

Speech by C. M. Belinn, President
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OPERATION WHIRLWIND

Past, Present, Future

MR. CHAIRMAN, DISTINGUISHED GUESTS, LADIES AND GENTLEMEN:

The role of a promoter sometimes has a distant relationship to that of the scientist and engineer because they both must search out, develop and employ facts and devices to a conclusion. When I first got a bird's-eye view of Southern California, I was convinced that air transportation would play a major role in its development, in forging a sound community of interest with the east and north by way of the trunklines, and on a local level via short haul carriers. This was back in the late twenties. Twenty years later, my prophesy seemed accurate as far as long-range aircraft operations were concerned and everybody was now excited about feeder airlines. This period was coincident with news space being given a new device known as the helicopter. Some said that one would soon be perched on top of every garage, and already rural real estate was receiving attention from the speculators.

It took no selling to convince me that Southern California could be served properly only by helicopter and that this undoubtedly would apply to a great number of other large metropolitan areas. But, despite the ballyhoo, no such device was available and probably could not be counted upon until long after the war in which we had become engaged at that time.

Our Company was caught in the same avalanche as were many others and, in self-defense, filed an application for the establishment of airplane feeder routes, the only strictly one-area case I know of. We

integrated a large limousine operator with our airplane operations so as to provide single carrier service to the many cities which only helicopters could reach. Our Company had hopes that this crutch would serve the purpose until suitable helicopters would be available. Strangely, the war accelerated the helicopter and, so far as I can see, it had little if not a retarding affect on short haul type of passenger transport aircraft. Therefore, thanks to a denial of our application, the crutch was never used and our concurrent application for strictly helicopter service was granted. As you see, therefore, the helicopter to me is primarily a device offering a logical means to an end.

I shall not bore you with many of the events and highly explosive moments leading up to the institution of service, other than to explain one or two which appear significant and of great historical value to ourselves and, we believe, to the postal service. We realized being first, whether we liked it or not, carried certain responsibilities along with it, which would have a profound affect upon the future of our industry and possibly air transport and society as a whole. We had been asked, for example, by the Post Office how long it would take to commence operation in the event we were certificated. We stated flatly that it would require between ninety and one hundred and twenty days. We commenced operation on the 90th day after our certificate was clear and free of appeal by our competitors. (I have often wondered what we based our estimates on.)

We recognized also that since no prior concept existed in any of the subsequent phases of our undertaking, almost everything we did would be used as some sort of gage by which the helicopter would be appraised, and I will count off a few of them. The first one came home suddenly. It was the personnel situation. We soon found that we were creating a new class of airline employees. With

my own background in the air transport industry, I was naturally inclined toward experienced airline people; yet, I knew that this approach was loaded with danger, because I feared that the helicopter would be fettered and never amount to much commercially if the people who nursed them in the early stages were imbued with fixed wing inhibitions. On the other hand, the handful of mechanics and pilots who understood helicopters as a device had never known the frightful meaning of meeting a timetable day after day, as well as living up to the many other standards which are expected of a scheduled operator. It was a difficult decision. Nevertheless, with only one person other than myself of airline background, the service was launched, and I have never regretted this course.

A hard second was the matter of limitations and specifications. No one knew what a helicopter transport pilot should look like, how long he should fly per day or month, or how much to pay him; what the weather minimums should be; what the operating altitudes over inter-urban areas should be. We struggled almost until the last moment with the size, location, and surfacing of our HELIPORTS, as we named them. The first step of our operation called for setting up 25 sites. After weeks of negotiating, we received bids for fencing and surfacing, the lowest of which averaged \$1,700 each. Obviously, even if we had had the money, costs such as these were incompatible with staying in business. So, we had to devise ways and means which finally resulted in an average cost of \$250.00 each.

A third and terribly far-reaching item was the regulatory problem. All existing safety regulations were promulgated before helicopter operations were thought of, and written by men who largely had never seen a helicopter, much less ridden in or flown one. This created a delicate situation, because we didn't want the pendulum to suddenly swing in the other direction. I can state unequivocally that

the Civil Aeronautics authorities, and specifically the local GAA group with whom we deal, appeared to understand that they had as much to lose in the event of a miscarriage as we who had our cash and sweat in the deal. This mutual understanding and excellent atmosphere continues to exist, and is very important because, up to now, only the preliminary curtain has been raised. I feel that a solid foundation has been laid, upon which future steps with the federal, state and municipal governments can be expected to assume a normal course of progress.

A fourth and perhaps the all-important premise which had been realized was the fact that we were charged with a triple responsibility with respect to performance. Our commitment to the Post Office was to carry mail from the first day with a degree of consistency, which in other forms of transport had taken decades to achieve, and I mean by that that we were expected to give services for the dollar on a current basis. Secondly, if for no other reason than survival, we found ourselves in the midst of a program of technological development, and I assure you that this was a loaded one. For example, the midget-sized radios with which our ships came equipped were useless in actual practice, which meant that we had to develop our own. This was not such an easy problem because not only is the matter of space and location for mounting a problem, but no suitable transmitters or receivers were available on the market. The answer, of course, was in improvising war surplus materials. Another one was landing lights. Opinions as to their characteristics were in direct proportion to the number of persons we discussed it with, and in the same category, of course, we had to arrange instrument and other essential lighting, including flashers. There were dozens of other items of lesser magnitude, but of equal importance, which had to be taken in our stride. And, by all means, don't forget that the book included

many items and procedures which were not needed -- such as flares, 45 minute fuel reserves, etc. -- the elimination of which was not entirely automatic. And I do not in any way cast aspersions upon those who have produced any of our equipment, whether it be helicopters or typewriters. But, as I suspected, history did repeat itself, in our accelerated helicopter operations, because, in addition to the devices mentioned, bugs cropped up in the helicopters exactly as we have experienced in airplanes since their earliest days. And, third, our fixed costs had to be in line, otherwise the necessary government support might be jeopardized.

So that we could see how we were doing from time to time we decided to set up a row of mileposts. The first one: REGULARITY was based on day contact flight. With safety of life and property uppermost in our minds, this, of course, could be called the critical period because of its potential impact upon public opinion, and incidentally upon economics, particularly in the field of financing, insurance, depreciation and other fundamentals, and, finally, upon government reaction with its consequences upon stability of the industry itself. We passed the first milepost without incident, with 3,967 hours and 35,703 landings behind us. I am reasonably confident that we have this phase under control. (We had one mechanical delay the first seven months).

The second mile post was dedicated toward achieving "AROUND THE CLOCK" operation, and this one was not so uneventful, but we know more today. This is a subject in itself, and I would be glad to elaborate on it. I also can report that this one is now behind us. The third milepost we classify as OPERATION AT WILL. This simply means that somewhere along the line we must achieve the regularity of surface vehicles in virtually all types of weather day and night. This is a rough one and we are just now coming to grips

with it. The fourth, and the one which may properly be termed the
E.A.D. PRODUCT, encompasses the carriage of passengers as well as cargo,
in combination with the mails, as a feeder to and from the many air
carriers serving the metropolis.

Los Angeles Airways got off to a good start from an opera-
tional viewpoint, and in the first month carried 60,000 pounds of mail.
As more segments and more routes were added, the loads have increased
so that now this figure looks pretty small. For example, during the
month of April, we moved in excess of 413,000 pounds. The subject of
traffic generation and other exploitational data is a long one.
However, to the extent that it affects the future of the helicopter
industry from a production, and, consequently, engineering point of
view, I believe a few observations would be in order. First of all,
it is a generally known fact that the distribution of traffic in every
form at large metropolitan areas has not kept abreast with the
increases in speed of modern day aircraft. This largely was the
premise upon which the Post Office Department based its support of
the helicopter operations in the first place. This is a meritorious
philosophy and one which should be ever before us, because we have
not reached by a long shot the ultimate in speed and ground require-
ments of long range aircraft. In fact, it might well be said that our
latest crop of long range piston powered aircraft may be the beginning
of the end of a type, and, in the foreseeable future, be replaced by
very much faster equipment.

We operate four routes known as Segments "A", "B", "C" and "S". Referring to your route map you will see how different they are. Segment "A" covers the San Fernando Valley consisting of large cities highly congested. Segment "B" serves the San Gabriel Valley, i.e. most of the cities located between Los Angeles and San Bernardino and, of course, this is wide open territory with a great number of smaller cities. Segment "C" is our coastal route, which again symbolizes a different type of operation because so much of it is in coastal terrain and weather. Finally, there is the shuttle segment which serves metropolitan Los Angeles and that one again is different because we land on the rooftop of the Terminal Annex building. The loads on all of the segments are very heavy and growing all the time. In the month of October, 1947, we expedited a little over 60,000 pounds of mail, flying 10,000 flight miles; last January, flying only 23,000 miles, we carried 310,000 pounds, which is approximately a five-fold increase in traffic represented by only two and one-half times as many miles. Stating it differently, for each mile flown, we have doubled the amount of mail carried in a little over a year.

For example, take American Air Lines' Flight No. 11, which is an important mail flight between Washington, D. C. and Los Angeles. Leaving Washington at 10:40 in the evening, it is due to arrive in Los Angeles at 10:35 the next morning. Our helicopter flight No. 209, departing at 11:15 for downtown, is set up to

accommodate this flight, which allows 40 minutes to rework and transfer the mail to the helicopter. But, in practice, it sometimes works differently. First of all, the mail and cargo load on this flight is usually very heavy, ordinarily amounting to around 3,000 or more pounds. Secondly, its arrival time is frequently so tight by the time the large volume has been unloaded and reworked that only minutes are left in which to move it to the Terminal Annex via the twelve minute helicopter flight. Again, every minute is required to break it down for street delivery in time for the last carrier of the day. Here the helicopter acts as a cushion, but if this flight arrives too late for the 11:15 helicopter, nothing in the world will put it on the street that day.

At this stage of our thinking, we shouldn't lose sight of the fact that the next step in long range transport aircraft will probably place us close to the 500 m.p.h. range. This definitely poses the possibility of aircraft leaving, let's say, Los Angeles at the most desirable hour in the evening for passenger traffic, yet receiving from the helicopter service all of the inter-urban close-of-business mail from its 6,000,000 metropolitan inhabitants, and still land in New York in time for first carrier delivery by helicopter the next morning. This is not possible now due to the three hour time differential between west and east. Following this logic, the correspondent on the east coast has a whole day to develop a reply and still have it in the hands of his Los Angeles correspondent by morning carrier the second day.

There are, of course, many other and fascinating combinations of service, particularly on shorter hauls, which could be expected to develop when equipment in the 500 m.p.h. range, in combination with helicopters, becomes a reality on our airlines. A special delivery letter mailed in New York any time before noon

would be delivered the same day to any city on the helicopter routes on the west coast.

My hunch is that we are flirting with the preliminary stages of a new concept of communication, one which should be highly profitable, if properly exploited, both to the Post Office Department and the air transport industry. When a patron buys airspace, he buys speed, and he has always been willing to pay for it.

Now, a word about cost. By the simple process of tabulating the number of letters which we transport, against our gross income, the cost of helicopter service by the letter can be readily and clearly established. There are no hidden costs involved in this tabulation because our Company does one job only. This was the hope expressed by the Civil Aeronautics Board, which we have faithfully adhered to. There are no promotional charges and no plush rugs or chrome anywhere in the Company. Everybody from the President on down wears several hats, with the consequence that our overhead is almost nil, and our ratio of supervisors to producers is zero. I realize that the cost of messengers is not included in our mail pay. On the other hand, this is more than offset by the fast rate of depreciation write-off and other non-recurring expenses which we are committed to under the terms of our three year temporary certificate. Our operating costs are steadily decreasing and it affects the price of expediting each piece in some proportion to the increased tonnage per mile. At the outset, based on clear-cut tabulations, the cost represented about 11 mills per letter, roughly a 20% bite out of a 5¢ airmail stamp. Our last month's figures indicate that this cost has dropped to 2.9 mills, which is only 5% of a 6¢ stamp. For this pittance, that letter is dispatched on our downtown shuttle segment in time for morning

carrier, whereas via surface it would probably make the noon carrier, which is the most competitive of our schedules. It has been recognized that in our own case we expedite the mails on an average of between 4 and 24 hours, and, of course, there are cases where, particularly over the weekends, it becomes much greater. Of course, in the 43 cities which are on the circular routes pattern, the advantage is on the 16 to 24 hour side. I associate the cost item with the added speed because, even at this juncture, it is not too prohibitive if compared with the cost of aviation in general, and particularly the fixed wing feeder industry. For the third quarter of 1948, our costs were \$11.88 per ton mile by helicopter against an average of \$34.94* for the feeders. The latest month covered by our own figures is \$8.82 per ton mile, and if a comparison were made against what it originally cost to introduce airmail, then the picture would be startlingly bright for the helicopter. The fact that the helicopter in its very initial stages has been able to effect a downward trend in costs, in and of itself, should more than justify all-out continued support.

We do not intend to depend upon a mail subsidy for our existence. Regardless of the pros and cons, this is not a healthy situation, and, in my opinion, it is incompatible with the Civil Aeronautics Act. We will see the full growth and development of the helicopter industry with enormous impact upon the fixed wing industry only after we can effectively transport anything that other aircraft can do. This latter statement may startle you, but I don't believe very many people here would take issue with me that one of the most disagreeable aspects of passenger air transportation today is the terminal situation, both with respect to costs and time consumed

* CAB Reports, Third Quarter - 1948.

between the airport and destination. I realize fully that certain improvements are planned in the form of freeways and arterial highways, but these steps sometimes are prohibitive in cost and will act only as a temporary palliative.

We are living in an age of decentralization and unprecedented growth of the large centers. This situation forces both vertical and lateral revision of our metropolitan pattern. The combination is one virtually impossible of solution except through aeronautics. The fundamental solution is the helicopter, and the result will step up long haul business for all the airlines in passengers, mail, and cargo, as well as make money for the airports.

I am not prepared to make any slipstick prophesies on where the impact of the helicopter will first be felt, primarily because we have been fully occupied in our day-to-day task. One of these days, however, we expect to take time out and make some real observations. In the meantime, we have two or three glaring illustrations, which, in the final analysis, may be as controlling as any. For example, over 2,000,000 persons make up the downtown area of Los Angeles, which is 45 minutes to an hour by surface away from the airport, at a cost of \$1.40, and we are told that the franchise operator who does the job is not getting rich. Many airline passengers go to the larger hotels which are not always located on the routes of the established bus lines. From the moment a passenger disembarks, he usually has to stand around and wait for his baggage. If he gets a break on this, he usually can't get under way until the buses accumulate a full load. In a great number of instances, he must also transfer to a taxicab with another handling of his baggage and, finally, to his hotel which all involve effort and costs in the form of tips and other charges. Our answer to this situation would simply be to construct a facility on the rooftop of the larger and strategically placed hotels so that

helicopters would land and be serviced with passengers there by the hotel porter, just as our mail is now being handled on the Terminal Annex rooftop. In fact, since mail and passengers originate on the same flight in large metropolitan areas, we would schedule several stops for both mail and cargo. Stating it differently, rather than go to the street for a waiting taxicab, the passenger and his baggage would be taken via the elevator to the rooftop and checked out for the helicopter. On the basis of present taxicab rates which are being employed by a great number of people, the fare would be \$2.50, 25¢ per mile for ten miles, and, on the basis of cruising at 120 m.p.h., this flight would take five minutes. If this proposition were carried to its proper conclusion, the helicopter would not land on the ground at the airport. It would again land on the rooftop of the airport central administration building. This building usually is located in the center of activities, convenient to the prominent airlines and, again, the air carrier with whom the passenger is connecting would receive the passenger and his baggage on the rooftop so that, in effect, the whole transaction would be on a through fare basis with no hidden or extra charges or inconveniences.

While, admittedly, this sort of operation sounds fantastic, and possibly it would not service all of the passengers using the airport -- I can tell you that I wouldn't have believe it either if someone would have told me a year and one-half ago that we would be expediting over 200 tons of mail per month today -- it should be pointed out that in the average month, an airport like Los Angeles clears 90,000 passengers based on 175 landings and takeoffs daily. I leave it to your judgment as to whether or not you, as a passenger, could be relied upon to make reasonable use of that type of improvement in service. If it sounds strange, perhaps your mind would change if I were to tell you that right now we are moving an average of 7,500

pounds of mail daily on and off one single rooftop, using improvised, wartime single engine equipment, and other facilities. In fact, we have on many occasions moved five thousand pounds an hour for several hours at a time.

Going back to my revenue figures, I find, with a 10 place helicopter, a potential of \$2.50 per mile on this short haul schedule. Of course, this is based upon a 100% load factor. On the other hand, no credit is given for mail and express which, together, should be good for about 50¢ per mile. So, all in all, we look for a gross revenue of between \$2.00 and \$3.00 per mile from a sixteen thousand gross pound helicopter when employed upon high density short haul routes.

As the routes stretch, naturally the per mile fare will drop. I should imagine it will level out on a system average of between 15 and 20 cents per passenger mile and about 40 to 50 cents per mile for mail and cargo combined.

I have touched on the broad commercial potentialities of the helicopter, in a mixed tense, because it is based on spot checks and observations over the past year and one-half on our own operation. For example, we have carried over 2,000 guest passengers during the period. They were about equally divided between industry and non-industry people, but usually appeared objective in their appraisal of our proposition. Without exception, we have received factual data which could readily be classified into two main categories, the first being quite surprising, namely that we have detected no fear or apprehension of the helicopter as a vehicle. And, secondly, we have been asked "when do you expect to extend the facility to passengers as a taxi service between the outlying communities?" and a very great number have been impressed by its prospects as a sightseeing facility. This gives us something new to think about. (Being an adopted Californian, I can, of course, understand particularly why our visitors

from out of the area would feel this way).

Now, leveling our sights into the future more deliberately, it would appear that we have two distinct problems facing us. They are enormous, of such magnitude and importance that they must be faced squarely. I divide them into airborne and ground support. This may remind you of military parlance, and I am not so sure that it does not have military significance, because virtually everything that the helicopter is doing in peace time, it is equally capable of doing, in fact, in the event of a national or local emergency, it may well be doing front line work, because we should remember at all times that the helicopter was conceived, if not virtually created, as a rescue device -- not as a combat weapon -- and I see very little technical difference in preserving human life in the jungles of Burma compared with the jungles of a wrecked community.

At the risk of appearing here as a Monday morning quarterback, there are certain general facts which I feel you should consider in the same perspective in which an operator sees them. I have always viewed the helicopter as a "hybrid" or composite between land and air craft as the missing link, and it is the only mechanical device I know of capable of supplementing both. I should like to think of it as an airborne bus and I believe the public would readily adopt the same view. In order to sustain this, the helicopter will, of necessity, have to be just as safe and reliable and its operating costs must stay on reasonable terms with the end product. In airplanes, we compromise on many things in achieving speed. This has sometimes been rather costly in terms of dollars, as well as lives. IN THE EARLY DAYS, even the smallest airline accident made the national headlines. Now, only the four-engine ones have a perceptible impact, and then only for a week or so. A new problem will arise in the treatment of major helicopter accidents. First, because if the service is to be consistent with the

unique capacity of the machine, bad news as well as good news will express themselves close to home. The implications are many and obvious. Secondly, the impact of accidents will have an enormous affect upon economics in the form of high insurance rates and other prohibitions. Therefore, at all cost, they must be avoided.

Simplicity of design and penalties in structural weight -- a strange combination -- are some things we may have to live with for awhile, because we now have too many heavily loaded bearings, gears and other components, which result in altogether too many different periods of maintenance with consequent affect upon daily utilization and costs, as well. At this juncture, it appears to be about a toss-up between the so-called single rotor and the tandem. Stating it differently, both the Piasecki and Sikorsky have dual rotors, but they use the tail rotor for different purposes. I should like to see them both developed further because, undoubtedly, there is much to be learned from both principles. The controlling factor, however, may lean toward whichever scheme and configuration the power plant situation will eventually adapt itself most readily. I am of the opinion that for some time we will see the single engine design predominate, but, of course, with qualifications. First of all, I believe we are approaching the period in reciprocating engine design and maintenance when unpredictable failures in flight should be virtually nil. This, of course, is contingent upon using proven types of engines and designed for proper maintenance. This problem presents a glaring example in that we must not be carried away by fixed wing influences and practices. It must be remembered that multi-engine airplanes were designed essentially to navigate from one airport to the other in the event of engine trouble. This requirement does not pertain to helicopter flying because it does not need an airport to make a safe landing. All it requires is a small flat spot. It should also be remembered that even multi-engine

airplanes have troubles and drawbacks. Except for very heavy machines, it would appear that a rugged, oversized single engine with its simplicity of driving mechanism should provide sufficient safety for all known conditions except that one occasion which must always be regarded as possible. There is no reason why the helicopter should ever be in jeopardy if its pilot has one or two minutes of selectivity of landing sites, even in event of a main power plant failure. To cope with this, it is my feeling that perhaps supplemental power in the form of rocket engines attached to blade tips should be looked into. If solvable, this idea has some interesting prospects and is being given careful study by us.

I believe there is urgent justification for a commercial helicopter in two categories, the first being in the 6 to 8 thousand pound gross, and the second roughly double that size. The minimum speeds of the small size should be 100 m.p.h. and the other 120 m.p.h. cruise. A good rule-of-thumb may be 100 h.p. per thousand pounds of gross weight, as well as one passenger per thousand pounds of gross weight, in addition to a 200 lb. cargo capacity per thousand pounds gross weight. These figures should not be too hard to live up to even now. The cost of helicopters right now is exorbitantly high, the larger machines averaging \$19.00 per pound. Their obsolescence factor is very high. If we do a little planning, it should be possible to plan the life of future helicopters on a ten year basis. This, of course, will take into consideration a certain amount of standardization of basic specifications and other controlling factors with respect to the interchange and supplementing of major components from time to time.

I have made several prognostications on the characteristics of the helicopter airframe for scheduled commercial operations. In the light of experience, I have had to revise my thinking from time to time, so that now I confine myself pretty much to the generalities. I am

sure it is no secret that the more units we produce of a given design, the lower the price of the end product will be and the more reliable and serviceable it is likely also to be. With this in mind, I would also like to risk an observation, namely that there should be little or no reason, insofar as helicopter construction is concerned, for airtight military secrecy. Stating it differently, if the helicopter is considered as a work horse and rescue device, not a combat weapon, by the military, why then shouldn't we all sit down around a table and discuss the broad requirements applicable to both military and commercial purposes. This should at least be possible from the point of view of weight, as well as speed and stability factors, instrument and night flying devices, and many others. Then, if specific requirements warranted a branching out or refining on this point, it would be a strictly competitive matter. It should really be very simple to work up such a design, because the air frame of a helicopter is essentially a chassis for the mounting of components. I believe also that the design should contemplate a code of uniformity with respect to controls and instrumentation details so that components between various makes could even be interchanged. A round table forum such as this could also give engine manufacturers some sound advice on what a helicopter engine should look like, whether it be reciprocating engine, jet or rocket.

I can tell you that, even with the most reliable conventional engine in existence, our problems have not been lessened any by trying to adapt a conventional plane engine to a helicopter. In the past, of course, there were reasons for this, but in the future I do not believe there are.

At this juncture, I should also like to make one or two suggestions with reference to engine design. First of all, I do not believe that a helicopter engine has to be designed from scratch for helicopter purposes. At least, a vast improvement could be made in

the conventional engine if certain facts were considered at the time of design. For example, I don't regard it as a major engineering feat to construct an aircraft engine so that power could be taken from the back end as easily as the front end, as we now know it, and if this isn't possible, some simple means of remote accessory drive would be in order, particularly for the magnetos. There are many other points like this which will be developed from the school of hard knocks which helicopters are undergoing in an operation such as ours. But these problems will be easier to overcome and more results will be obtained quicker if we can concentrate our objectives.

The next phase of OPERATION AT WILL involves plenty of complications because it presumes complete dominance over weather conditions, particularly ground fog. We have approached this one pretty carefully because it appears that there is no common language with which we can study the problem.

We have equipped all of our machines with conventional instruments and have had reasonable results, but I must confess that we have not overcome the vibration problem sufficiently to guarantee uniformity and reliability of instrument performance. Here again, we are not positive that the answer lies in the conventional instrument procedure. Perhaps I should even say that we question whether this approach is sound.

We have directed considerable study in another direction, one by which perhaps several of the unique characteristics of the helicopter would be treated in one sweep. It is a little early to tell where we stand on this presently, but, in this day with so many new electronic devices as we have seen perfected in the last five or six years, it may well be that electronics will dominate in this chapter. Under the very best of circumstances, this path will be pretty circuitous and rough, at least in the beginning, but in an age where it is possible to

transmit voices and images around the world, why shouldn't it be possible for a pilot to see through fog? It would be a major dereliction of responsibility not to scratch pretty deep on this subject, and that, I assure you, we will do.

The other half of the picture to which I refer as GROUND SUPPORT has some pretty novel and interesting aspects too. After having made roughly 20,000 landings and take-offs from the rooftop of the Los Angeles Terminal Post Office Annex, our pilots have developed a sixth sense in detecting small flat spots from which they can operate, and it seems that this sense increases progressively so that nowadays Southern California appears as a forest of flat spots, commonly referred to as rooftops and, for the most part, at least in California, unused except to resist a little rainfall now and then. These rooftops, by and large, protrude up through the canyons almost as lighthouses beckoning for someone to use them. Now, if it is possible to operate from one rooftop, which we must have proven by this time, then it seems reasonable to develop this unusual dimension for what it would add in capacity to our overcrowded arteries of commerce. And this, of course, takes us to the outlying cities.

We feel that in a general way rooftop operation is safer from an operating viewpoint, cleaner and more efficient from a traffic viewpoint, and, in the long run, much more economical, bearing in mind the competing prices for open lots of sufficient size and properly located to be useful. We can visualize a situation where the helicopter rarely touches the ground because each city of any significance has a post office or other federal structure. Those which already have been constructed should immediately have a flat deck added to accommodate helicopters up to about 10,000 pounds gross and all federal buildings of the future should have this facility considered in its original planning, but based upon much greater gross capacity.

The idea should be carried one step further. Major airport administration buildings should have their helicopter landing facility on the top, in the same manner and for the same reason, so that the helicopters would discharge their cargo at a central point with elevator connection to the concourses of the connecting airlines and, of course, mail and cargo should be transferred to and from basement level of large terminals by means of conveyors instead of being handled and rehandled on small push carts.

From home-to-home, door-to-door, and desk-to-desk is what it is all about. Until the advent of the helicopter, aviation was in the transportation business up to a certain point. While it is true that man travels as many air miles as ever on his journey, he probably would not be buying air transportation in the first place, or he probably would not be using airmail and air express if he were not working against time to get to his ultimate destination.

New devices serving mankind have always appeared in the sequence of evolution. Space can be mastered fast only in the air space and, with our larger metropolitan areas growing to the size of some whole states or small countries, a machine capable of mastering both the air and the ground must take its place on the team of tomorrow.