yet to be produced.

The problem of fuel and manpower requirements is illustrated by the following example: the problem of moving 100,000 long tons of cargo from San Francisco to Australia, about 6,500 nautical miles. Using EC type ocean vessels 4 ships with 320 crew members would suffice, consuming 165,000 barrels of fuel oil. To fly the same tonnage using C-87 type planes would require over 10,000 planes, 120,765 members of flight crews, and 85 ocean-going tankers to supply the 8,996,600 barrels of fuel needed for the planes.

Other planes, like the B-24, which was extensively used in cargo service in the Pacific, carried as little as two and three tons. It was not designed as a cargo plane--but was modified and used as such because of lack of anything else at the time.

Some of the new ships that are coming along, like the Stratocruiser, are better performers; here are some of its characteristics. These are estimates by the manufacturer, and, of course, have to be taken with some reservations until more operating data are available.

The direct operating cost for the standard passenger cargo version of the Boeing C-97 or 377 or B-29, commercial version, is estimated to be about ten cents a ton mile for all ranges from 300 miles to 2,300 miles. The estimated direct flying cost curve starts at about 9.7 cents per ton mile for a 300 mile range and drops to 8 cents a ton mile for a 1,300 mile range, assuming 100 percent maximum range speed for longer distances; this is assuming also 130,000 pound takeoff weight, meaning the total weight of plane, cargo and fuel.

At 1,700 miles the cost curve rises slightly; it approximates ten cents a ton mile from there to the 2,300 mile range, and twenty cents a ton mile at the 3,600 mile range. Now note those greatly increased costs per ton mile as soon as you get longer distance range. Obviously the difference is the fuel that must be carried. That illustrates the point made as to limited capacity.

At 140,000 pound takeoff weight, the cost per ton mile is somewhat lower. Maximum pay load, under varying conditions, ranges from 30,000 pounds at 500 miles to 11,650 pounds for 4,200 miles. The Boeing 377 is a plane designed to operate somewhere around the ten to twenty cents per ton mile point, which is a pretty good immediate objective for cargo activities.

Another plane in the cargo field is the so-called Fairchild Packet or flying box car. I do not have much in the way of operating data on it, and not many of them are in operation. As you may know the fuselage is square, and has a cargo capacity of 2,870 cubic feet, which is 93 percent of that of an ordinary railroad box car. Because of the square design and wide opening rear doors they are easy to load, have good cargo stowage characteristics, which the average cylindrical fuselage type of plane does not have.

There are other planes such as the Mars Flying Boat which made some remarkable records. A typical example--in a flight to Brazil, the Mars took off with a gross weight of 148,500 pounds, cargo load of 12,774 pounds, five passengers plus crew, flew nonstop to Natal, 4,250 miles, average speed of 146 miles per hour. Note that, compared to the total of 148,500 pounds, cargo amounted to only 6.5 tons. Where shorter hops were made, the cargo record was better. According to the Navy, the direct operating cost of this plane, with no depreciation, interest or overhead costs being included, has been about six cents per ton mile. The new commercial version will operate even more economically and be a more efficient cargo carrier.

The famous Douglas DC-4 Skymaster will carry somewhere around 14,000 pounds, maximum cargo capacity, depending upon what other equipment it has. It will cruise consistently about 200 miles an hour, and, at the present time, is the favorite cargo plane of the

U. S. air lines. There are various reports as to operating cost; they run between 10 and 15 cents per ton mile.

We can conclude, then, that compared with other forms of transportation, air transport has the characteristic of being high-cost transportation. We have a tendency to overlook that fact because of the tremendous volume of cargo flown to all parts of the world during the war and, to a certain extent, still being flown under peacetime conditions. Factors of cost were ignored during the emergency; e.g., flying steel pipe for a petroleum line from Burma to China. We do not ordinarily fly that sort of material in airplanes because cost on a commercial venture would be completely out of line and we simply could not afford to fly.

Very little data have been released, at least that I have seen, on actual costs of the Air Transport Command, or M.A.T.S. operations. Such costs would mean little commercially anyway.

Other characteristics of air transport are: dependence upon ground transportation for pickup and delivery; great dependence upon the Government for construction of airports and flyways, and developmental research.

Let us turn now to some of the actual statistics of United States air transport operations. Some of you may be interested in the performance records of some of the domestic carriers. American Air Lines is the largest. In 1945, it flew 47,892,000 revenue miles; carried 1,300,000 passengers; and route miles were 7,854.

The second largest domestic airline is the United Air Lines with 40,101,000 revenue miles; 772,000 revenue passengers; 599,000,000 revenue passenger miles; and 6,018 route miles.

The third one is the T.W.A., slightly smaller than the other two, with 31,874,000 revenue miles, 556,000 revenue passengers, and 513,039,000 revenue passenger miles.

The fourth carrier is Eastern Air Lines, with 27,333,000 revenue miles, 896,545 passengers and 466,799,000 passenger miles.

The fifth in size is Northwest Air Lines. From there on they drop very rapidly in size and in performance statistics. The United States domestic air transport field is thus dominated by four large lines, five if you care to include Northwest, with the rest of them comparatively small. Some critics profess to see in that somewhat of a danger in competitive matters, but that is not our concern at the moment.

Here are some other statistics that may indicate that the "little boy" of the transportation field is growing up very rapidly; he is no longer a junior member of the transportation family; he is getting to be big business. In 1940, the total number of revenue passengers in U. S. flying, excluding duplications, was 2,240,000. Last year, 1945, the number was 5,138,000. And if it had not been for war conditions, that figure would undoubtedly have been higher. The revenue passenger miles grew from 861,000,000 in 1940 to 2,831,000,000 in 1945. The ratio of

revenue passenger miles to available seat miles jumped from 58.56 in 1940 to 88.62 in 1945. What does that ratio mean? Well, it simply indicates what is sometimes called load factor. In other words, planes in 1945 were running 88 percent loaded, which is a very good performance record and one which the air lines discount for the next few years. They estimate that if they can operate with a load factor of 60 to 65 they can make a profit on most runs. The average revenue passenger per revenue aircraft mile jumped from 9.02 in 1940 to 17.07 in 1945. There are many other statistics, but our time is limited.

However, here is another one of interest: the average length of passenger journey rose from 384 miles in 1940 to 551 in 1945. That may surprise some of you who consider the airplane primarily an instrument of long distance transportation; essentially it is, but, nevertheless, the average passenger in the United States rode only 550 miles, which is roughly the distance from San Francisco to Salt Lake City by air. On cargo, mail pound miles, statistically an invention of the Post Office Department, jumped from 18,680,000,000 in 1940 to 123,457,000,000 in 1945, or roughly a 650 percent increase. Express pound miles did just about the same in percentage increase--no, a little bit more, or about 800%. It jumped roughly from 5,990,000,000 express pound miles to 45,192,000,000. Even the excess baggage pound miles jumped 600 percent, and, incidentally, constitutes a very nice source of revenue for the air lines. A passenger is allowed only 40 pounds and many people cannot get what they like to carry in 40 pounds. Those bottles are heavy.

As for operating revenues: In 1940, the total passenger revenue on domestic air lines was \$43,808,000; in 1945, \$142,132,000, or an increase of roughly 350 percent; express revenue jumped from \$1,809,000 in 1940 to \$10,653,000 in 1945; excess baggage increased from \$445,000 to \$2,248,000 last year; a nice source of revenue; and other non-mail revenue totaled \$923,000 last year.

Mail revenue has risen from the 1940 figure of \$19,547,000 to \$35,504,000. There are many other statistics available--revenue miles flown, total number of accidents, total number of fatal accidents. I heard the President of the Association of American Railroads comment on relative accidents the other day before the Harvard Club; when they asked him about the comparative safety of two transportation forms, air and rail, he was much too kind to airlines in saying: "Take your choice. There is not much to choose between them". Actual facts are that over a period of years on the basis of passengers killed per million of miles, flown per accident the air lines are about twenty times more risky than the railroads. However during a recent year they were better than the railroads and have generally improved their safety record.

We have some data on international carriers, and some on express, by air and rail. In 1945, the ratio of air express to rail express, in revenue, was 3.19 percent, and as to the number of shipments, 1.04 percent. In other words, air express amounts to only one percent of total rail express in shipments, three percent in revenue.

Let us look very briefly at the data on airline investments. As of 1944, the close of the year--these are data supplied to me the other day by the Air Transport Association, the trade association for the air lines--all domestic air lines had an investment in operating property of about 66 million dollars; in materials and supplies of about 14 million dollars and cash investments and special funds of about a hundred and eight million, or a total investment of 188 million dollars. As a matter of fact, the air lines came out of this war in very excellent financial condition. As an industry they have more cash and more liquid assets relatively than any other form of transportation and have been able in the last few months to use extensive methods of financing, including debenture bonds and sale of stock. The public, of course, is so air-minded and has so much cash, at the present time, that most anything will sell, and, the air lines are in excellent condition to continue their expansion. A few of them like T.W.A. are running in the red at the moment because of rapid expansion and possible difficulties in management, but most of them are profitable. It is not so true, as you will remember I mentioned several weeks ago, of the motor transport industry, which is taking a financial beating at the present time.

Some of the new planes, incidentally, are not cheap to buy. A Boeing 377 costs about \$1,300,000 each, and the Constitution, a new plane Lockheed has under construction, will cost about two and a half million dollars per unit. Thirty-six to forty passenger ships, such as the Martin 202's, which will be used primarily in short-haul service, will cost about \$215,000 each, depending on the number purchased; and an order of 20 Convair 240's brought a price of \$225,000 per plane. The Constellation costs a minimum of \$750,000 each. Small feeder line planes, such as the Saturn and 20 passenger Boeing, are priced from \$115,000 to \$145,000.

Now how about airports? At the end of 1944, the Civil Aeronautics Administration estimated that the airport investment in the United States--civilian airports only, leaving out all strictly military airports--amounts to \$1,027,000,000. The sources of funds were as follows: Federal, \$741,000,000; State, \$10,155,000; Municipal, \$193,000,000; Commercial and Private, \$83,349,000. At the present time, there is a bill before Congress to expend \$500,000,000 in federal funds over a period of seven years. Most of the airports at the moment are controlled municipally. This is one of the most controversial of subjects, one about which we could talk for the remainder of the period--the matter of financing airports.

You might be interested in knowing that Harvard University is spending \$50,000 on a rather extensive airport survey. That \$50,000 came from four different sources, the Association of American Railroads, American Air Lines, the Aircraft Industries group, and some funds which Harvard had. It is hoped it will be a complete study, one of the first real ones made on the subject of airport finance and a study much needed to throw some light in dark corners.

From another source, I have a report on LaGuardia Field about which municipal officials are most reluctant to talk. It is supposed to have cost between sixty and seventy million dollars; nobody actually knows, because a good deal of it was built by W.P.A. and other substandard labor. The rental paid by air lines for hangars is reported to be twelve cents

per square foot per year. The buildings are substantial, with ceilings sixty feet high, and are complete with heat, electricity and other facilities. Their cost is estimated at \$12 to \$25 per square foot; the air lines are supposed to pay 12 cents per year. This compares with a minimum of 35 cents for low-grade warehouse space which the Interstate Commerce Commission requires the New York Central Railroad to charge its customers.

Rental paid by air lines for ticket and other offices in the terminal building is reported to be two dollars per square foot annually, with no charge for waiting rooms, corridors or other space.

Landing fees are on the basis of \$200 per month each for one to three schedules; \$100 a month each for four to six schedules, and a descending scale as the schedules increase. A schedule is a daily stop of a 21-passenger transport airplane, that is, one landing and one takeoff.

Here are some other figures. Chicago Municipal Airport, representing an investment by the City of almost \$10,000,000, operates at a loss of \$114,000 per year, charges all of the air lines landing in Chicago a grand total for landing fees of \$76,350 a year. The rental for the leases on hangars is \$71,000 and the concessions paid \$2,400, a total of \$149,750 a year.

The Washington National Airport, owned and operated by the Federal Government, has for the fiscal year of 1944 revenue of \$516,000; exact expense data are, as you might expect, not available.

I have an estimate here: air lines and other aeronautical interests contributed \$135,000 for use of the airport, whereas other activities such as pay toilets, restaurants and various concessions contributed \$265,000. Our research discovered an actual example where the pay toilets at one airport yielded considerably more revenue per year than all the air lines that used the port. I throw that in to indicate that finances of airports are in somewhat of an uncertain condition. I got one airline officer to admit, in Cleveland a few weeks ago, that he thought such conditions are changing. Instead of the public paying most of the bill in taxes, the air lines might begin to contribute a little more. Congressional sentiment seems inclined that way and even a few air enthusiasts feel air transport is now sufficiently adult and prosperous to become more nearly self-supporting

Now to the subject of air mail! I am doing this not in the sense of criticizing air lines, but showing you some of the problems to be faced. Mr. William A. M. Burden, Assistant Secretary of Commerce and one of the most potent proponents of air line operations, reported in 1945 that the Post Office Department obtains a profit of almost \$100,000,000 a year from air mail. However, here are figures which Mr. Burden seems to have ignored. Total air mail revenue of the Post Office Department for 1944 was only \$77,000,000. Now how even Mr. Burden could manufacture a hundred million dollars profit out of a gross revenue of seventy-seven million only he can testify! It is estimated that if, as is wanted by the Post Office Department, a five-cent air mail rate goes into operation, with the consequent decline in mail volume now moving by cheaper forms of transportation--instead of the present profit, almost entirely from

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first-class mail, a great portion of it moving by rail--it will be found that the Post Office will operate at a deficit of between 70 and 90 million dollars a year. I have a large array of figures here on air mail, but time does not permit elaboration.

Before we close, how about comparing rates? At the present time, between most major cities, air rates are actually lower than first class rail, including lower berth. The savings run as much as \$12.65 difference (between Denver and San Francisco) as between railroad and air line rates. The railroads, according to a document I saw yesterday, are going to ask the I.C.C. to continue the same passenger rates as they have now, if not higher ones, which I think will be just the thing for which General Smith, of American Air Lines, is looking. He could ask for nothing better than rates to be high for his competitor so he can eventually come in with his famous three-cent air line rate and really go to town! Railroads will have to adjust both rates and service to compete successfully.

How about rates on express and air freight? Here are some figures. Between Los Angeles and New York, airport to airport, American Air Lines, with its one classification all commodity freight rate now in effect, will carry 25 pounds or less for \$8.78, compared with an air express rate of \$21.00 for the same package; 50 pounds for \$17.06, compared to an air express rate of \$42.00; for a package weighing between one hundred and five hundred pounds, the rate is \$33.63 per hundredweight and \$84.00 for air express. Now watch how the rate drops between a thousand and two thousand pounds. The freight rate comes down to \$31.38 per hundredweight and, for a package weighing three thousand pounds or over, the rate is \$26.90 per hundredweight. There is a pick up and delivery charge of 35 cents per hundredweight at each terminal. Such rates will calculate down to a basic freight rate of around 20 to 26 cents per ton mile or less.

Perhaps time will permit mention of the famous experiment by Ralph Myers, a big shipper of perishable products from California to eastern markets. In his very extensive report of results of 30 plane loads of fresh fruits and vegetables he reached conclusions of considerable value in air cargo analysis. He used DC-3's, a special plane manufactured by "Convair" called M-39, and some "Flying Tigers" Conestogas.--He was charged a maximum of 26 cents per ton mile on a contract basis.

I might interject here that there are many contract air lines, including major lines themselves, now offering much lower rates than this 26-cent rate. The famous Flying Tigers and flyers such as they are working now, we understand, down to 15 cents per ton mile, even between 10 and 12 cents per ton mile, especially on the return journey when they have to pick up anything that will pay their gasoline bill. They are undergoing the same experience of fierce competition that the motor truck industry had in the 1920's, when the problem of return hauls and contract versus common carriers created near chaos. Air transport is now entering a period of chaotic conditions. I predict that most of these contract carriers will eventually fail, particularly so if the railroads should come down in rates instead of going up--instead of asking for a 25 percent increase as they did recently, with a probable grant of 10-12 percent. The contract carrier competition will also hurt the large common carrier airlines and eventually regulation will be requested.

I am sorry time does not permit me to give you all of Myer's conclusions on perishable air cargo, for he makes some very good points. He found most airports inadequate as to runways, fueling facilities, large plane servicing, inaccessibility to bulk shippers, and cargo handling devices. They are better for passenger operation, some of them, but they must be completely rebuilt for cargo operation. He also points out the restrictions of the C.A.B. on routes. Instead of the great circle route, which would save on mileage and expense, planes had to follow the rigid pattern of routes laid out by beacons and control devices of C.A.B., adding as much as \$500 cost per trip. Such route restrictions must be lifted if we are to have less expensive air cargo transportation.

The matter of packaging must be completely reviewed and revised, to have perishables moving by air. The whole subject of precooling must be worked out. Much has been heard of the alleged fact that by flying at high altitudes--stratosphere--it was not necessary to bother about refrigeration for produce, that the cold air would actually cool it to the necessary temperature. It was proved in Myers' flights, flying around 12 to 20 thousand feet, to be untrue and undependable, and consequently precooling must be practiced for all perishables if spoilage is to be avoided.

Other important conclusions were that: planes must be able to carry minimum loads of 9 tons, preferably more; must be insulated and equipped with temperature controls; must be built for mechanized loading and more readily balanced; interiors should be rectangular for better loading and should be at truck-bed height. There were other items of interest, but we must hurry on.

What products will move at the higher rates that air lines must charge? As a partial answer to that question, I was permitted to examine part of the Air Cargo, Inc., studies.--They have been secret, but when I went up to New York, several non-airline people had these data so I assume that they are no longer secret.

Air Cargo, I think, was an organization financed by the commercial air lines. The basis of their assumption is that most of their potential cargo will be derived from 13 classifications, as follows: (Most of these now are the chief products moving by railway express.) First, wearing apparel; second, light machinery, including some agricultural and household appliances, office, store and some light factory products and special parts for such machines; a third classification includes chemicals and drugs; fourth, is motor vehicle parts, a field from which they hope to get a lot of business; fifth is leather and leather products, including shoes; the sixth classification is textiles, cotton, rayon, silk, woolens, carpets, rugs and miscellaneous; seventh, professional and scientific instruments, including cameras; eighth, rubber products of various kinds; ninth, nonferrous metal products, including chiefly jewelry, silverware, watches and clocks; tenth, motion pictures, either in raw or finished form.

Eleventh is printing and publishing. A fact that rather startled me was that the chief form of printing and publishing products Air Cargo has not looked at, magazines and papers such as Time, News Week, New York Times

that have national circulation but are published at a central point. Most of you may know that Time and NewsWeek now are flying most of their magazines, either in actual finished form or as plates that may be used for printing in certain locations.

Twelfth: Cutlery, tools and hardware; and thirteenth: Recordings and transcriptions.

I mention this list as an indication of where the thoughts of the air industry are going, at the present time. Those are products on which air traffic managers will probably concentrate. It does not have much relationship to military service, but, nevertheless, it gives you an idea of what they think they can carry commercially.

I have gone five minutes over my time. I have some material, rather brief, on the Air Transport Command; all of it is in regard to experience, organization, equipment and routes. A.T.C. does not give out much analytical information or information applicable to commercial air transport.

However, the experience of the Air Transport Command and the Naval Air Transport Service was probably one of the finest that could come to any industry in actually proving what can be done in the way of flying throughout the world under all conditions with various planes and every variety of cargo. It would be too bad if the air lines do not capitalize on more of the experience thus gained. It would do some good in analyzing the air cargo potentialities and freight characteristics of various types of planes, routes and services for future activity. Actually what I have said here today will soon be out of date, so great will be the developments in air transport and so almost-beyond-imagination are its potentialities.

Now if you have any questions I will try to answer them.

QUESTION:

When you express a rate per ton mile, you mean ton mile of cargo.

DR. SNELL:

Yes. It means one ton of cargo carried one mile. It was statistically devised and is sometimes confusing, but is generally used.

QUESTION:

How does this fellow Myers expect to rebuild the airports, the municipal airports?

DR. SNELL:

That is a question similar to one all air transport men are asking. Either the municipalities or the Federal Government will do it, or both. Present possibilities of private financing are remote. Every form of transportation in the United States has at one time or other been heavily subsidized and consequently air transport, a comparatively new form of

transportation, feeling unable, at the present time, to finance all its terminals itself, wishes to do the natural thing and turn to the Government and say, "Here, you subsidize us; we are going to benefit everybody so everybody should subsidize us".

When we get into expenditures of five or six billion dollars for airports, plus well over fifty million dollars that I omitted to give you for present air beacons and airways, radio equipment, radar and blind landing devices we are going to get an expenditure of about, I would guess, in the vicinity of eight to ten billion dollars, which compares very favorably with the total of the railroad investment of around 26 billion dollars.

The aviation industry cannot expect the Government, local, State, or Federal, to finance all or even a large percentage of that. I think that public reluctance is going to slow down air line development to a certain extent and increase their costs. They hope to induce the public to pay the bill but that is what will probably happen.

QUESTION:

Are there any coach-type three-cent-a-mile air lines immediately?

DR. SNELL:

Not immediately, but this Martin 202 and the new type small Boeing and the Convair type 240 will operate, I believe, pretty economically and permit a fare of slightly less than four cents a mile. I have some data that will show what some of these smaller planes can do; they are very economical--and I think that when they come out, they will amaze some people as to how cheaply they can operate. It will depend on airport cost allocation, tax policies and several other items, of course.

QUESTION:

While you are looking for that information, what about the DC-3?

DR. SNELL:

Well, the DC-3's actual minimum operating cost runs somewhere in the vicinity of 60 cents a mile, not a ton mile, but 60 cents a mile. If you can load that plane with a pretty good mail cargo and 21 passengers at 5 cents a mile each, at 60 to 85 cents a mile, cost you can readily calculate that you can obtain a profit. It is like a bus; Greyhound used to operate its average bus for around 20 cents a mile, but now I understand its average is about 30 cents per mile. All right, if you put in 36 passengers, each one at a cent or $1\frac{1}{4}$ cents per mile, you are operating at a profit. And the same thing is true of the DC-3. Claims have been made that DC-3's in cargo service can operate at less than 15 cents per ton mile. You can maintain a profit with a full load; the only thing is-- I was out to the airport the other day and noted planes coming in with as few as eleven passengers. If they fly all the way from Chicago with eleven passengers, there goes your profit.

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QUESTION:

Of course, you can include that dollar and a quarter a pound they charged me for excess baggage.

DR. SNELL:

At the present time, I know of only one major air line in the United States running a deficit. Some of the little ones are unprofitable and are subsidized by mail service, carrying mail at much more than 45 cents per ton mile, the rate for the main lines. Now some of the little lines like Continental and Inland are heavily subsidized, not on a pound basis but on an actual mileage basis. In other words, they may be receiving 40, 50 or 60 cents a mile just to fly a plane with a little mail on it; it may be one or two sacks.

On some heavy main routes they may devote the whole plane to mail--take off all passengers and put on mail and get only a flat fee for doing it; in that case they lose money at present rates. How long we will continue to subsidize the small fellows, of course, your guess is as good as mine. Some of them never will have sufficient volume of passengers or mail; of course, air transport is a "defense device"--quotation marks. You could build a highway to the moon and call it a "defense device" if you wanted to, and get a subsidy accordingly.

QUESTION:

You spoke about this plane having eleven passengers; there is also the possibility that it may have had a lot of freight.

DR. SNELL:

Well, I stood around and watched several flights and they did not unload very much cargo. I can go still further. Coming down from New York they had a thirteen car train the other night with not more than a hundred passengers. That is not making money. I went to Chicago recently on a train that was less than half loaded. I went from St. Louis to N.Y. and the train was less than half loaded. The days of terrific loading in most forms of transportation are definitely over, which means that all transportation must figure costs considerably more closely, particularly on the air lines, where they are still exploring. One of the big DC-4's of the Pennsylvania Central came in the other night with only twenty passengers and that plane will carry 58. Some flights are running full on some days, but the load factor is coming down and the days of just running anything that will fly or anything that has wheels and making a profit are very definitely over. We are going back to conditions that were true in 1940. The United States is going to have a tremendous surplus of transportation facilities.

Now from the point of view of defense and attack in war, that was a desirable condition because it enabled us to take up the increased volume without too great danger of our transportation system breaking down. The actual condition is that in peacetime we have a surplus of transportation.

You gentlemen should know, I am sure, that the passenger service of the U. S. railroads operates at a loss, with the possible exception of the New Haven Railroad or maybe certain lines of the New York Central and the Pennsylvania.

Mr. Young's railroad, the Chesapeake and Ohio--you may have noted his attacks upon the present form of passenger transportation of the United States, this is not secret, one can dig the material out of the Interstate Commerce Commission reports--has one of the biggest deficits of all railroads in passenger transportation; in fact, it cuts his profits from freight operations almost by one third. If he could quit running all passenger trains tomorrow, his railroad would jump terrifically in profits. The same is true of most railroads. The thing that I am interested in here is: Will a form of transportation, such as the air lines, which is, at present, I would guess, 80 percent dependent upon passenger traffic for its revenue and will be within the next few years--be able to operate a variable type of service such as passenger transportation against the competition of the private motor car, with the reduced rates on railroads and the reduced rates on bus lines and still make the profits that they seek?

It might be of interest to interject here that one big air line analyzed the European situation and declined to enter into a request for a route to Europe because they figured that by the time every nation was running its own government controlled air line, plus four or five American air lines, there would not be enough business for all of them. And I am rather inclined to think that their analysis was correct. T.W.A.'s loss, at the present time, is coming chiefly from their European operations. When their Constellation came in from France the other day, there were two passengers. They do not make money on two passengers, flying the Atlantic. Of course, most of them got off at New York, undoubtedly. But I found that airline load factors in general are down.

QUESTION:

Are there any restrictions put on by the Government, priorities for getting passage overseas, now which would have a tendency to keep the number of passengers down by making it difficult to get a priority?

DR. SNELL:

Well, of course, the old priorities are gone.

QUESTION:

I know there are restrictions on overseas traffic.

DR. SNELL:

Unless one can prove that he is a business man or diplomat or on a government mission or has some legitimate business in Europe, he is not allowed to get a passport. That is the principal priority condition that exists now. The same is true to almost every other part of the world except South America.

QUESTION:

Does not that have a tendency to keep the air lines from making money?

DR. SNELL:

Yes, it would, but also do not forget that steamship service that used to exist is also in the same condition. Now when full conditions of competition return with the surplus of ships, both on the sea and in the air, I very much question if there is going to be enough business; that is just a thought; your guess is a good as mine.

QUESTION:

Has any thought been given to the use of gliders such as the military used during the war?

DR. SNELL:

I mentioned that just in passing in the very beginning. Yes, there has been considerable thought but they really have not done what I call extensive commercial experimentation. There is so much air in the air subject that it is hard to tell when it is in the realm of feasible possibilities and when it is merely conjecture. If we could get away from this newspaper Sunday supplement type of air analysis and get down to some actual experimentation and really economic and engineering analysis and reports, it would serve to clarify the knowledge of what can and cannot be done in air transport. I would guess that gliders are perfectly feasible for some operations and, if I remember correctly, some eastern contract freight line plans to start glider operations soon.

QUESTION:

You say that one of the most important developments will be in air cargo. DuPont has operated since 1937 and has done a perfectly magnificent job through about thirteen cities. I firmly believe that that is going to be one of the biggest cargo developments in the country.

DR. SNELL:

I am not too sanguine on DuPont's All American service. Most aviation men say no. I cannot quite conceive of all sorts of stuff being dropped to the ground not to mention the problems of pickup.

QUESTION:

May I tell you that it has been done?

DR. SNELL:

Surely it has been done. However, will it continue to be done in competition with other forms of ground transportation on an economical basis? That is the question I would like to have answered. I do not know.

I am rather skeptical. Suppose you were talking about a point that had no rail or truck facilities. All right, DuPont's service would suffice, but with ground service you can do it by truck for right around five cents per ton mile. You cannot do it at such low cost by Dick DuPont's service and after all cost is important.

QUESTION:

The speed factor is involved. I am talking about perishables.

DR. SNELL:

Is there enough volume at a typical small West Virginia town to make such service economical? For certain commodities there might be, just as supplies to the Burma Road by air was feasible and nobody worried about cost. I think it is a splendid experiment. While he is not making money at it and while the C.A.B. is not very enthusiastic about it, there is no reason why it cannot be continued and adopted where best suited.

I would like to see more experimentation in lighter than aircraft, also. I think the Goodyear Company has some points there and that we should experiment; I do not believe they will be as successful as hoped but I would like to see more experimentation. I would like to see DuPont's activities spread to other parts of the United States. However, I do not believe that it can be as cheap as other forms of transport unless we consider the speed factor exclusively or are serving an area which does not have other forms of transportation. Perhaps the helicopter will solve the problem of serving small towns by air transport. - - - - -