

1952

Federal

Recommended Citation

Federal, 19 J. AIR L. & COM. 221 (1952)
<https://scholar.smu.edu/jalc/vol19/iss2/8>

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FEDERAL

THE AIRPORT AND ITS NEIGHBORS — REPORT OF THE PRESIDENT'S AIRPORT COMMISSION

May 16, 1952

Dear Mr. President:

We have the honor to transmit herewith our Report in response to your letter of February 20, 1952,¹ in which we recommend action to alleviate certain problems inherent in the present location and use of airports and, in addition, we propose policies and procedures designed to insure sound and orderly development of a national system of airports, to safeguard the welfare of the communities and to meet the needs of air commerce and the national defense.

An intensive study of all aspects of aviation that bear on the airport problem has been made. We have examined the record and have consulted with individuals and with organizations concerned with civil and military aeronautics and airport management. We have collected, compiled and analyzed the views and opinions of some 75 municipal governments of United States cities on the past, present and future of the airports in their communities and have visited 30 of the major airports of the country to confer with the local authorities and to see for ourselves what their problems and plans are.

In addition, we have obtained the views of civic associations representing people who live in the vicinity of airports but are not otherwise related to the aviation industry. Some of these groups were outspoken in their desire to be relieved entirely of the nuisance and exposure to potential hazard resulting from aircraft operations in their vicinity. The majority were more moderate in their views. Recognizing that aeronautics is an essential element of our national economy, they asked only that all possible steps be taken to minimize nuisance and hazard.

All civil organizations and government agencies dealt with have been most helpful and cooperative.

While the problems associated with airport location and use are far too complicated to be adequately dealt with in ninety days, and will require continuing study, your Commission has carefully weighed all information that it has been able to obtain and is in unanimous agreement on the statements and recommendations expressed in this Report.

Respectfully yours,

J. H. DOOLITTLE, *Chairman*

C. F. HORNE, *Member*

J. C. HUNSAKER, *Member*

SUMMARY REPORT OF THE PRESIDENT'S AIRPORT COMMISSION

The task of the President's Airport Commission has been to consider means to safeguard the lives of people living in the vicinity of airports and to alleviate for them, as far as possible, the disturbance that arises from the operation of aircraft. As directed by the President, the Commission has studied these problems in the light of an urgent need for continued development of both civil and military aeronautics for the welfare and safety of this country.

Establishment of the Commission was an outgrowth of a sequence of

¹ For text, see, 19 JOUR. AIR L. & COM., 101 (Winter 1952).

tragic accidents in the New York-Northeastern New Jersey metropolitan area. The fact that these mishaps were confined, by coincidence, to a single community accentuated fears of many Americans that aircraft represent a serious hazard to ground-dwellers. They also served to increase awareness of nuisance aspects in the use of airports, particularly with regard to noise. As the result of a careful and detailed study of both hazard and nuisance factors, the Commission feels that a great deal is being done to protect the people; it also feels that more could and should be done.

Along with every other vehicle invented and used by modern man, aircraft suffer occasional accident with resulting fatalities to their occupants. More rarely, people and property on the ground are also involved. Incidents of this sort are more likely to occur near airports because operations are somewhat more hazardous at terminals than enroute. Current improvements in equipment and in operational procedures, however, offer the possibility that accidents of all kinds will be further reduced. Accidents involving aircraft on airways and at terminals should eventually fall well below rates now considered normal for other forms of commercial transportation.

The same favorable trend cannot be forecast as confidently for the nuisance factors. Exhaust mufflers and slow-turning multi-blade propellers of large diameters have been applied successfully to quiet small airplanes. As aircraft become larger and faster, the power required to propel them and the resultant noise multiplies many-fold. Some noise reduction can be achieved, even in these large aircraft, by reduced propeller tip speed and by removing more energy from exhaust gasses, but reducing their noise to comfortable proportions still presents a difficult problem.

In the future, with wider use of high speed turbine-driven propellers or high thrust jet-propulsion, there will be a tendency for the volume of noise to increase beyond levels now experienced and for the character of the noise to become more objectionable. Research is now under way in these areas but the problems are technically difficult and no effective solutions are in sight.

Airport Growth

The growth of air transportation has put a severe strain on many major airports. Original facilities for handling airplanes in the air and on the ground and for taking care of passengers, mail, express and freight in terminal buildings have been outgrown. Many airports are approaching saturation. Some of them are badly out of balance due to a deficiency in one or another of their facilities. For example, some of our large municipal airports now have traffic control capabilities permitting a great many landings and take-offs per hour but their runways or their servicing facilities on the ground have not kept pace. In some cases runways which were once adequate in strength will not now support today's heaviest airplanes. Larger and faster airplanes making more landings and take-offs in worse weather will call for more adequate runways, larger clear approach areas and improved traffic control facilities and procedures.

Definite traffic patterns have been established by the Civil Aeronautics Administration at every major terminal airport in the country. These flight tracks have been designated after careful consideration of all flight safety factors. Serious efforts are being made to reduce ground hazard and noise. Eventually airports and their runways should be planned so that all approach and holding patterns minimize flights over thickly settled areas.

Tighter control of aircraft near airports must be achieved. To accomplish this, necessary equipment must be developed, procured and installed. Once adequate facilities are operational, positive traffic control at congested airports should be insisted upon at all times, even under what are now considered Visual Flight Rule conditions. The ceiling and visibility limits for VFR flights in congested terminal areas and the minimum ceilings and

visibilities under which aircraft are permitted to circle and maneuver after instrument approach should be raised.

Airport use becomes more complicated when there is joint use by civil aviation and the armed services. In the interest of economy it is common practice for air defense, military air transport or air reserve training units to be based on municipal airports. Combat airplanes are generally noisy and will probably become noisier with the advent of more powerful jet types. Because of the noise of military operations (especially on week ends) and because accidents have occurred, people living near such airports have complained. Joint military and civil use of major airports is undesirable. Separation should be effected whenever it is economically feasible. Military training operations over thickly settled regions should be prohibited.

In some cases, manufacturing plants are located on busy civil airports and both experimental and production aircraft are being flown from these airports. Recognizing the potential hazard involved, especially with the very fast jet types, some manufacturers have established test facilities on remote airports, and are making trial and shake-down flights away from congested areas. Whenever practicable this should be required. Flight delivery of production aircraft may be permitted under proper procedures and under conditions where nuisance and hazard to the surrounding community are reduced to the minimum.

Community Encroachment

Another aspect of the problem deals with the technical and economic forces which are pressing for airport expansion and which, in turn, are opposed by the encroachment of the surrounding community. Many communities are approaching an impasse arising from limitations to safe operation on existing airports combined with a physical inability to improve or extend them because homes or factories have been built close to the runway ends.

The pattern of development for major airports has been historically similar. Twenty years ago when airplanes were small in size and few in number, airport sites were selected at a distance beyond the city limits where ground was cheap and where few buildings obstructed the natural approaches to the field. Few then complained of the noise because it was infrequent and not very loud. As a matter of fact, this audible evidence of the arrival and departure of mail and passenger airplanes was often a source of local pride.

Normal growth, greatly augmented by the wartime movement of people to the cities, caused a spreading out toward the airport. Furthermore, the airport and its activities frequently acted as a magnet, drawing first the sightseer and then the businessman interested in concessions. Because desirable land was cheap, and a new and advantageous type of transportation was available, industries (sometimes aeronautical, sometimes not) settled near the airport.

Attached to all of these enterprises were people. People required homes within a short distance of their jobs. Speculators saw the opportunity to subdivide cheap land at a profit. Public utilities established primarily for the airport could be made available to the adjacent housing. Villages emerged, complete with shopping centers, schools, hospitals and recreation facilities. As a consequence, many municipal airports which were started less than two decades ago in the open country were progressively surrounded by residential and industrial areas.

The immediate problem is to find a way to protect present airports and the people residing near them by applying some means of control of ground use in approach zones. Local authorities should prevent further use of land for public and residential buildings near the ends of existing runways. If

this is not done, new contingents of home owners will be added to the ranks of those who are now protesting against noise and hazard. In time public pressure may threaten the continued existence of the airport and large investments of public and private funds will be jeopardized.

Zoning

This Commission has two suggestions to make in this connection: 1) that certain extensions or over-run areas be incorporated in the airport itself, and 2) that larger areas beyond such extensions be zoned by proper authority, not only to prevent the erection of obstructions that might be harmful to aircraft, but also to control the erection of public and residential buildings as a protection from nuisance and hazard to people on the ground.

Many airports already maintain cleared areas beyond the ends of paved runways to reduce the danger from accidental over-runs on landings, or from aborted take-offs. The Commission feels that no new airport should be planned without clear and, if possible, level areas at least 1,000 feet wide and at least one-half mile long beyond each end of the dominant runways. These areas should be incorporated within the boundaries of the airport.

Beyond such extensions, the problem of the use of the land in approach zones becomes more difficult because of the large area involved. For reasons shown elsewhere in the report, it would be desirable to protect approaches to dominant runways for a distance of at least two miles beyond the runway extensions. Such protective zones should be fan-shaped with a width of at least 6,000 feet at the outer ends.

Outright ownership of sufficient land at each end of the dominant runways would provide the best solution. There is no legal question but that airports engaged in interstate commerce are a public utility for which public funds may be expended. Also, there is no legal question but that states, counties and municipalities may join together to condemn land (where enabling legislation exists) outside the boundary of any one municipality for airport purposes. The cost of acquisition of sufficient land, however, is frequently beyond the capabilities of a single community.

Where it is not economically feasible to purchase such tracts of land so that absolute control of their use could be maintained, reliance must be placed on zoning laws to protect both the aircraft using the airport from obstructions to flight and the people on the ground from hazard and noise.

Although there are legal means to zone approach areas to protect aircraft from collision with obstructions, no zoning laws have been enacted to the knowledge of this Commission to control land use generally in approach zones. Consideration of basic property rights raises the question in both cases as to whether or not such control of use constitutes a "taking" of the property, and as such should be compensable to the owners.

Traditionally the power to control the use of land rests with the states and may be delegated to counties and local communities. The federal government should, however, propose model airport protective legislation for enactment by the states, and should help where practicable toward reaching a satisfactory solution of this type of zoning problem.

It is recommended that the responsibility for zoning be left with the states and their political subdivisions, at least for the present, and until they have had a full opportunity to cope with the problem under adequate federal guidance. It is further suggested that the federal government commit no funds for new airport construction unless the state, or other local authority gives reasonable assurance that the air approaches to the airport will be protected in accordance with the recommendations made herein. The land under the approaches should not be put to any use which might later serve as a basis for an effective argument that the space above should not be used by aircraft. Future residents should not be given any grounds for claims that aircraft approaching or departing from the airport, or which may be

involved in accidents, create a nuisance which entitles them to an injunction, to recover damages or to demand that the airport be closed.

The suggestions made above apply particularly to new airports to be laid out in areas free from natural and artificial obstructions. Such ideal conditions are to be found in a very few localities desirably adjacent to sources of air traffic. For a long time to come, therefore, most airports must make the best of existing conditions even if they must fall short of the ultimate airport specifications recommended here.

To promote the general welfare and to protect necessary systems of air transportation, it is essential that the major airports now engaged in interstate commerce, the postal service, or in defense activities be continued in operation. Furthermore, these airports must not be allowed to deteriorate. They must be continually improved to the greatest possible degree along the lines recommended. They should be made to approach the ideal airport as closely as local conditions permit. Local zoning authorities should employ their powers to prohibit further developments which will interfere with appropriate use of existing airports. Here also availability of federal funds should be dependent upon such local action.

Federal Assistance

Federal aid for construction at airports was inaugurated in the early 1930's. The Federal Airport Act of 1946 set up a continuing program with an authorized maximum expenditure rate of \$100 million per year. In general, the program called for financing airport projects on a "matching" basis, with the federal government providing grants-in-aid to the communities concerned. Unfortunately, this program has lagged because of inability to synchronize the availability of federal and local funds. Such difficulties should be resolved at the earliest possible date. Priority of expenditure of federal funds should be given to the lengthening of runways and to the acquisition of cleared extensions beyond the runways for incorporation in the airport.

Runway Design

A solution to many aspects of the airport problem is, in the opinion of the Commission, the early acceptance of the single or parallel runway design of airport with approaches over relatively clear areas. By this means, airport development could proceed along economical lines with minimum hazard and annoyance to neighbors. The single or parallel runway airport has one shortcoming—difficulty of operation in strong cross-winds—but this is being overcome through pilot training techniques, the use of tricycle gears and the further development of special cross-wind landing gears.

Too much emphasis has been placed on statistics of prevailing winds, including light and variable winds of little consequence in modern flying practice. As a result large sums still are being programmed unnecessarily for multiple intersecting runway airports, and too little consideration is being given to the hazard zones off the ends of these same runways. Simplified traffic control, economy of navigational aids, more effective use of radar, less airport acreage, room for expansion, protected runway extensions and smaller paved areas are favored by an oblong rather than a square airport. This is a principle that can be applied to new airport design, and in many cases, to present airports which are being hemmed in on some sides by residential areas. However, where high cross-winds are prevalent an additional but shorter runway, oriented at 90° to the dominant runway, will be needed for some years.

Runway Length

Some manufacturers suggest that future transport airplanes (derived from current long-range high speed bombers) could be designed to have a

marked gain in performance and efficiency if airports with runways several miles long with clear, flat approaches of several additional miles at each end were available. Such configurations for a few new airport projects might prove economically feasible, but for existing municipal airports such extensions are impractical. There are very few sites available within reasonable distance of population centers where airports with extremely long runways could be built. A well balanced system of civil air transportation, adequate to meet the needs of national defense, air commerce and the postal service calls for a widespread network of airports of reasonable size with the future to determine the requirements for a few "super" airports at strategic points for very long-range routes.

Most municipal authorities consulted by this Commission wish to retain their present airports. They urge that current standards of runway length be "frozen" and remain in effect for a substantial period of time in order to protect their already large investment. They argue that airplane designers should apply the results of research and invention to the improvement of the safety, performance and economy of their products within existing runway length limits.

Standard runway lengths for different categories of airports have been proposed. As many airports as possible should bring themselves up to these standards. It seems to this Commission that major air terminals should eventually provide principle runways for the use of transcontinental or inter-continental airplanes that are at least 8,400 feet long. A length of 10,000 feet should accommodate all types of practical transport airplanes now foreseen. Additional runway length would provide an additional safety factor but should not be required for normal operations.

A future change in the established standards for runway length should come only after compelling considerations. Its effect on the air transport industry would be world-wide. Few principal civil airports could undertake any substantial increase in runway length, and a new system of airports would have to be undertaken.

While runway length standards are desirable, it appears undesirable to specify a long term standard for strength of runway construction, or to attempt to limit airplane designers on airplane weight or wheel loads. Airports should be designed for the greatest wheel loads anticipated, and in the event that runways prove inadequate in strength for future airplanes, they can be reinforced or rebuilt.

Nuisance Factors

Some excuse may be found for failure to have foreseen the rapid rate of aeronautical progress in designing airports in the past, but it is to be regretted that more consideration was not given to the comfort and welfare of people living on the ground in the vicinity of airports. To be sure, many settled near an airport after it was in operation, with little realization of the potential nuisance and hazard. The public cannot be expected, however, to anticipate technical developments and it should be informed and protected by the responsible authorities.

The public deserves a clear explanation of necessary airport procedures, accompanied by valid assurances that everything possible is being done to alleviate both noise and hazard. For example, in low visibility incoming aircraft sometimes must be "stacked" near an airport under precise traffic control to prevent collisions. The public will understand and accept this necessity if it is assured that, within the limit of safe operation, the holding areas are selected so that the stacks will not be a source of nuisance. Also where operators are making a sincere effort to reduce engine run-up noise by controlled ground procedure and by the provision of proper acoustical treatment, and are avoiding take-offs over inhabited areas, reasonable

people can be persuaded to tolerate some noise as a part of the cost of living in this age of technology. Operators, pilots and airport controllers must be indoctrinated to consider the people on the ground and make every effort consistent with safe flying practice to reduce hazard and noise.

Aircraft designers and manufacturers must also assume a share of the noise alleviation task. So far, they have been concerned mainly with noise levels inside the airplane. They should also strive to minimize noise outside the airplane. If the manufacturer is given a penalty for high noise or better yet a premium for low noise level, it will stimulate competition in the development of quieter aircraft.

Standardization and Training

It is believed that through standardization and training, accidents due to pilot error can be reduced. There is, at the moment, a regrettable lack of uniformity of design and arrangement of transport aircraft cockpits. Not only is there variation between different types of aircraft, but also variations in the same type, depending on the ideas of individual airlines. A useful step in improving the training of pilots in emergency procedures would be the standardization and simplification of equipment in cockpits. Simplified emergency procedures naturally would follow. The pilot's job would be easier and safety would be increased.

More training in emergency procedures should be required. Simulated emergency drills, in airplanes without passengers, should be conducted periodically. Such training flights should, of course, be conducted over uninhabited areas. A method of training flight crews without hazard is through the use of flight simulators. These are complicated devices duplicating the cockpit and flight deck of the airplane. The equipment and instrumentation are operated by an instructor to simulate various emergency conditions. The crew then deals with the situation as it would in flight. Necessary practice is thus provided without risk. Since flight simulators are expensive and one is required for each type of aircraft, it may be necessary to purchase and use them on a cooperative basis.

Airport Planning

Alleviation of presently undesirable conditions is not enough. Policies and plans for the future must take into account trends in the air transport system of the nation. This will require continuing study.

It is to be expected that air transportation will continue to develop at a rapid rate. Municipalities should anticipate this expansion. They should plan for it and prepare to finance their share of it. Plans should include improvement of existing airports up to the point of balanced saturation and also the purchase of land required for additional airports some years before saturation is reached. If the latter is not done the purchase cost will be much greater and the chance of obtaining and protecting a desirable site correspondingly reduced. Insofar as topography, present land use and economies will permit, the airport should be as close as possible to the center of the area from which air traffic originates. Comprehensive forward planning is essential to the establishment of efficient, economical, nuisance-free airports.

Such planning may require changes in the laws that govern the use of the navigable airspace, including the flight path to and from airports. Coordination and standardization in the development of airports used in interstate commerce is necessary. It is possible that the future will call for a system of airports for a metropolitan area with separate facilities for certain types of air traffic. This involves regional and city planning and particularly questions of interconnecting highway and air services and the integration of the air and ground traffic. It also implies successful development of short-haul aircraft, possibly of the helicopter type.

The inadequacy of our present road network, particularly in the vicinity of major cities and between city and airport, is one of the greatest deterrents to the further development of transport aviation.

Navigable Airspace

As a result of fear engendered by low flying aircraft, several communities have recently passed local ordinances prohibiting flight over them at altitudes less than 1,000 feet. Along airways, such regulations would present no problem. They could, however, severely hamper approaches to certain airports. It is anticipated that the courts will shortly be called upon to decide this question.

This Commission believes that the federal government, through the Civil Aeronautics Board and the CAA, now has authority from Congress to regulate and determine approaches for airports used in interstate commerce. Accordingly, the CAA should determine what is the best approach pattern for a particular airport, and should then declare that the "safe altitude" in that area is in conformity with the airport approach pattern. Pursuant to the Civil Aeronautics Act of 1938, this should mean that there is a "public right of transit" in accordance with that airport approach pattern. If the pattern appears to depreciate property values of underlying landowners, the federal government might, if funds are made available by the Congress, exercise the power of eminent domain to acquire title to the land. If an easement through the airspace is involved, it appears that additional legislation would be required.

Airport Certification

It is clear that commercial airports are instrumentalities of interstate and foreign commerce. As such, they have a definite public character. Their continued efficient operation vitally affects interstate commerce, national defense, and the postal service. They are, however, at the present time subject to little federal regulation. The Commission believes that such regulation should be kept to a minimum, but also believes that more authority over such airports is required than is now provided by federal statutes.

The Civil Aeronautics Act authorizes the Administrator to inspect, classify and rate any air navigation facility (which includes airports) as to its suitability, and to issue certificates for any air navigation facility. But the Act does not require the issuance of a federal certificate to airports, nor does it make unlawful the operation of an airport without a certificate.

The Civil Aeronautics Act should be amended to require that certificates shall be issued for the operation of airports used in interstate commerce. Such certificates should define minimum standards for safe operation and proper maintenance and should be revoked if such standards are not met. The abandonment of such certificate or the closing of an airport for other reasons, however, should not be permitted except after notice and hearing and due finding that the proposed action is in the public interest.

COMMISSION RECOMMENDATIONS

The Commission feels that definite arrangements should be made and specific governmental agencies designated to develop and to implement the following recommendations:

1. *Support required airport development*—New airports will be needed and present airports must be improved. State, county and municipal governments should be prepared to assume their proper share of this expense.

2. *Expand Federal-Aid Program*—Authorization of matching funds for federal aid to airports should be implemented by adequate appropriations. Highest priority in the application of federal aid should be given to runways and their protective extensions incorporated into the airport, to bring major municipal airports up to standards recommended in this report.

3. *Integrate municipal and airport planning*—Airports should be made a part of community master plans completely integrated with transportation requirements for passenger, express, freight and postal services. Particular attention should be paid to limited access highways and other transportation facilities to reduce time to the airport from sources of air transport business.

4. *Incorporate cleared runway extension areas into airports*—The dominant runways of new airport projects should be protected by cleared extensions at each end of *at least* one-half mile in length and 1,000 feet wide. This area should be completely free from housing or any other form of obstruction. Such extensions should be considered an integral part of the airport.

5. *Establish effective zoning laws*—A fan-shaped zone, beyond the half-mile cleared extension described in Recommendation 4, at least two miles long and 6,000 feet wide at its outer limits should be established at new airports by zoning law, air easement or land purchase at each end of dominant runways. In this area, the height of buildings and also the use of the land should be controlled to eliminate the erection of places of public assembly, churches, hospitals, schools, etc., and to restrict residences to the more distant locations within the zone.

6. *Improve existing airports*—Existing airports must continue to serve their communities. However, cities should go as far as is practical toward developing the cleared areas and zoned runway approaches recommended for new airports. No further building should be permitted on runway extensions and wherever possible objectionable structures should be removed. Operating procedures should be modified in line with Commission recommendations for minimizing hazard and nuisance to persons living in the vicinity of such airports.

7. *Clarify laws and regulations governing use of airspace*—Authority of the federal, state or municipal governments with respect to the regulation of the use of airspace should be clarified to avoid conflicting regulation and laws.

8. *Define navigable airspace in approach zones*—The limits of the navigable airspace for glide path or take-off patterns at airports should be defined.

9. *Extend Civil Aeronautics Act to certificate airports*—The Civil Aeronautics Act should be amended to require certification of airports necessary for interstate commerce and to specify the terms and conditions under which airports so certified shall be operated. Certificates should be revoked if minimum standards for safety are not maintained. Closing or abandonment of an airport should be done only if clearly in the public interest, by properly designated authority.

10. *Maintain positive air traffic control*—Certain air traffic control zones in areas of high air traffic density should be made the subject of special regulations to insure that all aircraft within the zone are under positive air traffic control at all times regardless of weather.

11. *Raise circling and maneuvering minimums*—Present straight-in instrument approach minimums are considered satisfactory but the minimum ceilings and visibilities under which aircraft are permitted to circle or maneuver under the overcast in congested terminal areas should be raised.

12. *Accelerate installation of aids to air navigation*—Research and development programs and installation projects designed to improve aids to navigation and traffic control in the vicinity of airports, especially in congested areas, should be accelerated. Installation and adequate manning of radar traffic control systems should be given high priority.

13. *Revise present cross-wind component limits*—Existing cross-wind component limitations should be reviewed to establish more liberal cross-wind landing and take-off specifications for each transport-type aircraft.

14. *Develop and use cross-wind equipment*—Although modern transport aircraft can operate successfully in any but very strong cross-winds, the further development and use of special cross-wind landing gears should be accelerated.

15. *Extend use of single runway system*—New airports should adopt a single or parallel runway design. This should be adequate except under strong wind conditions, in which case a shorter runway at 90° to the main one may be required. Present airports should plan to develop the dominant runway at the expense of those less used. Airport expansion should be achieved through additional parallel runways.

16. *Meet standard requirements for runway length*—For each category of airport a standard runway length has been established consistent with its future planned use. Airports should bring their runways up to the standard. For inter-continental or transcontinental airports, the length of the dominant runways should be 8,400 feet with possibility of expansion to 10,000 feet if later required and with clear approaches as per Recommendations 5 and 6.

17. *Accelerate ground noise reduction programs*—Engine run-up schedules and run-up locations should be adjusted to minimize noise near airports. Adequate acoustical treatment in run-up areas and at test stands should be provided.

18. *Instruct flight personnel concerning nuisance factors*—A tight discipline with respect to airport approach and departure procedures to minimize noise nuisance to people on the ground (within the limits of safe operating procedures) should be maintained at all times.

19. *Arrange flight patterns to reduce ground noise*—Airways and flight patterns near airports should be arranged to avoid unnecessary flight over thickly settled areas to minimize noise, but only within the limits of safe flight practice.

20. *Minimize training flights at congested airports*—Flight crew training should be conducted, as far as practicable, away from thickly settled areas and with a minimum number of flights into and out of busy airports.

21. *Minimize test flights near metropolitan areas*—Production flyaway from aircraft factories under proper conditions is acceptable but all flights of experimental aircraft and test flying of production models near built-up areas should be reduced as far as possible.

22. *Avoid military training over congested areas*—Although the basing of reserve air units at airports near cities has been considered generally desirable, and the location of certain combat units there is sometimes necessary, training maneuvers, particularly with armed military aircraft, should be conducted only over open spaces. Rapid shuttle service to an outlying military training field offers minimum interference with civil air operations and maximum safety and freedom from nuisance to people on the ground.

23. *Separate military and civil flying at congested airports*—Military aircraft should not be based on congested civil airports except when it is not economically or otherwise feasible to provide separate facilities for them nor should commercial aircraft operate regularly from busy military airports.

24. *Provide more flight crew training*—Every flight crew should be required to have frequent drills in instrument and emergency procedures. This can be accomplished in part in flight simulators. These flight simulators should be located at convenient points and should be available to all operators on a fair basis.

25. *Develop helicopters for civil use*—Concurrent with military helicopter development, interested government agencies should encourage civil helicopter development for inter-airport shuttle services, and for short-haul use, emphasizing safety, reliability and public toleration factors.