San Fernando Valley State College

INCOMPATIBLE LAND USE AROUND

HOLLYWOOD-BURBANK AIRPORT

A thesis submitted in partial satisfaction of the requirements for the degree of Master of Arts in

Geography

by

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ABSTRACT

INCOMPATIBLE LAND USE AROUND
HOLLYWOOD-BURBANK AIRPORT

by

Ogden LeRoy Shutes
Master of Arts in Geography

July, 1971

This study was inaugurated in the belief that understanding the origins of present land use is requisite to solving the problems of obtaining and maintaining compatible land uses within airport environments.

The three basic factors influencing land use compatibility are identified as noise, hazard, and fear. The tolerance of specific areas to these factors varies according to the existing land use activity. Some land uses are not compatible within an airport environment, notably residential and institutional uses.

Hollywood-Burbank Airport is used as the study example because it was created in a compatible rural environment which subsequently was surrounded by urban land uses, some of which are incompatible with the airport.
operations.

The historical development of land use patterns surrounding Hollywood-Burbank Airport is traced through the interpretation of air photographs from 1928 to 1970. The findings of this study reveal that the initial urban use of the land tends to persist and is difficult to change in order to maintain land use compatibility in an expanding airport environment.

There is a need for comprehensive land use pre-planning in a jet-age airport environment to ensure compatible land use. Hopefully, more effective and currently maintained research will be conducted to provide a better understanding of compatible land use in an airport environment and to provide palliative solutions to existing land use problems and proper preplanning for the jet-age airports of the future.
CHAPTER I

INTRODUCTION

Urban Land Use Near Jet Airports

Communities located in the vicinity of large commercial airports have shown an increasing dissatisfaction with having to endure the noise, hazard, and fear, caused by jet aircraft. The Valley News and Green Sheet on 11 April 1971 quoted California Senator Alan Cranston as saying that "Two million to ten million persons with homes near airports throughout the nation are living in unacceptable noise environments. These people are subjected to serious interference with their rest, privacy, and sleep, and many of them are forced to suffer psychologic disruptions." In the Southern California area in 1970, a Burbank Citizens group calling itself the Burbank Anti Noise Group (BANG) was instrumental in convincing the Burbank City Council to inaugurate a city ordinance imposing a curfew on jet aircraft departing Hollywood-Burbank Airport between the hours of 11 PM to 7 AM. This ordinance went into effect on 1 May 1970.
Lockheed Air Terminal, Inc., the operator of Hollywood-Burbank Airport, appealed to the courts for relief from the restrictions of this ordinance and on 1 October 1970, E. Avery Carey, a Judge of the U. S. District Court, handed down a decision invalidating the ordinance because it dealt with the field of air traffic which is preempted by federal legislation, and because it would place an undue burden on interstate commerce.

Thus, it seems that the citizens who are forced to endure the disturbances caused by jet aircraft are unable to control the source of the disturbance, and, therefore, must seek another solution to the problems caused by jet aircraft. The question is thus raised of the origin of these intolerable circumstances.

Airports require such large amounts of level land that they are usually built in rural environments where large areas of relatively cheap level land are available. The agricultural uses of the surrounding land are compatible within airport environments at this point in time. It is after the access roads are built connecting the airports with existing urban areas that the land developers and speculators make their appearance and start building the residential housing demanded by the continually expanding urban population. The once rural airports are soon
completely surrounded by residential areas and by the schools and community service centers needed by residents. These new residential uses are often situated in locations which render them incompatible with the airport environments nearby.

Purpose of the Study

Studies have been made of airports throughout the United States of the compatibility of current land uses within airport environments. However, in a review of the literature, no historical studies were found detailing the development of present land use patterns within airport environments. This study was inaugurated in the belief that understanding the origins of present land uses is requisite to solving the problem of obtaining and maintaining compatible land uses within airport environments.

The purpose of this study is threefold: first, to identify conditions within airport environments which should be considered in order to control the selection of surrounding land uses; second, to identify and describe the evolving urban landscape surrounding Hollywood-Burbank Airport between 1928 and 1970 and thereby to identify and measure the urban land uses incompatible with that airport; and, third, through an evaluation of the changing situation
in the area of Hollywood-Burbank Airport, to reveal any modifications which would render present land uses compatible within that airport environment.

Definition of an Airport Environment

In this study, an airport environment includes the airport itself and all land included within a circle, the radius of which extends approximately two miles from the ends of the runways. This is consistent with other studies of land use around airports. For instance, in its report to the Federal Aviation Administration (FAA), Transportation Consultants, Inc. (1966:19) states that:

The consideration of actual land uses ... on and around the airport provides an evaluation under maximum conditions of noise exposure from aircraft on the ground or in flight ... Areas beyond approximately three miles, if recommended Federal Aviation Administration climbout and approach procedures are used, would have less noise exposure. Therefore, uses that are compatible within this approximate area should be even more compatible when installed beyond it.

This study is confined to a two-mile limit from the airport in order to focus upon a restricted area having a severe intolerance to aviation operations.

The Study Area

Hollywood-Burbank Airport is an example of an airport which was born in a compatible rural environment, but which
subsequently became surrounded by urban land uses, some of which are incompatible with the airport operations. Field research for this study area is limited to the surrounding area which is affected by the airport.

Methodology and Procedures

In their text prepared for the Committee on Land Use Statistics, Clawson and Stewart (1965:11) comment on historical comparisons obtained by the recording of changes, or modifications in land use:

There is great value in historical comparisons of data relating to land, but this can best be accomplished by comparison of observations taken at two defined points in time, each for the same area and each so clearly defined as to location that no confusion will arise. An attempt to record past changes in land use, except by such clear identification of the situation at specified points in time will almost certainly lead to confusion.

The present study makes historical comparisons of land uses; it satisfies the above methodological criteria for the acquisition of data at definite locations, and for definite points in time, through the use of air photographs.

Land use maps of the area surrounding Hollywood-Burbank Airport are drawn from this writer's interpretation of air photographs taken one year prior to the beginning of construction of the airport, 1928, and continuing to the
present with a series of evaluations for the years 1938, 1949, 1960, and 1970. The areal extent of each land use category is measured on the maps to determine the relative degree of incompatible land uses for each year studied.

Accuracy of the airphoto interpretation is verified through the listings in city, business, and telephone directories. Finally, these land use maps are compared in order to trace through time the development of land uses which are incompatible within the environment of Hollywood-Burbank Airport.

Importance of the Study's Findings

The fact that compatible land use around airports is a critical contemporary problem is discussed by Bulban (1967:42), who affirms that joint planning among appropriate governmental and private parties is urgent for large airports. Dorn C. McGrath, Director of the Metropolitan Area Analysis Division of the Department of Housing and Urban Development, is quoted by Bulban to substantiate his assertion:

Viewed in the perspective of vanishing open land, rising airport development costs and the aviation industry's growing noise problems, achieving land use compatibility is more urgent and complex than many interests are willing to admit. The 'airborne blight' of jet aircraft noise, extending far beyond the boundaries of the property the aircraft actually use, is becoming a greater source of conflict and a common symptom of land use incompatibility.
This writer believes that an understanding of the processes which foster the development of land use patterns around airports, whether compatible or incompatible, should be of value to future airport and urban developers in pre-planning compatible land use zoning. The development of the Palmdale, California airport into an intercontinental jet air terminal is currently under consideration and is an example of an airport whose planners are specifically aiming for compatible land uses. Comprehensive studies of the Palmdale site are being made for this very purpose.

The preplanning for compatible land use prior to the construction of an airport facility, and the programing of specific modifications of land use through the period of the airport's operation, require an understanding of land use classifications and an understanding of the elements of airport environments which foster specific land uses. Chapter II presents identification of these elements, a brief discussion of their relevance within the environment of an airport, and points out the current urgency for proper action on the part of airport designers and civic authorities.
FOOTNOTES FOR CHAPTER I

1. For example, see the following newspapers, magazines, and government publications for treatment of the problem of airport disturbance in the surrounding communities:


   b. *New York Times*, 10 August 1969. HUD and the Transportation Department announce four grants totaling $166,734 for studies on aircraft noise abatement to be made at Kennedy, O'Hare, Bradley International, and Cape Kennedy regional airports.

   c. *The Valley News and Green Sheet*, Van Nuys, California, 29 August 1969. Preliminary steps taken at meeting of approximately sixty Burbank residents in a grass roots movement to join forces in combating jet aircraft noise created by planes using Hollywood-Burbank Airport.


   e. *The Valley News and Green Sheet*, Van Nuys, California, 17 March 1970. David M. Simmons, president of Lockheed Air Terminal, Inc., urges the Burbank City Council to consider restrictive zoning and other
land use measures as possible solutions to the noise problem at Hollywood-Burbank Airport.


g. Los Angeles Times, 16 August 1970. P.J.C. Friedlhandler, of the New York Port Authority, suggests that homeowners in the vicinity of Kennedy, LaGuardia, and Newark airports join forces to press for a new jetport in the New York area instead of continuing their individual protests against the disturbance created at the individual airports.

h. Los Angeles Times, 10 September 1970. One billion dollar program urged to curb Los Angeles jet aircraft caused noise.

i. Los Angeles Times, 23 October 1970. Judge upholds Inglewood residents' right to sue the owners of Los Angeles International Airport over the airport generated disturbance to the surrounding residents.

j. New York Times, 17 November 1970. FAA official, L. N. Million, Jr., says regional airports should be built on forty square-mile plots owned and controlled by the government. He says that direct ownership of the land by the government would provide the most positive method of controlling effects produced by aircraft operations by using the land for compatible purposes.

k. The Valley News and Green Sheet, Van Nuys, California, 22 January 1971. Captain
Paul Soderlind, chief test pilot for Northwest Airlines, said that rezoning airport environments and soundproofing some homes is probably the most effective means of controlling sound produced by aircraft.

1. Aviation Week, 8 June 1970. C.E. Schneider, "New Jersey Court Sets Curfew For Jets."

m. Office of Science and Technology, Executive Office of the President. Report of the Jet Aircraft Noise Panel. Alleviation of Jet Aircraft Noise Near Airports, A report of the Jet Aircraft Noise Panel, March, 1966. This is a collection of papers (21) which were presented at a one day meeting of the Jet Aircraft Noise Panel on 29 October 1965. These papers cover all aspects of problems caused by noise produced by jet aircraft in an airport environment -- how to reduce the noise, the possibility of zoning for compatible use, and documents specific cases of airports in the United States including attempts at legal action taken by residents of areas surrounding airports to control or limit airport activities.

2. Senator Cranston was quoted in The Valley News and Green Sheet, Van Nuys, Ca. article as saying that the figure of two million to ten million people was furnished to him by experts on the airport induced problem.


6. For example, see the following:


b. Bishop, Dwight E. and Richard D. Horonjeff, Procedures for Developing Noise Exposure Forecast Areas for Aircraft Flight Operations, Bolt, Beranek, and Newman, Inc., August, 1967. FAA Technical Report DS-67-10. They have developed a system of noise contours around an airport determining land compatibility according to the Effective Perceived Noise Level the area is subjected to by approaching or departing aircraft.
CHAPTER II

LAND USE COMPATIBILITY IN AN AIRPORT ENVIRONMENT

Recency of Its Importance

Public media are currently placing emphasis on the multiple problems involved with compatible land uses around an airport. Indeed, the issue has assumed news value, what with citizens organizing into groups and approaching civic authorities and airport management to protest against existing airports, as well as the development of proposed new facilities. Perhaps this recent public exposure has elicited the initial awareness of many people, who have not been directly affected by an airport environment. The problem is crucial, and authorities are deeply involved in an effort to solve the many difficulties.

When viewed from Kitty Hawk, site of the first successful flight of a power-driven airplane in 1903, certainly the problems created by land use compatibility are relatively recent. According to Tillett and Weiner (1955:1), "It probably started during World War II with the tremendous expansion in both numbers and size of
aircraft. During the slightly more than a quarter-century since that war, immense urban expansion has often engulfed airports originally built in rural areas. Further, today's airplanes are far larger and noisier than anything envisaged by the original airport builders. These and other causes were recognized in Southern California a decade ago in a project conducted by the Southern California Laboratories of the Stanford Research Institute (1961:37):

Southern California's rapid population expansion and development of suburban areas have surrounded many previously remote airports with houses, schools, and other land uses not compatible with aviation. At some airports the problem has been further complicated by the noise of jet engines and extension of runways to accommodate larger aircraft. Increases in the volume and frequency of operations have also aggravated the problems of airport-community relations. Some air commerce airports have been closed for safety reasons over extended periods of time. More recently, flight rules, designed to protect the public from the noise of jet operations have forced uneconomic take-off and landing detours, restricted hours of operation, and have otherwise prevented efficient use of aircraft because of the greater need to protect the public.

The following study is a historical survey of the development of such incompatible land uses around Hollywood-Burbank Airport.

Basic Factors Influencing Land Use Compatibility

An initial step in planning compatible land use in an area around an airport is to note the area's proximity to
the airport, and to review the three basic factors which influence land use compatibility: noise, hazard, and fear.

Noise. Many researchers place emphasis on the factor of noise as the principal problem, while other studies of compatible use of land in airport environments are solely concerned with this factor. In a current report for the Office of Noise Abatement of the Federal Aviation Administration (FAA), Galloway and Bishop (1970:1) review the introduction and expansion of commercial jet aircraft, which greatly increase the noise factor:

For almost two decades the increasing magnitude of aircraft operations has brought increased concern over the noise aircraft produce in communities surrounding airports . . . . During most of the decade of the 1950's, almost all jet aircraft were operated by the military agencies. Concern over aircraft noise led the Air Force to conduct a series of major investigations of the noise properties of jets, methods of noise control for test operations, and the effect of noise from aircraft operations on communities surrounding air bases.

In the late 1950's and the early 1960's the introduction of commercial jet aircraft in large numbers greatly expanded concern over aircraft noise. Whereas most jet aircraft operations were previously restricted to military bases, now most large metropolitan areas, and an ever increasing number of smaller communities, received noise from jet aircraft in increasing numbers.

Bishop and Horonjeff (1967:1) prepared a study for the FAA's Department of Transportation, in which they devised complex formulas and procedures to create noise
contours around an airport. They developed a concept, which they called Noise Exposure Forecast (NEF) that depicts those "land areas having different degrees of noise exposures which influence the land use and the reactions of people residing in the given land areas."

In terms of noise level, the noise produced by jet engines is not necessarily louder than that of piston-propeller engines, but it seems to be more annoying. Marte and Kurtz (1970:19) suggest the idea of a perceived noise level where the weighting scale is based on annoyance criteria rather than simply on equal loudness. They further refine this to the concept of an effective perceived noise level:

Recent research, still in progress, has further refined the perceived noise level concept by inclusion of factors to express the added annoyance due to time duration to which a subject is exposed to the noise, and the presence of pure tones, which prove more irritating than broadband noises of the same pressure level.

Hazard, as an influencing factor in land use compatibility, presents a dual problem in that it is significant to low flying aircraft, as well as to people and structures on the ground. Particularly vulnerable areas are the immediate vicinity of the airport boundary, and the land under approach-departure paths of aircraft. Thus, in these areas the use of land for multi-level structures
should be prohibited.

For example, on a foggy morning in December, 1962, an airplane on an instrument approach to the east-west runway of the Hollywood-Burbank Airport inadvertently maintained too steep a glide path and crashed into an area of homes one mile from the airport. Death resulted for four people in the airplane and four people on the ground.¹

As recently as July, 1969, seconds after taking off from the north-south runway at Hollywood-Burbank Airport an airplane crashed into the seven-story monument "Portals of the Folded Wing" at Valhalla Memorial Park. Death resulted for two people in the aircraft.²

The potential of an aircraft accident posed by low, circling airplanes around an airport creates a hazard to its total environment, and any land use that would bring together a large concentration of people in the open (i.e., spectator sports, outdoor theaters) would also constitute unwise planning.

Fear of the possibility of an aircraft accident, expressed by people living in the vicinity of airports, is an additional factor which can compound the problem of maintaining land use compatibility within an airport environment. The probability that an aircraft accident will involve people on the ground is less than may be generally
supposed, as Transportation Consultants, Inc. (1966:17) show in a statistical table on non-occupant fatalities involving several modes of transportation. Over a fourteen year period from 1950 through 1963, all types of aircraft were responsible for only sixty-six non-occupant fatalities as compared to 121,853 non-occupant fatalities caused by railroad passenger trains, and 4,908 non-occupant fatalities caused by buses.

However, the fear of aircraft accident expressed by residents in the vicinity of airports can vitally affect the operation of an airport, whether this fear of aircraft accident be real or imagined. By public demand, the Newark Airport was closed in 1952 following a series of three aircraft crashes within a six-month period which resulted in fatalities to residents on the ground. The airport was not allowed to reopen until a new runway was constructed, and the air traffic pattern was changed to minimize low flying aircraft over residential areas. In their report of the incident, Tillett and Weiner (1955:52) disclose a consequence, which is in favor of those who live in an airport environment:

The Newark Airport episode won one thing for residents around airports -- recognition that public and private agencies concerned with airport operations have an obligation to abate the resulting nuisance
to the residential communities surrounding the facility.

The preceding points up the significance of land use compatibility problems around commercial airports. Noise from jet aircraft is the principal problem element although hazard and fear are also problematic. A more detailed assessment of this problem can be made by evaluating the generalized physical layout of an airport and the suitability for adjacent use of several land use categories.

Variance in Land Use Compatibility

A typical airport layout (Figure 1) displays the three divisions of land to be considered in terms of adaptability for various uses. Within this airport environment, there is a small degree of variance in the compatibility of land uses.

Airport. Most land uses within the area of the airport proper are directly concerned with airport operations, and therefore are compatible with the environment.

Approach-departure paths. The land area directly under approach-departure paths, utilized by aircraft landing or departing from the airport is most subject to noise, hazard, and fear. Thus, it is this area where the problem of compatible land use is greatest.
Figure 1

Typical Airport Layout

1. Airport proper.
3. Other adjacent land, extending approximately two miles from ends of runways.
Other adjacent land. Land area adjacent to the airport perimeter, and extending two to three miles from the ends of the runways is, of course, less affected by the airport environment. However, compatible uses of such land is desirable, particularly near the airport perimeter.

General Categories of Land Use

Specific land uses have different tolerances to an airport environment, and this factor is taken into consideration in the general classification of land uses. Transportation Consultants, Inc. (1966) designates eleven general categories of land use in its report to the FAA on compatible land use planning. The following is a listing of these categories, including a brief discussion of the compatibility of each within airport environments, and ground photographs of selected examples:

Natural. Wildlife and fish preserves, forests, open land, and rivers or bays are all part of the natural uses of land. Wildlife seems to readily adapt to the increased levels of noise, and most natural land uses are compatible within the airport environment. It is not unusual for an airport site to be chosen because of the surrounding natural land use, since this area serves as a sound buffer zone between the airport and occupied zones. Such areas,
especially expanses of water, provide an unobstructed approach to the airport.

However, there are two exceptions to the compatibility of natural land uses. First, there is appreciable danger to low flying aircraft from a likely collision with birds attracted to areas directly beneath approach-departure paths at an airport's perimeter. Secondly, swampy lowland regions in the immediate vicinity of an airport require specialized rescue equipment in the event an airplane is forced down in the water saturated area.

**Agricultural.** Land use for almost all agricultural purposes is compatible within airport environments, with the possible exception of poultry and mink farms because of their negative reaction to the noise and disturbance created by aircraft. Agricultural use of airport property itself (Zone 1, Fig. 1) is often undertaken to produce income from otherwise unproductive land. However, the area should not be utilized for growing small grain crops that might attract flocks of birds.

**Recreational.** Public parks, swimming pools, athletic fields (Photograph 1), botanical gardens, tennis courts, and golf courses are examples of recreational uses which are aviation compatible except where spectator crowds are exposed to the danger of an aircraft accident. Since parks
Photograph 1

Recreational Land Use Around Hollywood-Burbank Airport
and golf courses are designed with vast open spaces, they afford not only an unimpeded approach to the airport proper, but also a comparatively safe place for an emergency landing. Further, the master airport plan can incorporate well designed recreational areas to serve as buffer zones between the facility itself and the surrounding occupied land.

**Railroads, freeways, and highways.** When freeways or highways are located closer than one-half mile from the ends of runways, approaching aircraft can be an interesting distraction to motorists, resulting in automobile accidents. Otherwise, railroads (Photograph 2), freeways, and highways are generally compatible around an airport, and they have proved to be excellent buffer zones. It is suggested that planning and construction of the nation's ever expanding network of freeways and highways should take into consideration their desirable function as buffer zones in airport environments.

**Municipal utilities.** Tall structures such as power transmission lines (Photograph 3) and smokestacks are hazardous under approach-departure paths and thus should not be allowed. Smoke producing installations, such as incinerators and certain industries, decrease pilot visibility, and should be banned from this environment. The
Photograph 2

Transportation Routes Around Hollywood-Burbank Airport
Photograph 3

Power Transmission Lines Around
Hollywood-Burbank Airport
so-called "sanitary land-fill projects" should be prohibited at the ends of runways (Zone 2, Fig. 1) as they tend to attract flocks of birds that menace low flying aircraft.

**Industrial.** In terms of mutual compatibility, the use of land for industry is perhaps the use most adaptable to the immediate airport property (Photograph 4), or around its perimeter. Buildings containing equipment and workmen can be soundproofed, airconditioned, and virtually sealed off from the airport environment. However, those industries, which depend on readings from delicate instruments, would exclude themselves from the environment because vibrations from operating aircraft cause inaccurate readings. Conversely, it would be essential to ban certain industries if they produced electronic interference with the airport's instrument landing systems. Other exceptions are smoke producing installations and tall structures.

**Commercial and service.** Commercial and service oriented land use (Photograph 5) are identified as those which attract the consumer to the premises, such as restaurants, retail stores, office buildings, motels, and car service stations. These are all aviation compatible activities, particularly when soundproofing and air-conditioning provide isolation for both employees and
Photograph 4

Industrial Land Use on the Property of Hollywood-Burbank Airport
Photograph 5

Commercial and Service Oriented Land Use Around Hollywood-Burbank Airport
shopper-consumers from aircraft created environmental disturbances. However, contrary to the acceptable close proximity of industrial activity to the airport itself, commercial and service oriented enterprises should be located in more outlying areas. This would allow more adequate protection for the heavy pedestrian traffic.

**Institutional.** Institutions such as schools, churches, community halls, and the like are particularly vulnerable to potential hazard from aircraft accidents and high noise levels. This would seem to preclude the advisability of institutional land use within airport environments.

**Resource production.** Mining, or sand and gravel pits are generally aviation compatible activities. However, machinery equipped with tall booms should not be placed close to the ends of runways, because of the obvious danger to low flying aircraft.

**Residential.** Land use for residential purposes presents major problems regarding compatibility within airport environments. Multiple family residences (Photograph 6) are a little more adaptable to the environment than the smaller homes for single-family occupancy. Many apartment buildings are soundproofed and airconditioned to protect persons inside. However, outdoor activity is exposed to high noise levels. Thus, they should be constructed in
areas well away from airports for full utilization of these outdoor facilities. Multi-level apartments should not be located under approach-departure paths.

Single and two-family dwellings (Photograph 7) are greatly exposed to the three basic factors (noise, hazard, and fear) which make this type of residential land use particularly incompatible near airports. Occupants of individual homes usually have outdoor patios and swimming pools, but any enjoyment of these appurtenances is understandably threatened by low flying aircraft and other airport oriented disturbances. Although houses may also be soundproofed and airconditioned, indoor family life is still subjected to the nuisance of noise and electronic interference that disrupts television and radio reception. Furthermore, single-family residential property values, especially under approach-departure paths of aircraft, have been found to be depressed when compared to single-family residential values of neighboring land not so directly affected by an airport environment (Shutes, 1969).

Vacant land. While it is not a "use" in the same sense as other categories, a vacant and idle area is a necessary classification in order to account for all land in a land use survey. Quite often, especially in a
Photograph 7

Residential Land Use--Single- and Two-Family Homes
Around Hollywood-Burbank Airport
developing urban area, land may be vacant only temporarily while in a period of transition from one type of land use to another. Such a "use", if specifically decreed, is not only aviation compatible, it also serves as an effective buffer to less compatible urban uses.

Every airport has its own individualized problems in attempting to maintain compatible land use in an aviation oriented environment. However, conclusions can be made as to the adaptability of general land use classifications within an airport environment. Natural uses and agricultural uses are generally compatible any place within an airport environment. Recreational uses, land used for transportation routes and public utilities, and industrial land uses are not only generally compatible within an airport environment, they can be utilized as a buffer zone shielding less compatible land uses. Commercial and service oriented land uses, when properly designed and located, can be compatible within an aviation centered environment. Residential land use, especially for single-family dwellings, and institutional uses such as for schools and churches, are the least compatible land uses in an airport environment and should be entirely excluded if possible.
Summation

During World War II, technological advances in the aircraft industry started the trend toward today's larger, noisier airplanes, and the related problems of compatible land uses around airports. Subsequent to that War, the situation advanced to its current importance by the widespread growth of suburban areas that encompassed formerly isolated airport installations.

An airport environment is defined as the airport per se, land directly under the approach-departure paths, and other adjacent land extending approximately two miles from the ends of the runways. In this environment, there is a degree of variance in the compatibility of land use, which is influenced by three basic factors: noise, hazard, and fear.

Land can be classified into general categories according to how man uses the land, and a determination can be made as to the compatibility of each land use within an airport environment. Some land uses are not compatible within an airport environment, notably residential and institutional uses.

Chapter III traces the development of changing land use patterns adjacent to one airport, the Hollywood-Burbank Airport from 1928 through 1970.
FOOTNOTES FOR CHAPTER II


CHAPTER III

HISTORICAL DEVELOPMENT OF LAND USE PATTERNS
SURROUNDING HOLLYWOOD-BURBANK AIRPORT

The Study Area

Hollywood-Burbank Airport is located at the eastern end of California's San Fernando Valley in the City of Burbank (Map 1). Adjacent land includes areas in both Burbank and the City of Los Angeles. The present study is concerned with the various uses of this surrounding land in terms of compatibility or incompatibility within the airport environment.

Since colonial times, land use in the area has undergone complete transformation from agricultural use to the current, highly developed urbanized communities with the most drastic changes occurring during the study period, 1928-1970. The San Fernando Mission Fathers, who were the original land use managers of the area, used the land for grazing (Height, 1953:18). But due to lack of a dependable supply of water, which caused the loss of thousands of head of sheep during the draught of 1877, the area was converted
Map 1

Hollywood-Burbank Airport Environment

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Automobile Club of Southern California.
into one huge wheat field (Height, 1953:44). The wheat which was sown in late fall was matured by winter and spring rains. After summer harvesting, the land lay fallow until the late fall planting (Height, 1953:52).

The Los Angeles aqueduct, with its completion in 1915, brought a dependable flow of water from the Owens River Valley into the area. This led to intensification of agriculture into citrus orchards and truck farms, as well as to the start of real estate subdivisions. As they became clusters of settlements, these subdivisions led to the development of the first San Fernando Valley communities. According to Height (1953:50), it was at this time that

The basic street and rail patterns were laid out . . ., setting the course of all future development in the San Fernando Valley. . . . Natural routeways through the valley, especially the route of the railroad in the east end and the proximity of the easily accessible southeast portion of the valley, spurred the first community development.

This initial development of the valley comprised the townships of Burbank and old Lankershim (the latter now designated North Hollywood), now the area of the Hollywood-Burbank Airport environment.

1928 Land Use Patterns

In 1928, the airport was not yet in existence and the land use patterns (Figure 2) for the area which would
Figure 2

1928 Land Use Patterns

Source: Fairchild Aerial Surveys, Inc. Aerial photographs taken in May 1928. Interpretation by the author.

Percent of Land in Selected Uses

- Natural 17.0
- Agriculture 37.5
- Parks and Outdoor Recreation 1.1
- Industrial .8
- Commercial 1.0
- Gravel Pits 1.3
- Single-Family Residence 12.7
- Multiple-Family Residence 0.0

- Schools
- Railroad Line
- Power Transmission Line 28.6
- Freeway
- Vacant
later surround the Hollywood-Burbank Airport were almost exclusively agricultural (37.5 percent of the study area). The only industrial site was at the juncture of the two railroad lines (map coordinates J-13), the beginning of Lockheed Aircraft Corporation. Other industrial activity at this time was confined to the extraction of rock and gravel throughout the Tujunga Wash. Total industrial land use was 2.1 percent of the area.

Clusters of single-family residences (12.7 percent of study area) scattered throughout the region were the nuclei of today's valley towns. The widening and improving of Cahuenga Pass in 1926 created easier access to the valley from Hollywood, and this increased both subdivision activity and the rate of population growth (Jennings, 1944). These changes are noticeable in the land use patterns by the concentration of single-family residences in the southern half of the area, which is closest to Hollywood.

It is probable that the large areas of vacant land (28.6 percent) in the southeast quadrant are due to subdivision activity, indicating the land use as being in a state of transition from agricultural to residential and commercial uses.

The overall picture of land use in this part of the San Fernando Valley in 1928 still reflects the valley's
rural heritage with only the beginning development of town sites and service centers.

1938 Land Use Patterns

Union Air Terminal (Photograph 8), predecessor of Hollywood-Burbank Airport, was built by United Aircraft Corporation and officially opened in 1929. Height (1953: 116) asserts that the Terminal site was selected because of the availability of cheap flat land, favorable climate for aviation activities, and established road connections with Los Angeles.

The area's 1938 land use patterns (Figure 3) disclose that the predominantly agricultural land use (40.1 percent) persisted through the decade. Lockheed Aircraft Corporation (J-13) remained the sole industry in the area aside from airport oriented industrial activity.

There was an increase in the area (to 17.5 percent) devoted to single-family residences, but more important, the aerial photographs depict a significant increase in the density of houses in these areas. The development of essential community services for this growing population is indicated by the five commercial centers (E-6, F-8, H-3, H-11, and N-5) shown on Figure 3, an increase from three in 1928. These centers developed into the cores of
Photograph 8

Air Photograph of Union Air Terminal in 1929. Looking north.

Picture Courtesy Lockheed Aircraft Corporation
Figure 3
1938 Land Use Patterns


Percent of Land in Selected Uses

- Natural 13.3
- Agriculture 40.1
- Parks and Outdoor Recreation 1.5
- Industrial 1.0
- Commercial 1.2
- Gravel Pits 1.6
- Single-Family Residence 17.5
- Multiple-Family Residence 0.0

- Schools
- Railroad Line
- Power Transmission Line 23.8
- Freeway
- Vacant
today's major commercial service centers.

New schools, necessary to enlarged residential communities, were built between 1928 and 1938. These schools and some residential areas are extant in 1971 despite the fact that some of them (B-9, E-7) experience undesirable exposure to the basic aviation factors of noise, hazard, and fear. These residential and school sites probably were more acceptable in 1938 because of the smaller planes and far less air traffic. This apparent persistence of incompatible land use suggests that it is difficult to change land use patterns once they have been established.

Another land use which would become incompatible in the jet aircraft era was the power transmission line (F-1 to 0-10) which presently (1971) is a hazard to aircraft because of its close proximity to the end of the E-W runway. But again, it is likely that this was not a hazard for the small planes and light air traffic in 1938.

Hanson and Beckett (1944:48) state that the entire San Fernando Valley experienced a period of marked increase in building activity during the decade of the thirties. They estimated that fifty-six percent of the houses extant in 1940 had been built in the thirties. This trend is portrayed for the study area by the land use maps (Figures 2 and 3) which show an increase in single-family
residential land use from 12.7 percent in 1928 to 17.5 percent in 1938. A notable decrease from 17.0 percent to 13.3 percent occurred in natural land use. The predominately agricultural land use continued with only a modest increase of 2.6 percentage points.

1949 Land Use Patterns

A substantial increase (from 1.0 percent to 4.7 percent) in the area devoted to industrial activity is revealed in the 1949 land use patterns (Figure 4). World War II brought rapidly expanding aircraft industry to a logical location in the immediate vicinity of the airport (H-10). Jesse Kitchens (1970), Airport Manager, stated in an interview that Lockheed Aircraft Corporation acquired the airport in 1940, and that the runways were extended by the army engineers during World War II. Although the company maintained its original site east of the airport (J-13), much of Lockheed's manufacturing operation had been moved to the airport by 1949.

An even greater change in land use in the forties was the expansion of the areas for single-family homes from 17.5 percent of the study area in 1938 to 44.1 percent in 1949. This occurred at the expense of agricultural lands which decreased from 40.1 percent to 7.1 percent. This
Figure 4

1949 Land Use Patterns


Percent of Land in Selected Uses

- Natural 16.8
- Agriculture 7.1
- Parks and Outdoor Recreation 1.7
- Industrial 4.7
- Commercial 6.6
- Gravel Pits 2.3
- Single-Family Residence 44.1
- Multiple-Family Residence 1.1
- Schools
- Railroad Line
- Power Transmission Line 15.6
- Freeway
- Vacant
explosive urban growth resulted from the influx of workers to man the aircraft factories engaged in war oriented production. This situation, with its attendant circumstances, is described by Jennings (1944:72):

In the San Fernando Valley the urban growth has been extremely rapid. From 1940 to 1943 the population increased by 40%, and now [1944] is greater than 217,000. The reason for this rapid growth is that the valley still has much nearly level land available for residential expansion, and the aviation industry that has centered there is large enough to support the growing population. Whole blocks of single-unit houses are erected at a time, and all exactly alike. Whole fields of beans, alfalfa, or tomatoes are transformed over night. Super Markets and trading centers are built in a matter of weeks. Houses are sold before they are built. The airplane factories operate around the clock and business houses and places of entertainment follow suit. Theaters advertise 'Open All Night' and ballroom signs read 'Dance till Dawn'.

Except for the government approved housing to accommodate the many war workers and their families, subdivision of the land and building construction were retarded throughout the valley. But with the lifting of wartime building restrictions, the latter years of the forties witnessed a postwar boom in these activities. The postwar homes continued the trend of expanding single-family residential use since they were almost identical to those erected earlier in the decade. Hanson and Beckett (1944:48) asserted this was due to the willingness of
those confirmed suburbanites . . . to suffer the inconveniences of 25-50 miles per day on traffic choked highways in order to insure themselves of a rural atmosphere and an opportunity to indulge in small time farming.

Toward the end of the forties, the building of apartment complexes began (M-8). This type of housing continued to invade the valley through the fifties and sixties.

The soaring population fostered a predictable increase (1.2 percent to 6.6 percent) in commercial land use. These business districts appeared along the major boulevards in what Height (1953) refers to as "string type" commercial districts, which were characteristic of valley settlement. Thus, several main arteries in the valley can be traced by their string-type commercial land use: Lankershim Boulevard (N-4 to I-3); Burbank Boulevard (N-6 to L-13); and Magnolia Boulevard (O-9 to N-13).

More schools were necessary to care for the increased student enrollment, but in the selection of sites, it is apparent that little, if any, regard was given to the adverse effects of the airport environment on school activities and safety (M-9, M-10, L-9, J-10, E-6, and E-8).

Compared to present day jet aircraft, the airplanes of 1949 were relatively small and quiet and, therefore, probably caused little concern for land use planning. However, ongoing research in the aircraft industry, and
testing of prototypes, should have made it quite evident that future aircraft would be larger, noisier, and more apt to create hazard and fear. Nevertheless, an examination of the 1949 land use patterns demonstrates that insofar as proper zoning for land use is concerned, the city planners neglected to account for the effects of a future airport environment on the activities assigned to the land nearby. The continued urbanization of the airport area throughout the decade of the forties did result in the near exclusion of agricultural land use, and it suggested that, with foresight, the city planners might have enacted and enforced appropriate zoning laws to ensure compatible land use prior to and during this transformation.

1960 Land Use Patterns

During the fifties, agricultural land use diminished from 7.1 percent to 0.9 percent of the study area, primarily as a result of continuing invasion by residential areas. At the turn of the decade, therefore, the 1960 land use patterns (Figure 5) reveal that agriculture had become vestigial throughout the study area.

There is also evidence of continued expansion (from 4.7 percent to 9.2 percent) of industrial land use around the airport, and along the two railroad lines. These in-
Figure 5

1960 Land Use Patterns

Source: Fairchild Aerial Surveys Inc. Aerial photographs taken in May 1960. Interpretation by the author.

Percent of Land in Selected Uses

- Natural 15.1
- Agriculture .9
- Parks and Outdoor Recreation 1.6
- Industrial 9.2
- Commercial 10.6
- Gravel Pits 2.6
- Single-Family Residence 43.1
- Multiple-Family Residence 3.0
- Schools
- Railroad Line
- Power Transmission Line 13.9
- Freeway
- Vacant
Industrial areas were compatible within the airport environment.

The most notable land use change evidenced is the increase (1.1 to 3.0 percent) in multiple-family dwellings, which usually were apartment complexes covering several blocks in an area. Many of these structures had invaded areas formerly used for single-family residences (M-7, K-4, I-3, J-13, and H-11), areas which concomitantly decreased in extent from 44.1 to 43.1 percent. These apartments are located in areas marginal for that kind of land use (I-3, J-3, and J-5), but they would have been acceptable if they had been equipped with proper soundproofing and air-conditioning. Although the multiple-family apartment buildings located east of the airport (H-12, J-14) normally would have been considered unacceptable in the airport environment, they were somewhat compatible because low flying aircraft probably did not operate near the foothills which originate two miles east of the Hollywood-Burbank Airport.

Further extension of the existing string-type commercial districts along the principal boulevards increased the area of commercial activity from 6.6 percent to 10.6 percent of the study area. A report of the San Fernando Valley Planning Area Study (1967) considers this string-type commercial development to be typical throughout the
east valley. The concentration of commerce at major inter-
sections heralded the eventual growth of shopping malls in
the sixties of which Victory Plaza Shopping Center located
at the corners of Victory and Laurel Canyon Boulevards (K-2)
is an example.

The majority of additional schools were built in the
newly developed single-family residential areas on the
fringes of the airport environment. These schools were
better located than most of the older established ones in
the area, but their sites were not entirely satisfactory
in terms of safety and disturbing noise.

The automobile, having played a major role in the
development of the valley from the beginning, assumed
greater significance with the emergence of the freeway sys-
tem that provided commuters with fast through routes be-
tween the valley and Los Angeles. The Ventura Freeway was
the first to open, in 1960, and the Golden State Freeway
was already under construction.

The decade of the sixties witnessed the near demise
of agricultural land use within the study area while areas
devoted to commercial and industrial uses continued to ex-
pand. Residential areas continued to expand due to
multiple-family residences which more than compensated for
a slight decrease in single-family residences.
1970 Land Use Patterns

The trend toward construction of apartment complexes in the late fifties continued to invade the single-family residential areas (Figure 6), and became the major land use change through the mid-sixties, raising the land in this use to 5.2 percent within the study area. Many of the multiple-family dwellings represent an expansion of existing complexes (J-5, J-2, and L-7). A study of 1970 air photographs and a field inspection, however, expose a large number of individually constructed multiple-family residences in areas of primarily single-family homes, especially along main thoroughfares. Since their design is complementary to the predominant land use for single-family residential areas, these units are not indicated in the land use figures. However, this particular pattern of construction has resulted in a scattering of multiple-family buildings throughout all of the single-family land use areas.

According to the traditional alignment of railroads and industry, it follows that the major increase (from 9.2 percent to 12.3 percent) in industrial activity occurred as a westward movement along the railroad lines. Since this development of industry is under an aircraft approach-
Figure 6
1970 Land Use Patterns


Percent of Land in Selected Uses

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<th>Use</th>
<th>Percent</th>
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<td>Agriculture</td>
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<td>Industrial</td>
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<tr>
<td>Commercial</td>
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<tr>
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- Schools
- Railroad Line
- Power Transmission Line 13.8
- Freeway
- Vacant
departure path, it occupies one of the least desirable areas for other types of land use.

The land use for commercial purposes decreased from 10.6 percent of the study area in 1960 to 8.8 percent in 1970. The notable change of the sixties was the development of two large regional shopping centers (I-2 and K-2) containing one or more of the major department stores. This type of commercial development is tolerable in the airport environment because soundproofing and airconditioning of the buildings serve to isolate both the employees and the customers from most environmental disturbances. The string-type commercial districts are still predominant, but they have lost their prominence as neighborhood shopping areas in favor of the one-stop regional shopping centers. A tour of Magnolia, Burbank, and Lankershim Boulevards reveals many unoccupied buildings along their string-type commercial districts.

The power transmission lines (F-2 to 0-10) existed before the airport was built, and it may not have been a hazard to the smaller aircraft flying prior to the jet age. Yet the lines have become a definite hazard to the large commercial jets of today because aircraft landing on the E-W runway have to pass over these high lines. It is probably not feasible to relocate the lines because of the
prohibitive cost.

By 1970, only two agricultural land use areas (G-2 and F-11) have survived the era of urban consolidation which occurred during the decade of the sixties. Yet the expanded industrial development that has infringed on the production of crops is an example of land use activity far more compatible to the airport environment than development into single-family residences. The unfortunate location of numerous single-family homes remains the critical consideration in the area surrounding the airport. Projecting to the end of the seventies, this problem may be eliminated if the construction of multiple-family apartment complexes continues to replace these single-family residential land use areas.

Summation

The historical development of land use patterns (Table 1) surrounding Hollywood-Burbank Airport is traced from 1928, one year prior to the facility's construction, to 1970. Four significant changes occurred during this period: (1) the demise of agricultural land use, initially the predominant use; (2) the emergence of single-family residences as the major land use; (3) the concomitant growth of commercial districts; and (4) the growth of
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Table I

Percent of Land Use, by Type, for the Study Area

Percent computed by the author
aviation oriented industry.

The basic agricultural characteristic of the land persisted until World War II; in 1940 40.1 percent of the study area was in agricultural land use. Military requirements fostered expanded production of aircraft and this, in turn, stimulated the rapid growth of aviation related industrial development in the immediate vicinity of the airport, thus raising the land devoted to industry to 4.7 percent in 1949. The predictable influx of manpower to serve industry occurred, making necessary the use of land for more homes, schools, and commercial areas in order to accommodate the increased population. Land for single-family residences peaked at 44.1 percent in 1949, while commercial use had grown to 6.6 percent of the land in the study area.

Growth in residential land use after 1949 was limited to multiple-family residences which multiplied through 1970 when 5.2 percent of the study area comprised that land use. Industry continued to expand, occupying 12.3 percent of the land by 1970. Commercial land use decreased, however, from its 1960 peak of 10.6 percent of the land, to 8.8 percent in 1970.

This almost phenomenal growth of land use for purposes other than farming or livestock rendered the
surrounding agricultural areas practically nonexistent by 1960. With the exception of certain single-family and school sites that still occupy areas incompatible with the airport environment, the current industrial and commercial activities are relatively acceptable and well located in the vicinity of the airport. Thus, in terms of compatibility with the immediate environment of Hollywood-Burbank Airport, the most notable change in land use during the period of the airport's existence was the growth of residential land use to nearly half (46.8 percent) of the study area. This occurred primarily at the expense of aviation compatible agricultural land use.
CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

From this study of the historical development of land use patterns in the Hollywood-Burbank Airport environment, several conclusions may be reached and recommendations may be made. First, incompatible land uses were allowed to develop in the Hollywood-Burbank Airport environment because land use zoning was ex post facto rather than preplanned. Second, little can be done at Hollywood-Burbank Airport to make the land use compatible with the airport environment. Third, there are several implications for the future of Hollywood-Burbank Airport and for compatible land use in the environments surrounding other airports projected.

The three basic factors of noise, hazard, and fear which prevail in a technologically changing airport environment can cause some existing land uses to be considered incompatible with the changed airport environment. However, the findings of this study reveal that the initial urban use of the land tends to persist and is difficult to change in order to maintain land use compatibility in an
expanding airport environment.

In the Hollywood-Burbank Airport environment zoning was not preplanned. As the San Fernando Valley Planning Area Study (1967:23) asserted, it appears that in the San Fernando Valley the land use usually preceded the zoning, "the later zoning merely recognized pre-existing conditions."

The Los Angeles Planning Commission Office has some historical zoning atlases covering the study area for the years 1930, 1932, 1942 and 1946. They show that no attempt had been made to zone land use in the study area at the time the airport started flight operations. As late as 1946, most of the land in the study area was zoned for residential use. The exception was in commercial and industrial zoning which recognized the existence of the string-type commercial districts and the World War II initiated manufacturing activities on the airport itself and in the areas east and west of the airport.

Without preplanned proper zoning and enforcement, there is no way to insure compatible land use in an expanding airport environment. In the case of the San Fernando Valley area surrounding Hollywood-Burbank Airport, there does not appear to have been any attempt to zone land use before the land use was in existence.
The existing problem with the Hollywood-Burbank Airport environment is one of achieving land use compatibility in an area where much of the existing land use (41.6 percent of study area used for single-family residences) is incompatible with the present jet aircraft airport environment. Four possible solutions to the problem are presented:

1. Remove the source of the incompatibility by closing the Hollywood-Burbank Airport. However, since this is the only commercial airport with scheduled airline flights serving the highly populated San Fernando Valley, there is a definite need for the airport.

2. The operators of Hollywood-Burbank Airport could purchase all the land in the airport environment and thus control the land use to maintain compatibility. However, since Hollywood-Burbank Airport is privately owned, it does not have the power to acquire privately owned land through condemnation procedures, nor does the airport command the financial resources which would be required to purchase all the land in the vicinity of the airport which is in incompatible uses.
3. The land in the airport environment could be re-zoned by city authorities to re-acquire compatible land use, but it is inconceivable that they would or could enforce new zoning laws in such a large developed area.

4. A compromise between the airport operators and the surrounding city governments might be mutually agreed upon. Such an agreement could curtail the flight operations to specific hours and to specific flight patterns. While such a compromise would not assure total compatible land use, it could offer a solution which would permit the airport to continue operating and could afford a partial land use compatibility acceptable to most of the residents of the airport environment. Although it is not plausible to assume that this recommendation could correct all of the seemingly insuperable difficulties, it appears to be a much more acceptable avenue for improvement than the other alternatives mentioned such as closure of the airport.

The only way compatible land use in an airport environment can be guaranteed is for the airport management
to control the land use planning in the area of the airport. There is a need for comprehensive land use planning in an airport environment which needs to be implemented and enforced, preferably early in the preplanning of an airport.

In the case of the Hollywood-Burbank Airport, as well as for most other urban centered airports, there appears to be no economically feasible method of re-acquiring total land use compatibility in an airport environment. The survival of these airports as functioning entities in the national air transportation system will have to depend on their ability to adopt operational compromises which will be acceptable to residents in the airport environment.

Airport planners, in their quest for large expanses of relatively cheap level land, will probably seek out areas removed from urban centers such as unproductive desert areas connecting the airport with the urban centers by some method of rapid transit.

The Los Angeles Department of Airports Information Brochure (1970:13) describes the plan for such an airport of the future located in a desert area in the Antelope Valley north of Los Angeles. The installation itself would occupy 17,000 acres, and management would have control over land in its immediate vicinity for the purpose of excluding
incompatible land use. This calculated foresight is a unique example of preplanning, and the concept of the projected superport is described by Palmdale's Mayor L. W. Chimbole. In anticipation of the need for planning and development to meet air transport operational requirements of the last quarter of this century, Chimbole (1971) states:

The very size of the airport is itself a major first step in the effort to prevent the kinds of problems we see in Westchester, Inglewood and all those beleaguered communities surrounding LAX.

The second logical step is the Los Angeles Regional Planning Commission's Impact Study which will provide the city of Palmdale and the County of Los Angeles with a guide for planning which will make available transportation and land-use information useful in the prevention of environmental encroachment and transportation deficiencies.

The research study will require more than two years before construction can begin, and to make the facility operational will require at least seven years. But the mayor believes in the validity of the preplanning, "while at the same time, we insure that the free-enterprise air transportation industry will be able to grow in southern California" (Chimbole, 1971).

In view of the findings of the present investigation into land use patterns, the writer believes that the Palmdale Superport concept is the first of its kind in the
United States, and strongly concurs with the initial studies undertaken to aid in preplanning, regardless of the consequential delay in completing the facility.

Many studies of compatible land use have been made since about 1952 when, presumably, the impact of aviation's technological jet age was fully realized to be in advance of adequate preparation for it. Hopefully, more effective and currently-maintained research will be conducted to provide a better understanding of and potential solutions to existing problems. Indeed, the prevention of further deterioration of existing airport environments depends upon remedial and palliative measures. By the same token, if there is truth to the adage that hindsight is better than foresight, then past experience points to the wisdom and cogency of purposive preplanning for the airport of the future.
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