The purpose of this paper is to show how the utilization of commercial air service by Californians is reflected in the pattern of intrastate routes and in the traffic frequencies of these routes.

Figure 1 is based on the May, 1962, issue of the Official Airline Guide and includes all scheduled service by common carriers, except that it does not include helicopter service in the Los Angeles and San Francisco areas. The intrastate flights flown as segments of international routes by Pan American Airways and foreign flag carriers, which have no traffic rights within the state, are not shown either. Routes from California points to out-of-state points are shown only from localities other than Los Angeles, San Diego, and San Francisco.

The routes illustrated on Figure 1 are operated by 6 trunkline carriers, 3 regional carriers, and 2 intrastate carriers. In general the routes with frequencies greater than 28 flights weekly are operated by trunkline carriers, and those with 28 or fewer flights weekly by regional and intrastate carriers.

Frequencies vary greatly between different sections of the state, and the contrast between the highest and lowest route frequencies within California is the greatest within any state in the United States. The greatest frequencies are between the Los Angeles and San Francisco metropolitan areas with 289 flights in each direction. In contrast to this, many routes in the state have only seven round-trip flights weekly.

The Los Angeles, San Francisco, and San Diego areas generate the greatest number of flights. The Los Angeles area alone generates more than 850 intrastate flights weekly out of the Los Angeles, Burbank, Van Nuys, and Long Beach airports. This means a take-off or landing every three minutes and does not include the interstate or international flights which form the bulk of the traffic. In contrast to the metropolitan areas, some of the smaller cities in the state, such as Chico, are served by less than 21 flights weekly.

What are the factors which are important in determining the route and frequency patterns shown on Figure 1? The most important, and most obvious, is population distribution. There is a definite correlation between the pattern of routes and a map of population distribution. The sparsely settled mountain and desert areas have few routes in contrast to the coastal and central valley areas.

Population distribution not only influences the location of routes to a great extent, but it also influences the frequencies of flights on those routes. In general, the population of terminal cities influences route frequencies more than any other factor. For example, the Los Angeles-San


Diego and Fresno-San Francisco routes have approximately the same lengths and functions, but the former route has a much higher frequency because of the larger populations of the terminal cities.

Population distribution, however, is not the only factor governing route and frequency patterns. Places such as Glendale, Richmond, and San Bernardino, all of which have large populations, do not have air service. This draws attention to the phenomenon known as traffic shadow. Traffic shadow is the tendency of one city in any cluster of cities to act as the air traffic receiving point for the entire cluster.

Traffic shadow is prevalent in many areas of the state but is most apparent in the three large metropolitan areas. There are three types of traffic shadow, none of which is necessarily exclusive of the others in any given city, and examples of all can be found in California. The most important may be termed “absolute” traffic shadow, and exists when the city or cities over which the shadow is being cast have no air service. For example, the Ontario and Riverside airports cast an “absolute” shadow over San Bernardino. Other examples include the Los Angeles, Burbank, Van Nuys, and Long Beach airports which cast an “absolute” shadow over all the other cities in the Los Angeles metropolitan area, and the Imperial airport, which casts an “absolute” shadow over El Centro and Brawley.

The second type of traffic shadow is “partial” traffic shadow, and this exists when one airport casts an imperfect shadow over another airport. In other words, the more important airport will draw some, but not all, of the traffic away from the less important airport. The airport over which the shadow is cast will have routes to many of the same points the more important airport does, but not to all of the points. For example, San Francisco and Oakland cast an “absolute” shadow over all of the other Bay area cities, but San Francisco casts only a “partial” shadow over Oakland. The Los Angeles airport casts a “partial” shadow over the Burbank, Van Nuys, and Long Beach airports.

The third type of traffic shadow, and the one most poorly represented in California, can be termed “reciprocal” traffic shadow. This exists when cities which are within range of each other’s traffic shadow have routes to different cities. The only example in California is the traffic shadows of the Los Angeles and Long Beach airports. Long Beach has a route to Avalon Bay, which Los Angeles does not have, but there are many places to which Los Angeles has routes which cannot be reached from Long Beach.\(^3\)

Special city functions also play an important role in both route distribution and frequency. The most striking case is Inyokern, a small town of about 500 people in the Mojave Desert, whose population could not possibly justify air service except for the fact that Inyokern is located adjacent to a naval testing installation. The military function is also present in routes to Lancaster-Palmdale, Oxnard, Vandenberg AFB, Van Nuys, and, possibly, Apple Valley. Deactivation of military installations at or near these places would probably cause a decrease or even abandonment of air service.

A resort function is a substantial stimulus to California air service. The most obvious case is the route from Long Beach to Avalon Bay, which

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serves an almost entirely tourist traffic. This resort function is also present in routes to Palm Springs, Apple Valley, Monterey, and Santa Barbara.

Another factor which is important in the establishment of air service to a few of the smaller towns in the state is route position. Places such as Blythe would not have air service if it were not for the fact that they lie on routes between major cities; for example, Blythe has air service because it lies on the route between Los Angeles and Phoenix. If the Los Angeles-Phoenix route did not exist, Blythe could not generate enough traffic to justify a route of its own from either of the terminal cities of the present route. If Needles were in a similar route position as Blythe, it would probably receive air service.

What are some of the unique characteristics of air transport in California? One of the most striking, when comparing Figure 1 with air route maps of other parts of the world, is the absence of places with service of less than fourteen flights weekly. The reason for this apparently lies in the alternatives which are available to the California air passenger. For example, a businessman living in Crescent City who must travel to San Francisco will take the plane if he can return the same day or early the next morning. If, however, the route were operated only three times weekly, travel by automobile or bus would actually be faster for him. This explains why such places as Lone Pine, Bishop, and Alturas do not have scheduled air service by certified carriers. They could all probably generate enough traffic to support a route which had a frequency of three flights weekly, but such service would attract no commercial traffic. It must be noted that many of these smaller places do have scheduled air taxi service and this is a partial substitute for common carrier service.

An attempt has been made to present the patterns of California air transport as they exist today and some of the geographical bases for these patterns. It should be emphasized that these patterns, and their underlying causes, are not static but in a constant state of change.