Collection of Travel Behavior Data. In Travel Analysis Methods for the 1980s, Special Report 201, TRB, National Research Council, Washington, D.C., 1983, pp. 48-62.
5. W. Brög and A.H. Meyburg. Consideration of Non-Response Effects in Large-Scale Mobility Surveys. In Transportation Research Record 807, TRB, National Research Council, Washington, D.C., 1981, pp. 46-50.
6. W. Brög, E. Erl, A.H. Meyburg, and M. Wermuth. Problems of Non-Reported Trips in Surveys of Non-Home Activity Patterns. In Transportation Research Record 891, TRB, National Research Council, Washington, D.C., 1982, pp. 1-5.
7. A. Baanders, J.M. Garden, and W. Brög. Panels: Attractions and Pitfalls. Presented to the PTRC Summer Annual Meeting, University of Warwick, Coventry, England, July 1982.
8. W. Brög, K.-H. Neumann. The Interviewee as a Human Being--A Critical Contribution to the Discussion of Methods in Empirical Social Research. Presented to the ESOMAR Seminar on Ways and New Ways of Data Collection, Jouy-en-Josas, France, Nov. 1977.

Publication of this paper sponsored by Committee on Aviation Economics.

Helicopters and Urban Communities

DAVID S. LAWRENCE

ABSTRACT

The principal beneficiary of helicopter services is the urban community, and the growing presence of helicopters in metropolitan areas, now a factor in the management of urban land and airspace resources, has elicited controversy. The benefits and the social costs of helicopter operations in urban communities are addressed, and the steps taken to enhance the benefits and minimize the costs are identified. Three issues are examined: (a) heliports are far less obtrusive in the urban environment than has been believed; (b) the helicopter's benefit to communities is principally transmitted through businesses; and (c) the issue of land use, particularly the allocation of land resources to heliports, is widely misunderstood. Specifically addressed are the two familiar costs of community helicopter operations, noise and anxiety; and a third, less obvious social cost, that of foregone opportunity. Steps taken by members of the helicopter community to enhance benefits and minimize costs are described. These steps involve both technology and communications. In the longer run, however, these improvements go beyond the amelioration of social costs--they reflect understanding between helicopter operators and the communities they serve, and they reflect a convergence of their objectives.

Although helicopters have been produced and sold since 1939, the modern-technology civil helicopter, as such, is largely the result of technology transfer from the Vietnam War period. The acceleration of civil helicopter technology since 1970 is analogous to that of fixed-wing technology after World War II--marked by quantum improvements in performance, reliability, and cost, which combine to clothe rugged military aircraft in the amenities and economics of commercial aviation.

This evolution has been accompanied by a dawning realization that the principal beneficiary of helicopter services is the urban community. Helicopters have provided unique, essential, and often dramatic services in rescue, air taxi, medical evacuation, police work, high-rise construction, and even the rapid clearing of financial paper. All of these services contribute meaningfully to the preservation and even the enhancement of the increasingly compromised amenities of urban life. This unique service value to the community is perceived by urban political and business leaders, whose demand for helicopter services has drawn helicopters to metropolitan areas in growing numbers.

In the past 20 years, the number of helicopters in major metropolitan areas has grown at an annual rate of about 15 percent--twice the rate for the country as a whole. The presence of helicopters has now become a factor in the management of urban land and air-space resources, and like other resource users, helicopters and their necessary heliports have elicited controversy. Most community leadership, mindful of overriding benefits, considers helicopters a necessity--not unlike factories and freeways--whose

inherent inconveniences are an acceptable part of the metropolitan equation. Others, however, consider helicopters as potentially noisy and intrusive and either do not understand or do not accept their necessity. The issue is one of perception: the external costs of urban helicopters (e.g., noise) are obvious; the benefits are not always obvious, because they are generally indirect.

Both the benefits and the social costs of helicopter operations in urban communities are addressed in this paper, and the steps taken to enhance the benefits and minimize the costs are identified.

BACKGROUND

The genesis of this analysis was a continuing investigation by helicopter manufacturers and operators, independently and under the aegis of the Helicopter Association International (HAI), into the economic and social functions of their products. An extensive benefit-cost analysis was begun in 1982, and early results of that work were presented at the HAI Annual Meeting in February 1983.

A major premise of that study was that heliports provided significant direct financial benefits, specifically municipal revenues, to their communities. The first tentative conclusion of the 1982 analysis, however, was that the premise was not well-founded. A survey of major public-use heliports produced evidence that direct financial benefits were not well-perceived and were either marginal or nonexistent, except for the four public-use heliports in New York City.

At the same time, three other conclusions that led to further analysis were reached in the 1982 study. First, heliports were far less obtrusive in the urban environment than had been believed. Second, notwithstanding the obvious considerations of public services, the helicopter's benefit to communities is principally transmitted through businesses. Third, the issue of land use, particularly the allocation of land resources to heliports, is widely misunderstood.

EXAMINATION OF MAJOR ISSUES

Heliports Are Generally Considered Innocuous

Benefit-cost analysis must rest on actual experience, and a survey of heliports was conducted over a period of 18 months by telephone, mail, and personal visit. The survey covered the 17 public-use heliports in cities of more than 250,000 population. The heliports are rarely elaborate. Many are only sidelines to larger business operations, and only five enjoy the services of a full-time, fixed-based operator. A summary of the character of these heliports is given in Table 1.

There was no difficulty in rationalizing the social value of the four heliports in New York City because they contribute significantly to municipal revenues. Representatives of the remaining 13 heliports had difficulty explaining their value in terms that could be quantified, but their arguments rested on three basic principles.

First, heliports are not obtrusive politically or financially. They require small outlays, much of which can be federally funded. They are easily established and just as easily disestablished if the initial development proves unsatisfactory or inappropriate. Unlike buses or taxis, they add no regulatory burden to the community; and on the air side they operate outside of existing traffic and are not directly competitive with municipal airports as revenue producers.

Second, heliports provide exceptionally good comparative value as a public utility. For example, a study of investments undertaken by the Port Authority of New York and New Jersey concluded that the four New York heliports had drawn less than $3 million in all costs since their implementation, compared with $1.5 billion for the West Side Bus Terminal and $3.5 billion for JFK Airport. When compared with the annual traffic through these facilities, the heliport system is twice as productive in investment cost-per-passenger as the bus terminal and nearly 10 times as productive as JFK.

But the dominant theme in the heliport survey was one of indifference. Few public-use heliports provide municipal revenues at all, and fewer serve the general public (as opposed to business and government interests); but three-fourths of them report no community opposition, and none of them report a serious community threat to present operations. No serious objections to a heliport had been filed once the heliport had been established. Some of these heliports have been in operation for more than 20 years.

Community Benefits Are Transmitted Through Businesses

This issue rests on the value of the helicopter to business and the value of business to its community. An interesting perspective on the emergency of the modern business helicopter is its evolution from

TABLE 1 Metropolitan Public-Use Heliports[a]

City	Annual Traffic Operations	Location	Maximum Landing Fee ($)	Heliport Development Funds	Profitable
Baltimore	520	Waterfront	2	Public	Yes
Cincinnati	20	Downtown rooftop	25	Private	No
Cleveland	2,200	Waterfront	2.50	Public	Yes
Columbus	120	Downtown ground level	15	Private	Yes
Denver	900	Downtown ground level	10	Public	Even
Detroit	75	Convention center rooftop	6	Private	No
Indianapolis	3,000	Downtown ground level	None	Public	No
Memphis	200	Waterfront	None	Private	No
Miami	5,000	Island	None	Private	Yes*(sic)*
New York *(3)*	114,000	Waterfront	40	Public	Yes
Newark	400	Waterfront	None	Public	No
Philadelphia	1,800	Waterfront	15	Private	No
Pittsburgh	300	Waterfront	4	Public	No
Toledo	50	Downtown rooftop	25	Private	No

Source: Aerospace Industries Association Heliport Directory and personal interviews.

[a]Not including heliports on fixed-wing airports.

convenience to routine and then to essential. Today's business environment demands productivity, and the inevitable involvement of business with the urban complex makes productivity in its transportation a difficult challenge. The helicopter provides this productivity by reducing the travel time not only of chief executives but also of the growing number of professional and managerial workers for whom mobility is a primary job characteristic. The value of that travel time is a hard number to determine. Efforts have been made to tie it to company sales and to executives' positions in their companies, and these result in a range of time values between $10,000 and $50,000 per hour (sic) for the management of hundred-million-dollar firms.

Whether this enigmatic value can ever be determined is not really important: the value to a company of its management and professional employees is far greater than their salaries, and that value deteriorates when they are trapped in traffic and unable to perform their professional functions. The rapidly growing number and sophistication of business helicopters is evidence of the importance of vertical mobility in this environment. This has not gone unnoticed by corporate location analysts, who increasingly reject prospective plant sites that do not provide for helicopter access. That need arises from the character and function of "the new corporate headquarters," analyzed recently by The Conference Board (1), whose helicopters free them from the confines of congested cities while maintaining their necessary linkage to financial and commercial centers.

Examples of helicopter-assisted management productivity abound. Prudential Insurance Company, operating from the public-use heliport in Newark, New Jersey, logged 195 hr of executive travel in 1983, compared to nearly 700 hr of equivalent trip time by car. The company saved 500 hr, roughly one-fourth of a working year. Union Carbide Corporation's 1978 move of 1,100 employees from Manhattan to new headquarters in Danbury, Connecticut, was contingent on approval of its heliport, from which Union Carbide inaugurated a helicopter shuttle of three daily flights to Manhattan and the New York airports (2).

Thus, the large corporation must be in two places at the same time: at the metropolitan periphery, where it lives and manufactures; and in the center, where it does its financial maneuvering and decision making. This leads to an expensive network of cross-hauling that is the classic urban transportation problem, and that leads to inefficiencies in the linkage between corporate operations and corporate headquarters. It is these inefficiencies that have motivated so many corporations to abandon urban centers for suburbs that appear (at least superficially) to satisfy their locational requirements. But the central city still does best those activities that depend on rapid communication and face-to-face contacts; and, despite its high labor costs and crowded land--or perhaps because of them--the resource potential of the urban core remains great. Access to the core from the new corporate hinterlands requires the vertical mobility of the helicopter. And this is not exclusively a megacompany phenomenon--the billion-dollar corporations that make up the Fortune 500 account for less than 7 percent of today's business helicopter fleet.

This leads to the discussion of the importance of business itself to its own community, an oddly elusive bit of data. It was clear in the preliminary study that very little work had been done to estimate the importance to a community of the kinds of activities that make the most use of helicopter transportation. These again are largely corporate headquarters functions, which are not generally the subject of community based studies. The study group itself therefore undertook to analyze the effect on community economic welfare of such corporate headquarters' activity.

The method of analysis and detailed conclusions are available in an unpublished report titled Corporate Headquarters Relocation: The Analysis of the Economic Impact on a Community. Most interesting were the effects of corporate headquarters on property values and the multiplied benefits of the corporate payroll. A study of the grand list (or total value of real property) of a number of southern Connecticut communities shows disproportionately large increases in the valuation of real property in the towns of Danbury, Fairfield, Greenwich, and Stamford during the last 15 years. The responses of those four towns to the relocations of Union Carbide Corporation, General Electric Company, American Can Company, and other Fortune 500 companies is clear and dramatic (see Figure 1). Between 1965 and 1982,

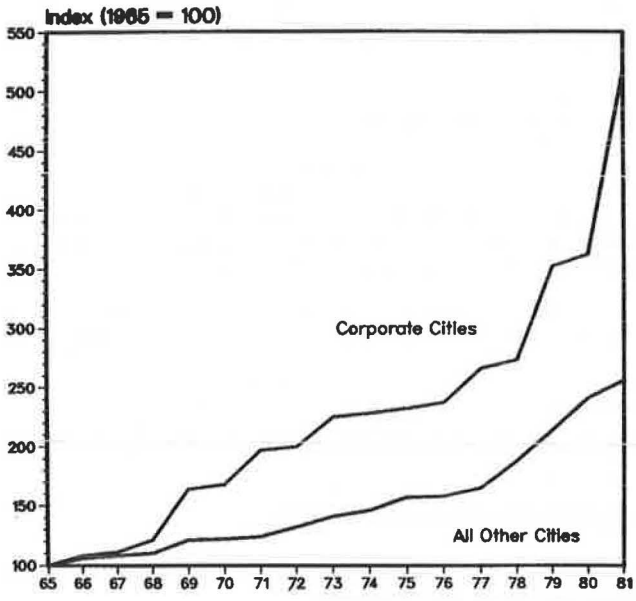

FIGURE 1 Grand list of corporate cities in Connecticut.

grand lists of corporate cities in Connecticut increased by more than 500 percent, more than twice the increase for all other neighboring cities with comparable populations. In general the study concluded that the value of corporate headquarters' relocation to a host community averaged $100 million in annual sales, $1 million to $3 million in annual property taxes, 3,500 secondary jobs, and intangibles such as senior executive participation in community planning and management.

The Fundamentals of Sensible Land Use

The traditional battles over the allocation of urban land to transportation, and particularly to heliports, have been fought over the preservation of privacy and the security of residential property. There should be no controversy here, because it is clearly unreasonable to preempt residential land for heliports. But more important, heliports can best serve urban communities when located away from residential land. They should be on or contiguous to commercial or industrial land, which generates the predominant share of their traffic. Moreover, in-

dustrial land, with its inevitable rail lines, waterways, and circumferential highways, means clear areas for aircraft approaches and departures as well as a natural masking of whatever noise may be generated at the heliport itself. This confluence of rail, water, and highways also suggests transportation centers through which the helicopter can contribute to intermodal synergy.

Surprisingly, the land use controversy now surrounds the allocation to helicopter operations of what should be noncontroversial land, which reflects a serious ambiguity in urban planning.

The most provocative example of this misunderstanding is a disturbing tendency to reserve highly productive harbor real estate for parks, playgrounds, high-rise apartments, and restaurants. Without denying the right of these activities to suitable real estate, and without even denying the necessity for esthetically pleasing facilities for urban living and recreation, the fundamentals of effective land use are undeniable, and the preempting of essential haborfront activities is counterproductive at best and dangerous in the long run. The situation is exacerbated by the eventual inability of these esthetic and recreational activities to coexist compatibly with modern commercial heliport facilities, which by their nature are necessarily noisy and intrusive within the fairly well-defined perimeter of their activity. But it is intuitively known that harbor sites can be reserved for both kinds of activities if both of them are carefully planned and carefully contained.

Going beyond intuition, Stokes (3) and his staff at the Urban Management Institute have been able to quantify the value of harbors to America's cities, and Stokes' recent study of 11 major U.S. waterfront cities has quantified the effect of heliports on harbor productivity. His conclusions are that harbors are far more productive and far more critical to the prosperity of major cities than had been believed, and that the tendency to shift their function from commerce to esthetics is potentially damaging. He concludes further that harbors are essentially comfortable with heliports, their attributes being compatible and consistent with the commercial function of the harbors themselves. Specifically, an analysis of the dimensions of harbor activity and the impact of additional investment on harbor productivity indicates that a heliport investment of $1 million would increase commercial activity by about 1 percent and would add 18 jobs equivalent to annual wages of about $350,000 a year to the community. Although these numbers are not very large, neither is the initial investment. The heliport investment in a harbor environment would generate wages equal to the initial investment in less than 3 years--clearly more productive than alternative investment in recreational facilities.

SOCIAL COSTS

An inventory of social benefits should be compared with concomitant costs in one way or another. The two most familiar costs of community helicopter operations are noise and anxiety. These are euphemistic terms, because the issues really relate to the community's perception of intrusion into its privacy and compromise to its safety. More fundamentally, even the issues of privacy and safety are only skirmishes in the real battle--the battle for the allocation of scarce urban resources. (It is interesting that noise and safety arguments are typically raised against proposals for new heliports, but once the land use issue is resolved, whether for or against the heliport, these arguments are rarely raised again.) These are not new issues in transportation--any transport innovation carries with it a real or perceived threat to privacy and safety, even to those who stand to benefit the most. The history of transportation in urban communities is in fact a history of volatile hearings, environmental impact arguments, and exaggeration of the issues on both sides. But the issues are real, if only because they are perceived to be real by the public.

A third and somewhat less obvious social cost is opportunity cost. The impact of opportunity cost on heliport development is significant, because it is difficult for political leaders who must be accountable to an electorate every 2 or 4 years to set aside near-term revenue opportunities for admittedly needed heliport facilities whose payback is either long term or intangible. In one recent case, for example, the last barrier to setting aside downtown real estate for a heliport with obvious long-term benefits was the city's reluctance to part with smaller but immediate revenues from parking meters that occupied the site.

UPGRADING THE EQUATION

It was a premise of this discussion that helicopters and heliports are increasingly perceived as an essential part of the metropolitan equation. Like other systems of metropolitan transport, they carry a cargo of costs and benefits. The growing demand for private helicopters and urban access suggests that the benefits outweigh the costs.

Yet steps have been taken by the helicopter community to further enhance the benefits and minimize the costs. These steps involve both technology and communications.

On the aircraft side, technology advances of the last few years have addressed the primary social costs. Significant noise reduction has been achieved through aerodynamic changes that eliminated the notorious slap of the two-bladed rotor and dramatically softened the noise signature even of conventional rotors. Changes in gear design have reduced the whine of helicopter transmissions and engines. Helicopter safety and reliability, never as great a horror as might be inferred from the publicity, and actually better than comparable fixed-wing general aviation, is a continuing concern of the manufacturers. Component redundancy, better materials and tougher testing, and especially the large-scale shift to twin engines tend to eliminate public anxieties about urban helicopter operations.

These technological advances carry with them substantial reductions in manufacturing and operating costs, and further advances now on the boards will reduce costs even more dramatically--perhaps by as much as 30 percent by the end of the decade. In addition, the cruise speed of the 1990 helicopter will exceed 180 knots, and the effect of the increased speed and reduced costs could cut seat-mile costs by one-half. At that time intercity helicopter service, now beyond the economics of any existing rotorcraft, could significantly expand the value of helicopters and heliports in urban communities.

At the same time, the Federal Aviation Administration (FAA) has now stepped forward to lead the integration of helicopters and heliports into the national transportation system. As a result there has been rapid improvement in all-weather operating capabilities, accelerated development of exclusive and safe helicopter airways, and improved, uniform guidelines for heliport location and construction.

Perhaps most important in upgrading the equation, the helicopter operating industry has begun to police itself. Like fixed-wing aviation before it, and the

trucking industry before that, helicopter operators have come a long way from the barnstormers of the 1960s. They have become increasingly sophisticated, responsible, and sensitive to the inescapable relationship between financial success and community acceptance, and through the Fly Neighborly program, helicopter operators have imposed a discipline on themselves.

Fly Neighborly is a voluntary noise-reduction program for all types of civil, military, and government helicopter operations. Through broadly sponsored regional seminars, the program makes pilots aware of the noise they might generate and trains them to minimize it through better operating techniques and route planning. It stresses openness, speaking to the community about what the helicopter is and what is is not, and listening to the community's concerns. The result of this new dialogue is the accommodation of helicopters to acceptable community standards of noise and intrusiveness and the informed accommodation of communities to helicopters.

In the longer run, these improvements go far beyond the amelioration of social costs--they reflect an understanding between helicopter operators and the communities they serve, and they reflect a convergency of objectives that can make their achievement a reality.

REFERENCES

1. R. Yee. The Headquarters Revolution. R.F. Gatje. Building Your Dream Headquarters. In Across the Board, The Conference Board, New York, N.Y., Nov. 1983.
2. D. Jensen. Headquarters to Urban Hubs. Rotor and Wing International, Oct. 1983.
3. C.J. Stokes, T.A. Ryan, and K.B. Stokes. Siting Heliports in Harbors: An Analysis of an Ideal Compromise. Transportation Quarterly, April 1984.

Publication of this paper sponsored by Committee on Aircraft/Airport Compatibility.