

MULTIPLE USE OF HIGHWAY CORRIDORS

Valuation of Airspace

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INTRODUCTION

Airspace

The terms "airspace" and "air rights" have often been used synonymously in the literature on the subject. Although there is little possibility of confusion, it seems appropriate to begin with basic definitions. Airspace is merely the cubic volume of space above the earth's surface, without upper limits unless they are defined for a specific purpose.

A parcel of land is generally described in terms of its horizontal dimensions, measured on the earth's surface. The addition of a vertical dimension to the horizontal plane of the earth's surface, such as a building height limit, then defines the buildable airspace as a cubic volume.

For the purpose of this study, highway airspace is defined (82)* as "that space located above and/or below the highway's established gradeline, lying within the horizontal limits of the approved right-of-way boundaries." Figures 1 and 2 illustrate this definition in the simplest possible graphic terms.

Air Rights

A volume of airspace becomes real property as a result of the rights attached to it. One of the oldest concepts with regard to ownership of real property states that ownership of land extends from the center of the earth to the periphery of the universe. This concept of full and complete ownership of land is not established law. Ownership of real property is, in reality, ownership of distinct and separate rights or privileges of ownership. Some of the rights inherent in real property ownership include the right to use, sell, lease, enter into, or give away

* References are to items in the Bibliography (Appendix A).

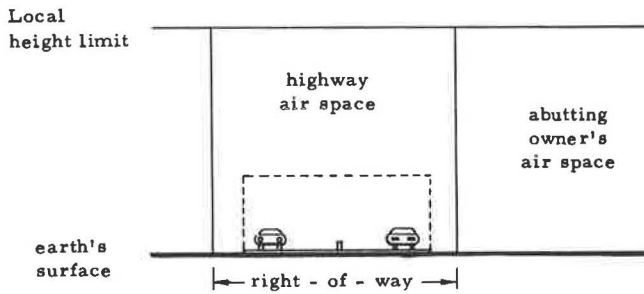


Figure 1. Highway air space above highway at grade.

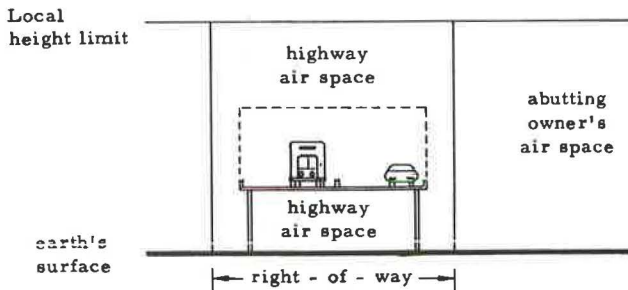


Figure 2. Highway air space above and below viaduct highway.

any portion or all of the property, or even to refuse to exercise any of these rights.

Ownership rights are guaranteed by law, subject to certain limitations and restrictions. Although legal definitions of ownership of real property imply complete ownership of land and everything attached to it, under it, and over it, legal title does not convey absolute fee simple title and unrestricted exercise of all conceivable ownership rights. Specifically, the four powers of government limiting ownership rights are: the power of taxation; the power of eminent domain; the police power; and escheat.

In addition to governmental restrictions, private agreements may also impose restrictions. These might limit use, development, or even the manner of conveyance, and are generally referred to as deed restrictions, and covenants, conditions, and restrictions (CC&R's). In essence, then, an owner of real property can use, sell, trade, or lease any one or a combination of the separate and distinct ownership rights associated with any portion or all of his property while retaining all other rights. Therefore, the definition and appraisal of real property involves consideration of the ownership rights remaining with the property and the effect of the loss of any of these rights on its value. Knowing exactly which rights are under consideration is fundamental to the valuation of real property, and the valuation of airspace as real

property. Thus, although airspace is a physical concept, and air rights or rights in airspace is a legal concept, the terms are interchangeable for all practical purposes.

Historical Background

The development of airspace above the New York Central Railroad's right-of-way in Manhattan, in the early 1900's, is generally considered to be the first significant commercial use of transportation right-of-way airspace in the United States. Today, this development includes the new Madison Square Garden, the Pan Am Building, and numerous hotels, high-rise offices, and apartment buildings along the famous Park Avenue. The land and air rights to approximately ten city blocks of this complex were recently offered for sale and are expected to bring almost a billion dollars.

The second major development of air rights occurred in Chicago in the late 1920's, with construction of the Merchandise Mart and Daily News Building over Illinois Central Railroad right-of-way. The Prudential Mid-America Building, Marina Towers, and the Outer Drive East Apartments are more recent additions to Chicago's inventory of airspace development.

In the early 1950's, the Pennsylvania Railroad's elevated rail yards in center city Philadelphia were placed underground, providing more than 20 acres of prime air rights. The Penn Center complex now occupies most of the site with high-rise offices, hotels and apartment buildings.

The current airspace developments in Chicago, in the Randolph Terminal area and further south between the Outer Drive and Lake Michigan, will also utilize Illinois Central right-of-way. The ultimate extent of these projects will apparently exceed the scale, if not the values, of the Park Avenue development in New York.

Use of airspace above highways for major commercial projects has a much shorter history, beginning in 1962 with the four apartment towers over the approach to the George Washington Bridge in upper Manhattan. Since that time, development has included a supermarket and an office-hotel complex over the Massachusetts Turnpike in Newton, the Prudential Center complex over the Massachusetts Turnpike in Boston, restaurants over the tollways in Illinois and Oklahoma, and a parking garage over the freeway in Reno, Nev.

Public projects above the highway have been more numerous and include a city hall, a library, a post office, a convention center, a courthouse, a bus terminal, an auditorium, an office building, and a portion of the United Nations Building in New York. Highway air rights projects are discussed in further detail in a later section. However, it is significant to note at this point that experience with development above the highway is limited in relation to the use of airspace under the highway or on adjacent right-of-way land. In nearly every state, public

and private developments of parking lots, warehousing and storage, parks, and playgrounds have utilized highway right-of-way.

Cooperation between State highway agencies and local urban renewal or redevelopment agencies has been successful in a number of cities, and promises to provide the most effective method for achieving air-space development on a large scale.

Highway Joint Development

Participation of the Illinois Central Railroad as a financial partner in the most recent air rights development in Chicago, and the cooperation of highway and urban renewal agencies are major examples of the concept of joint development. As applied to highways:

The term "joint development" shall mean cooperative action by the state highway department with federal, state, municipal, and other governmental agencies, and private individuals and organizations, in public or private development of the right-of-way, and the land contiguous or adjacent thereto, in such manner as not to injure, damage, obstruct, impair or impede the full, safe, and efficient use of the right-of-way for the primary purpose of movement of persons, vehicles, goods, and other lawful traffic. (45)

As a key element in joint development, the use of airspace provides numerous benefits to the public. Most important is the possibility of a much higher degree of compatibility between the highway and the community. Use of airspace above or below the highway can eliminate the divisive effects of major highways and improve the over-all environmental appearance of the area.

In addition, local public financial benefits can result from (1) public use of airspace (instead of removing land from the tax roll), (2) savings on land acquisition for local services, and (3) added park and recreation space. Private use of highway airspace can also provide revenue to the highway agency, and offset a portion of the right-of-way acquisition cost.

To the private developer, highway airspace can offer large, preassembled areas for development in high-density centers where land ownership is typically fragmented. In addition, development above the highway results in a highly visible location. The fact that public-private joint development has not been widespread is a result of a number of major limitations.

Limitations on Private Development

Legal constraints have been noted as a serious impediment to air-space development. More specifically, lack of State legislation authorizing the highway agency to sell or lease air rights for public-private joint development has been cited as the primary legal problem. New York and Connecticut have recently adopted statutes that remove much of the uncertainty surrounding the legal aspects of use of airspace. Other

States can be expected to follow these models, to various degrees, in the near future. In addition, the Federal Highway Administration has continued to issue guidelines on policies and procedures to facilitate joint development and use of airspace. Although the administrative problems will require continued attention, an optimistic outlook on solution of the major legal problems appears justified.

Concern for the safety of the highway and airspace users, and the free flow of traffic, will continue to limit the use of airspace. However, these concerns reflect the basic purpose of the highway and must be observed regardless of their effect on airspace development. The standards and precautions may appear overly restrictive to a private developer, and it is conceivable that certain standards may be reduced if experience warrants.

The cost of construction above the highway has also been recognized as a major impediment to private development. Special foundations and supports, wide spans, and protective reinforcement create engineering problems that, however readily solved, may significantly increase the cost of construction and utilization of airspace. These costs must be evaluated in relation to alternative projects on other sites, and do not necessarily prohibit the development of airspace.

Valuation is the limitation with which this study is directly concerned. In the general sense, valuation is a decision-making procedure in which the costs and benefits of utilizing airspace are compared. The ultimate result is a subjective decision on whether or not airspace will be acquired for private development. An inability to estimate benefits and/or costs can, and often does, result in a negative decision when a large long-term investment is required. The more specific definition of valuation, assigning a monetary value to the airspace or air rights, is discussed in the next section.

Valuation

To the extent that the monetary value of highway airspace can not be satisfactorily estimated, it is natural to expect reluctance on the part of the highway agency and the private developer to proceed with a joint development project. This limitation also applies to public users of airspace where future costs are difficult to estimate. Proper valuation remains a limitation, even when the legal, administrative, and physical problems of airspace development have been resolved.

Concern for proper valuation in the appraisal profession followed the use of airspace over Illinois Central right-of-way in Chicago in the late 1920's. A suggested method of valuation was: determination of the value of the underlying fee on the basis of comparable land values; then, deduction of the additional costs of development created by the right-of-way interests, with the remaining value being that of the air-rights (23, 39). A modification of this approach suggested the appraisal of an imaginary platform above the railroad right-of-way at the level

on which the air rights holder would acquire control of the airspace. The platform can then be appraised on the basis of comparable land values, with consideration of special costs, limitations on ownership, and accessibility problems (62, 59). This approach gave rise to the "deck equals land" concept, which is essentially the same as the earlier method, although it is somewhat less realistic, in terms of actual construction procedures, and tends to complicate the problem.

Expansion of the original method resulted in the Kuehnle and White formulas, as follows:

Kuehnle Formula (50)

$$V - (X + Y) - I = A \quad (1)$$

Therefore,

$$V - A = R \quad (2)$$

in which

- V = value of the land before taking of three-dimensional interest;
- X = economic value lost due to reduction of functional utility (net income) in modifying building for construction on the A interest;
- Y = additional cost of constructing the building under the terms of the conveyances creating the A and the R interests;
- I = interest on investment for the additional period of construction as a result of the divided vertical interests;
- A = value of air rights after taking of three-dimensional interest; and
- R = value of remainder three-dimensional interest.

White Formula (91)

- A = air rights value;
- V_c = land value by comparison in fee simple, vacant but improved with all utilities at lot line;
- X = loss of residual value from functional or economic obsolescence arising from creation of the air rights;
- C = added capital improvement costs to air rights purchaser or lessee in construction of building;
- D = savings to air rights purchaser or lessee in excavation and foundation costs, demolition, tenant relocation, and income losses during relocation and demolition;
- I = added interest and carrying charges as a result of added capital improvement costs; and
- R = residual value of fee interest.

Thus,

$$V_c - [X + (C - D)] - I = A \quad (3)$$

and

$$V_c - A = R \quad (4)$$

There is little conceptual difference between the two formulas and the basic appraisal methodology suggested therein. The Kuehnle formula (Eqs. 1 and 2) was applied in a hypothetical valuation of a highway tunnel easement; the White formula (Eqs. 3 and 4) was applied in a hypothetical valuation of the air rights used by the George Washington

Bridge Apartments. By increasing the number of factors considered, the valuation can be made more detailed, but the essential concept remains the same.

The income capitalization technique has been suggested, using a residual capitalization to determine the value of the air rights for a specific project. The result of this approach was compared with that of the White formula and produced a similar value for the George Washington Bridge Apartments' air rights (91). An additional application (47) suggests the use of land residual capitalization, after erecting the hypothetical highest and best use, to determine the value of the fee unencumbered by air rights; then, using the residual technique, after erecting the highest and best use in the airspace, to determine the value of the airspace. The difference between the two residual values is the value of the fee burdened with the air rights, or, in terms of the present study, the value of the highway interest within the horizontal and vertical dimensions of the required right-of-way.

This latter approach is similar to the familiar "before-and-after" rule applied to the taking of an aerial easement. The property is valued before and after the easement, with the difference between the two values, plus other compensation, being the value of the airspace for the easement (66).

An extremely practical approach has been used by the Illinois Central Railroad in setting the price for air rights over right-of-way in Chicago. This involves determination of the fee value of the land, by normal appraisal methods, and adding a value for assembly of a large parcel. Reference is then made to the existing zoning ordinance and, based on the floor area ratio, the maximum number of floors is determined. The space retained by the railroad, in terms of number of floors, is subtracted from the maximum to obtain the remainder. Expressed as a percentage of the total number of floors, the remainder is applied to the total fee value to obtain the value of the airspace (93). Under a similar assumption of highest and best use according to floor area ratios contained in New York City's zoning ordinance, volumes of airspace have been valued on the basis of comparable prices per square foot of building space permitted.

Numerous authors have referred to the value of the air rights as a percentage of the fee value of the site. This has led to the misconception that a certain ratio can be used as a rule of thumb to value the air rights, given the value of the fee. The procedure has never been recognized as a realistic approach to valuation, nor do the researchers know of a single case in which this "rule of thumb" has been applied. As used by the Illinois Central, the ratio of usable airspace to maximum permitted space was carefully calculated for each transaction. Obviously, the relationship of a positive air rights value to the fee value can always be expressed as a ratio. But it is unrealistic to assume that a ratio derived from the valuation of one site and use would

apply to any other site. It is suggested, therefore, that this ratio is meaningless for purposes of valuation.

This brief historical summary indicates the present state of air rights valuation methodology, as described in the literature, with the income capitalization and land residual approach as the most recent recommendation. The previous approaches involve the customary procedure of a series of adjustments to comparable land values in order to arrive at the value of the site, or air rights, under study. The implicit assumption is that comparable land values represent the results of other investment decisions in an active market. Inasmuch as the market, in general, determines land value through an income capitalization and land residual approach, the use of comparable land values is an acceptance of this approach. Given an active market demand for space, the use of comparable land values and careful adjustment would appear to be adequate for the valuation of air rights.

It is suggested, however, that this is not strictly the case with regard to highway air rights, even where the demand for space is strong. To the private developer, highway airspace, especially above the highway, is a new and different investment involving unknown risks. From the viewpoint of the private developer, a thorough investment analysis, using a sufficiently high income capitalization rate to compensate for unknown risk, is the most responsible approach to determining the value of air rights for a particular project. As noted later in the section on "Recommended Method for Valuation of Airspace," this method incorporates the basic valuation factors used in the Kuehnle and White formulas, and is consistent with the logic of the various methods suggested to date.

An appraisal report normally states the purpose of the appraisal before proceeding with a specific method. The primary concern of this study is valuation of air rights, above and below existing highways, for the purpose of sale or lease to private users. Valuation of air rights for the acquisition of right-of-way is no less serious a problem. However, it involves condemnation by the highway agency or other public body, and a substantially different set of conditions surrounds the transaction.

Emphasis has been given to the valuation of airspace for major private development above the highway. This requires the most extensive valuation process and is most complicated from the legal and administrative viewpoints. However, it also presents the greatest potential for significant joint development in relation to existing highways.

A brief review of legal considerations precedes the discussion of valuation procedures as applied in recent developments. A comprehensive framework is recommended for the valuation of air rights above and below existing highways, with additional consideration given to the feasibility of development and public policies.

LEGAL CONSIDERATIONS

This paper is directly concerned with only one dimension of the air rights problem—valuation. Thus, it need not deal directly with the antecedent question of the general lawfulness of air rights transactions as participated in by State highway departments. Nevertheless, the need for valuation arises only to the extent that air rights transactions are lawful in the first place, and the legal problems that burden such transactions occasionally influence the valuation process. Accordingly, a brief discussion of legal considerations seems appropriate before treating the background for valuation.

Two contributions to the solution of legal problems surrounding air-space development have recently been published. The first, Wright's *Law of Airspace* (93), traces the development of laws relating to airspace from the second century A.D. to the present. The second, "Proposed Legislation to Authorize Joint Development of Highway Rights-of-Way" (45), discusses the lack of state legislation specifically authorizing the State highway agency to participate in joint development, and offers a proposed bill for use in drafting the necessary legislation. As noted earlier, only New York and Connecticut have enacted legislation authorizing participation in comprehensive joint development. A number of States have legislation relating to specific aspects of joint development, or have interpreted existing legislation to permit joint development. In other States, private development of highway air rights is not permitted under interpretation of existing legislation.

This situation contains the elements for delay in air rights development, because the State highway agency may be uncertain as to its powers. In the negotiations for the lease of air rights in Nevada, described in the section on "Case Studies of Airspace Projects," mortgage insurance was delayed until the State legislature modified the existing statutes to specifically permit the highway agency to enter into an agreement with a private developer.

The remainder of this section discusses a number of the most important legal problems and issues that must be considered by the highway agency and a private interest. For the most part they must be resolved before the use of air rights can be considered, and must be thoroughly clarified before a private developer will proceed.

Acquisition of Air Rights

The State highway department's power to acquire fee simple or only a three-dimensional highway easement is a question of State statutory law and must therefore find approval in the State legislature.

The State highway department's condemnation of the air rights as well as an easement (that is, if it condemns the fee), with the intention of reselling or leasing the airspace to a private developer, raises the question as to the taking of the air rights for a public use. "Public use" is a state constitutional limitation on the condemnation power; hence,

if a question exists, it cannot be solved by legislative action, except insofar as the courts might defer to a legislature's express funding of "public use."

If the acquisition of the air rights is by purchase rather than by condemnation, and if the intent is as previously stated, the authority for expenditure of funds for a "public purpose" is also a State constitutional requirement.

The State highway department's authority to condemn property adjacent to a future highway for purposes of compiling a tract of land capable of joint development is, first of all, a question of the statutory power of the State highway agency. But even if the legislature expressly confers this power, the constitutional questions of "public use" and "public purpose" must be answered.

If the answer to any of the questions raised in the foregoing is in the negative, and if the project is to be on the Interstate System, the Federal Government may condemn the property under 23 U.S.C. § 107 and then sell it back to the State for 10 percent of cost. Sec. 107(a)(1) authorizes such a procedure when "the Secretary has determined . . . that the State is unable to acquire necessary lands or interests in lands." As far as is known, this statute has not been applied or contested.

In States with constitutional provisions requiring that gas tax revenues be devoted to "highway purposes," such revenues may or may not be used for the acquisition of air rights intended for joint development, depending on the interpretation in a particular jurisdiction. The legislature is helpless here to modify the State constitution by legislation, but it could appropriate non-gas-tax funds to the highway department for purposes of air rights acquisition.

Disposition of Air Rights

Before entering negotiations for the sale or lease of air rights, the following questions must be resolved. Are air rights "property" capable of being leased or sold under the State's common law? Does the State highway department have the power to lease or sell property in general, or airspace in particular? Does it have power to lease or sell for the purposes of joint development? May the department itself serve as the joint developer? These are questions of common law or of the substance and construction of the State statutes establishing and ceding powers to the State highway department; if the answers are negative, the powers can be changed by new legislation.

The owner of property adjacent to the highway may have a right to light, air, and view upon which the State highway department cannot infringe by joint development without paying just compensation. The existence of such a right is a matter of State common law as to property. However, if such a common law right exists, that it cannot be extinguished without compensation is a State constitutional principle.

If a structure planned above a highway will in any way interfere

with the motorist's ordinary use of the highway, conveyance of the air rights may be an unlawful diversion of public property. The outlines of this legal prohibition are exceedingly vague, as is its legal basis. It may be a common law doctrine, a matter of statutory construction, or a limitation derived from the State constitution. The prohibition seems to have been applied most frequently against municipalities rather than against the State, a fact which may shed light on its legal status. Indeed, there is broad legal language to the effect that cities, having acquired property for use only as a street, lack the power to convert any of the property to a purpose unrelated to transportation.¹

If a State concludes that a certain private development of air rights is in the public interest, and disposes of the air rights for less than fair market value, such a disposition may offend the "gift" clause in the State constitution. It may also bear on the State constitutional "public use" and "public purpose" questions identified earlier. To the extent that the State is permitted to dispose of the air rights by lease or sale for less than fair market value, the relevance of determining fair market value diminishes. However, it certainly does not disappear, because the State may wish to control the size and percentage of the discount.

When the highway or freeway is on a Federal-aid system and therefore receives federal funding (50 percent if on the primary, secondary, or urban systems; 90 percent if on the Interstate System), certain requirements set forth in the *United States Code* and Department of Transportation regulations must be satisfied. For projects on the Interstate System, under 23 U.S.C. § 111, the agreement between the Federal Government and the State (under which the former will reimburse the State for 90 percent of the cost of the freeway) "may . . . authorize" the State "to use or permit the use of airspace above and below" the freeway; by implication, such use is unlawful unless included in the agreement. Under Department of Transportation regulations for all federally aided projects, acquisition of less than unlimited vertical dimensions, an acquisition which thus can reserve air rights for joint development, must be approved by the Federal Highway Administrator as described in PPM 80-5 (81). However, this PPM encourages States to acquire a right-of-way of limited vertical dimensions in cities in light of "the possibility of substantially decreasing right-of-way costs" (81, § 4d).² Likewise, for any federally aided project, if the State acquires an unlimited vertical dimension and then wishes to convert the air rights to a nonhighway use, approval of this use has been delegated to the Federal Highway Administration Regional Administrator (81, § 4e)^{2, 3} with authority to delegate to Division Engineers or associate administrators. This requirement applies whether the air rights user is to purchase or lease the air rights from the State highway department, or the highway department is itself managing the

¹ Norman v. Ballard, 202 Okla. 93, 210 P.2d 340 (1949).

² Superseded by PPM 80-10 (11/15/71).

³ See also FHWA Order 1-1 (11/15/71).

joint development project. Detailed procedures for making application to the Administrator are spelled out in PPM 80-10.1 (82).²

The substantive standards governing the Secretary of Transportation in his passing on applications specify, under 23 U.S.C. § 111, applicable to the Interstate System only, that the use of the air rights must not "impair the full use and safety of the highway" or "interfere in any way with the free flow of traffic on the Interstate System." This general standard has been elaborated on in considerable detail in PPM 80-10.2 (83), which contains standards on minimum clearance, interference with visibility, location of structural supports, safety precautions, and other matters. Moreover, PPM 80-10.2 extends these requirements to all federal-aid systems.

Valuation

Valuation becomes a legal question primarily in two contexts—eminent domain and real property taxation. In the context of the ad valorem tax, the basic measure of value, as set forth in the State constitutions or State statutes, is usually as imprecise and nonoperative as "fair value," "true value," "just value," or simply "value."⁴ For purposes of eminent domain, the almost universal standard is "just compensation"; and "just compensation" is itself traditionally defined as "fair market value."⁵ This evidently, carries the same meaning as the various "value" terms employed in real property tax valuation.⁶ Indeed, some of the real property tax statutes themselves speak the language of "fair market value."⁷

The posture in which a valuation case reaches the court varies, however, in accordance with the context. In condemnation cases, the court basically must make up its own mind as to the proper valuation (although there may be expert witnesses who testify). In taxation cases, the court is asked to review the decision of another governmental official, the tax assessor. Typically, a court will substitute its judgment for the tax assessor's only if convinced that the assessor's decision has been arbitrary or contrary to law.⁸

Three distinct methods for determining value have received at least some degree of judicial sanction in working out the meaning of value (42). The first is "comparable sales," which inquires into the prices that comparable parcels of property have commanded on the open market. Reliance on the price for which the individual parcel of property being appraised itself was sold for in the recent past embodies, presumably, a kind of comparable sales approach. The second method is capitalization of the future income the property can be anticipated

⁴ See the elaborate chart which is the Appendix to Note, *Tax Assessments of Real Property: A Proposal for Legislative Reform*, 68 YALE L.J. 335, 386 (1958).

⁵ See 29A C.J.S. § 136(2).

⁶ See *Great N. Ry. v. Weeks*, 297 U.S. 135, 139 (1936).

⁷ *E.g.*, IOWA CODE ANN. § 441.21.

⁸ *E.g.*, *Bennett v. Bd. of Review*, 234 Iowa 800, 13 N.W.2d 351 (1944).

to generate. The third method is calculation of reproduction cost (sometimes original cost) less depreciation. In a few States these three methods are specifically set forth in the statutes.⁹

Given the three distinct methods, the question arises as to which of the three should be applied, and to what extent, in individual cases. Under what circumstances is each of the three the exclusive or the primary determinant of value? The courts have provided no answers. The typical judicial decision will say that in a given case one or more of the three methods of valuation is "of evidentiary value" or "may be considered" but is not "conclusive," and that each case must be decided on its own facts.¹⁰ In several States the statutes themselves mandate that "every factor" be taken into account.¹¹

Out of all this confusion there has emerged at least one rule, which has been recognized in New York State and which seems so eminently sound that other courts would almost certainly follow it: that absent extraordinary circumstances reproduction cost less depreciation establishes the maximum for valuation.¹² California has gone farther than this one rule and has established, by administrative code, a priority among the methods. If there are "reliable income data," the income capitalization method is "preferred"; the reproduction method is "preferred" only if neither reliable market data nor reliable income data are available.¹³ With regard to the application of these valuation techniques to air rights, there are, in fact, a number of valuation cases. But almost all of these are inverse condemnation cases in which the State, by flying aircraft over a person's property, has been held to have "taken" the air rights above the property. The holding of these cases is that the value of the air rights taken is the difference between the value of the original fee and the value of the property once the flights are in operation.¹⁴ This obviously is a specific rule responsive to a particular and limited situation that is altogether different from that involved in valuation problems within the framework of highway joint development.¹⁵

⁹ *E.g.*, COLO. REV. STAT. § 137-1-3(5). For official discussions of the mechanics of each of the three methods, see CALIF. AD. CODE, tit. 18, ch. 1, subch. 1, §§ 1-9. *See also* the appraisal manuals of California (14), New Jersey (63), and Wisconsin (92).

¹⁰ *E.g.*, United States v. Parkbelt Homes, Inc., 76 F. Supp. 297 (D. Md.), *aff'd*, 171 F.2d 230 (4th Cir. 1948); Schleiff v. County of Freeborn, 231 Minn. 389, 43 N.W.2d 265 (1950); L. Bamberger & Co. v. Div. of Tax Appeals, 1 N.J. 151, 62 A.2d 389 (1948); City of Plainsfield v. State Bd. of Tax Appeals, 127 N.J.L. 5, 20 A.2d 641 (1941); City of Denver v. Lewin, 106 Colo. 331, 105 P.2d 854 (1940); Bellingham

Community Hotel Co. v. Whatcom County, 190 Wash. 609, 70 P.2d 301 (1937).

¹¹ *E.g.*, MINN. STAT. ANN. § 273.12.

¹² *See* People *ex rel.* Parkline Operating Co. v. Miller, 287 N.Y. 126, 38 N.E.2d 465 (1941).

¹³ Title 18, ch. 1, subch. 1, §§ 4-6.

¹⁴ *E.g.*, Aaron v. United States, 340 F.2d 655 (Ct. Cl. 1964); Klein v. United States, 152 Ct. Cl. 221, *cert. denied*, 366 U.S. 936 (1961); Wright v. United States, 279 F.2d 517 (Ct. Cl. 1960); Herring v. United States, 162 F. Supp. 769 (Ct. Cl. 1958).

¹⁵ One reviewer of the draft of this report has suggested that the courts are heavily attuned to the before-and-after ap-

A further aspect of valuation characteristic to highway joint development is that it will often be a leasehold, rather than an ownership interest, that must be appraised. With the exception of eminent domain cases, the law has had relatively little experience in appraising leaseholds. The most significant class of cases concerns the taxation of leases held by private parties on property owned by government. Under rules of law discussed previously, in these circumstances the lease is taxable though the fee is not. The most noteworthy feature here is the occasional success, especially in earlier cases, of the argument that the "value" of the lease signifies its actual value less the future rent payable under its terms. This argument appears absurd, given the obviously sound rule of law that for property tax purposes an owner of property cannot deduct from the value of the property the portion of the purchase price he still owes.¹⁶ By now, the argument has been rather widely rejected.¹⁷

California has recently amended its Administrative Code in order to deal with the valuation of leaseholds and other possessory interests.¹⁸ It sanctions, for purposes of appraising such interests, the comparative sales approach, the income approach, and the cost approach. For each of the first two, there is a direct and an indirect method. The direct method is to value the possessory interest itself by resort to sales or income data. The indirect method is to value the fee by using such data, then make appropriate reductions to arrive at the value of the possessory interest. As the Code makes clear, the shorter the possessory interest, the more unsatisfactory the indirect method.

Highest and Best Use

In the legal contexts of real property taxation and eminent domain condemnation, real property is appraised in accordance with its highest and best use—that is, the most profitable use to which the property could be devoted. Thus, when the suburbs begin to extend outward into what had formerly been rural areas, the "best use" of individual tracts of land within the area may have become industry or residential development. The farmer who uses his land for agricultural purposes, even though he has done so for 50 years, could be subject to a real property tax based on his property's value for industrial or residential purposes.¹⁹

proach in the assessment of damages, so that in a situation where the matter ultimately winds up in court this familiar thought-pattern of the judge might keep coming into play. As a result, someone approaching a litigated case involving valuation of airspace for commercial use may have to do some educating of the court as the case progresses.

¹⁶ See Frank Kessler, *Property Taxa-*

tion of Leases and Other United Interests, 47 CALIF. L. REV. 470, 483-84 (1959).

¹⁷ *E.g.*, *People ex rel. Korzen v. Am. Airlines, Inc.*, 39 Ill.2d 11, 233 N.E.2d 568 (1967); *De Lux Homes, Inc. v. County of San Diego*, 45 Cal.2d 546, 544 (1955). But see *St. Louis County v. State Tax Comm'n*, 406 S.W.2d 644 (Mo. 1966).

¹⁸ Title 18, ch. 1, subch. 1, §§ 21-28, § 25.

¹⁹ *E.g.*, *Illinois Light & Power Co. v.*

The highest and best use must be a lawful one, however. If the most profitable use of the land is prohibited by local zoning, the initial conclusion would be that this use is illegal and therefore cannot count as the highest and best use.²⁰ There is a complexity, however, for almost every zoning ordinance contains a variance procedure by which individual property owners can seek to have their property excepted from some or all of the structures of the zoning law. The standards governing decision on variances themselves vary somewhat, but a review of zoning ordinances (and of enabling legislation) shows that phrases like "special circumstances" or "exceptional characteristics" are typical (38).

When the highest and best use of property is contrary to the zoning ordinance, therefore, it is not possible to conclude with certainty that the use is unlawful until and unless a petition for a variance is officially rejected. In addition, there may be a foreseeable possibility that the zoning ordinance itself will be amended. Yet if the owner has no intention of devoting his property to that use, a variance petition will not be considered, and there is no procedure by which a third party, including the tax assessor, can secure a decision from the body entrusted with the responsibility for passing on variance petitions. If, however, the party dealing with the State in a joint development transaction actually desires to devote the airspace to a use that is contrary to local zoning, a clause could be included in the contract providing for an upward adjustment in the sum paid to the State in the event that, upon that party's subsequent petition, a variance is granted.

Assume, however, that the lessee or purchaser has no intent to secure a variance. In the context of eminent domain and real property taxation, the rule has developed that if there is a "reasonable probability" that a variance would be granted, this fact should be taken into consideration in fixing the fair value of property.²¹

With regard to the State highway department, the general rule, based on principles of State sovereignty, is that States are immune from local zoning unless the State legislature waives this immunity by statute.²² This rule has been specifically applied to the activities of a State highway department.²³ Thus, when a highway department di-

Bedard, 343 Ill. 618, 626, 627, 175 N.E. 851 (1931).

²⁰ See Westchester County Park Comm'n v. United States, 143 F.2d 688 (2d Cir.), cert. denied, 323 U.S. 726 (1944); also, assessor's handbooks of California (14) and Wisconsin (92).

²¹ See United States v. Meadow Brook Club, 259 F.2d 41 (2d Cir.), cert. denied, 358 U.S. 921 (1958); United States v. Cer-

tain Land in Baltimore County, 209 F. Supp. 50 (D.Md. 1962); Dep't of Pub. Works & Bldgs. v. Rogers, 39 Ill.2d 109, 233 N.E.2d 409 (1968).

²² Green County v. City of Monroe, 3 Wis.2d 196, 87 N.W.2d 827 (1958); 32 Op. CAL. ATT'Y GEN. 143 (1958); 2 Anderson, AMERICAN LAW OF ZONING § 9.06 (1968).

²³ Town of Bloomfield v. New Jersey

rectly undertakes joint development, it need not comply with local zoning, unless a statute provides for the contrary.

The private party who buys property from the State highway department could not claim for himself the immunity belonging to the State, which is now out of the ownership picture. In the event that a private party leases property from the State, the result may depend on whether the lessee's land use is characterized as governmental or proprietary.²⁴ As noted later, lessees usually cannot avail themselves of the State's exemption from a local property tax, a rule which seems a close analogy. However, this result has generally been achieved by statute. Of course there may also be statutes that specifically require that the lessee conform to local zoning. A California statute (STREETS & HIGHWAY CODE § 104.12) does essentially that. It authorizes the State highway department to lease property, but requires that the department first determine that the use to which the property will be devoted under the lease is not contrary to local zoning. Moreover, if the joint development is to receive federal reimbursement, federal regulations appear to require that "local governments should assume responsibility" for preparation of the project's joint development plan (79).

In conclusion, if the State's lessees must comply with local zoning ordinances, the content of those ordinances sets legal limits on the highest and best use of the property, which is the use that serves as the legal basis for valuation. But the possibility of securing a variance from the zoning ordinance must also be taken into account in the valuation process.

In addition to the zoning issue, it will usually, if not always, be true in joint development that the uses to which the party dealing with the State highway department may devote the property in which an interest is conveyed will be expressly prescribed or limited by the State highway department. If the transaction is a lease, the prescriptions or limitations will be written into the lease. If it is a sale, they will be included as restrictive covenants in the deed. These limitations on use will generally be more restrictive than is local zoning.

Limitations on use in joint development deeds and leases serve two purposes that are distinct from private wealth enhancement. One is to protect the State's interest in the full and free use of the underlying highway or freeway. The second is to advance the public interest by providing for socially beneficial land uses, even if this sacrifices possibilities for greater private profits. There are great differences, then, between the function of use restrictions in private-private transactions and the function of those in public-private transactions, and it is therefore easy to argue that at least in the latter context these restrictions

Highway Authority, 18 N.J. 237, 113 A.2d 658 (1955).

²⁴ See Note, *The Inapplicability of Muni-*

cipal Zoning Ordinances to Governmental Land Uses, 19 SYRACUSE L. REV. 698, 702-03 (1968).

should be considered in determining highest and best use in a sale or lease of air rights.

There is no clear legal answer to this question; if there were, it would be only in the legal context of condemnation of the site by some other state agency, or in the context of the property tax, if the use that the lease or deed requires happens not to be tax-exempt. Obviously, this answer would not prohibit the State highway department from determining its own valuation policy. Therefore, the paucity of "hard law" on these points is not really damaging.

Property Tax Liability

An important valuation factor is the liability of a private party carrying out joint development for the property tax as levied by the city, the school board, the county, and various regional or municipal special districts. The possibility of this party's exemption stems from the fact that the State highway department, as an agency of the State, enjoys such an exemption. In some jurisdictions the exemption of the State, and indeed all public entities, is conferred by statute; in other jurisdictions, by constitutional provision. Absent such express provisions, general doctrines of state sovereignty might render the State and its departments immune from local taxation. The relevance of tax exemption to valuation is obvious. If the developer is in fact exempt, the value of the air space to him, whether he owns or leases it, will of course be higher than it would be were he subject to taxation.²⁵

To the extent that the developer is an owner rather than a lessee, he is liable for the property tax, which by its terms is usually levied on owners. Thus, if actual title to the air rights is conveyed by the State highway property to the developer, the latter is liable to the extent of the value of the air rights.

As will often be the case, the air rights will be leased, but the developer will own the buildings he erects (or which have been erected by the State) within the airspace. This problem has been dealt with by courts primarily in cases where the owner of the land is not tax exempt. The question is then whether the landowner is liable for the entire tax on land and improvements, or whether the landowner pays tax on the land, while the owner of the improvements is liable for the tax as applied to those improvements. Most jurisdictions have accepted the latter of these two alternatives, dividing the tax among the owners as per their respective ownership.²⁶

A few jurisdictions, however, refuse to recognize the division of ownership, and tax the landowner for the entire value (42, p. 74). Applying the majority rule to air rights, it follows that the developer is liable

²⁵ See *United States & Borg-Warner v. City of Detroit*, 355 U.S. 466, 472 (1958).

²⁶ See *Portland Terminal Co. v. Hinds*, 141 Me. 68, 39 A.2d 5 (1944), Annot., 154

A.L.R. 1302; *People ex rel. Hudson River Day Line*, 257 N.Y. 69, 177 N.E. 312 (1931).

for a tax on the improvements if he is their owner.²⁷ Of course, if the developer is a government agency or a charitable institution, it will be exempt from taxation in its own right.

Where the developer is the lessee of the airspace, or the airspace and the improvements, the lessee is not subject to the tax because ownership resides in the State and only the owner is liable under the basic property tax statute. A number of States, however, have enacted statutes specifically making the lessee of a public agency liable to the property tax as applied to the value of his lease.²⁸ This application of the property tax is sometimes referred to as a tax on the "privilege of using the property," rather than on the property itself. Even where the immunity of the State is guaranteed by the State constitution, such statutes are apparently valid. Nor does a tax on the lessee of the Federal Government offend the Federal Government's immunity, which is also of constitutional origin.²⁹

In a few States, under the basic property tax statute, possessory interests including leaseholds are taxable without regard to ownership.³⁰ Thus, in these States there is no need for a special statute subjecting private lessees of public owners to the property tax. Unless they are independently tax exempt, the taxation evidently follows automatically.

Federal Contributions

To the extent that federal funding is available to defray the costs that the lessee from the State in a joint development project will incur, the value of the leasehold to that lessee is increased, and the rent he pays should go up accordingly. To the extent such federal funding is available to reimburse the costs that the State will incur in preparing for joint development, joint development becomes financially more feasible for the State, a fact that may influence the terms of the lease.

With regard to planning costs, under Interim PPM 21-19 § 4a (79), "federal-aid funds may participate in expense related to joint development planning . . . to the extent that the information may be needed in making decisions concerning corridor developments related to the highway and in the design of the highway facility itself." Such planning is defined rather broadly by § 2c. The only significant limitation in this subsection is that the planning must involve the interested local governments. The cost of such planning qualifies for federal funding only if it receives specific federal approval. In any case, it is fairly clear that § 4 is dealing only with project funding. The State is thus also free to

²⁷ See Note, *Conveyance and Taxation of Real Estate*, 64 COLUM. L. REV. 338, 351 (1964).

²⁸ *E.g.*, the Michigan statute set forth in *City of Detroit, supra*; also see Hellerstein (42) at 80.

²⁹ See *City of Detroit, supra*.

³⁰ See CALIF. REVENUE & TAXATION CODE § 104; *De Lux Homes, Inc. v. County of San Diego*, 45 Cal.2d 546, 290 P.2d 544 (1955).

use its 1½ percent research and planning funds under 23 U.S.C. § 307 for purposes of joint development planning (76). For acquisition of right-of-way, federal funding is available for the purchase of the fee, even when the air rights above a certain level are intended for joint development. Moreover, under the terms and conditions of Instructional Memorandum 21-2-69 § IIB (76; see also 80, 5q), certain lands adjacent to the right-of-way for the highway itself may be acquired with the help of federal funding, and, to the extent not required for the highway, "may be devoted to either public or private uses."

Certain construction costs are also eligible. Under Interim PPM 21-19 (79) and Instructional Memorandum 21-2-69 (76) the Federal Highway Administration Regional Administrator, or Division Engineer, is authorized to approve federal funding for a number of items, including the following: platforms above the highway; construction of miniparks and the like; site preparation for recreational facilities; lighting, landscaping, and the like under a viaduct; and elevating a freeway on a structure. Approval of the last item must be concurred in by the Federal Highway Administrator. The regulations also set out the standards for approving these elements of construction costs. These are somewhat imprecise, but refer basically to whether the joint development project expenditure would be justified in terms of its contribution to the values of the community (79). These expenditures are predicated on the Federal Highway Administration's generous interpretation of the term "construction" costs as defined in 23 U.S.C. § 101(a). The Federal Highway Administration has concluded that § 101(a) must be interpreted in light of the other provisions of Title 23, which require that attention be given to local needs, social and environmental effects, and urban planning in approving federal-aid highway projects.³¹

In conclusion, it is noted that federal contributions to construction costs for air rights development by private interests are apparently limited to site acquisition and site improvement costs. In the use of airspace above the highway, these would be limited to land adjacent to the highway, supporting foundations, columns, decking, tunnel lighting or ventilation, and certain utility connections. The private developer would, of course, become liable for these costs in his purchase price or lease payment. The intent of this contribution is to facilitate highway construction, and cannot be interpreted as applying to further improvements in the airspace.

THEORY AND METHODS OF REAL ESTATE VALUATION

A thorough discussion of the theory of real estate value and methods of valuation does not appear to be necessary. However, a brief review of the central issues will serve to orient the reader and to indicate that

³¹ See §§ 109(a)(2), 128(a), 134.

the subsequent material on the valuation of air rights is based on commonly accepted theory and practice.

At this point, it should be re-stated that the emphasis herein is on the valuation of income-producing property owned or leased by a private entity. Valuation related to transactions between public agencies is discussed later herein.

Definition of Value

Economic theorists have explained the meaning of value in various terms such as "value in exchange," "value in use," "scarcity value," "worth," "utility." Because value can have many interpretations, the meaning used in the valuation of real property is important.

The importance of the factor of use was pointed out in an 1894 decision³² by Justice Brewer, who ruled:

The value of property results from the use to which it is put, and varies with the profitableness of that use, present and prospective, actual and anticipated. There is no pecuniary value outside of that which results from such use.

In *Appraisal Terminology and Handbook* (3, p. 192), value of property has been defined as the relationship between a thing desired and a potential purchaser. The key word in this definition is relationship. The appraiser's interpretation of value (2, Ch. 2) is best summarized as follows:

The value of real property depends on its relative scarcity and its ability to arouse desire for its possession (utility) in the market of a purchaser who has the purchasing power (resources) to buy.

Unlike most commodities, real property has a characteristic of permanence. The full value of real property is equal to the present and all future utilities of the property. Estimating the value of all future utilities is the paramount problem in real estate appraisal.

Feasibility Study

Inasmuch as use is such an integral part of real property value, economists and appraisers examine the feasibility of specific use(s) of real property. A feasibility study is aimed at determining whether a specific property use project or program can be carried out successfully. In almost all situations an appraiser might encounter, this success implies a sufficient return on the capital required to attract investors to carry out the development in view of the risk involved. Therefore, a feasibility study requires calculating a likely rate of return on investment for the one or more uses envisioned for the property.

³² C.C.C. & St. Louis v. Victor M. Backus, 1894, as taken from Lum (57).

Highest and Best Use

One of the most difficult aspects in arriving at market value is determination of the factor of use, not only present use but all reasonable uses, including the most logical and profitable use to which the land is adaptable and available, now or in the reasonably near or clearly predictable future (57).

Determination of the most logical and profitable use is accomplished by a highest and best use study. This type of study seeks to ascertain what particular use of a given parcel will provide the maximum return on investment within the constraints of zoning laws and other legal limitations. It always involves a particular parcel and never employs a single pre-existing development concept. In theory the appraisal analyst considers all conceivable uses and analyzes each one to determine the likely rate of return. In actual practice, analysts mentally consider many uses but immediately reject most of them as inappropriate for relatively obvious reasons, mostly having to do with physical limitations (i.e., incompatible with surrounding uses, inappropriate parcel size, poor access, etc.). The remaining uses are then studied intensively through market and/or marketability studies.

Every market study examines both the existing and future supply of and demand for a certain type of land use within a given geographic area. A marketability study applies this general real estate market information to a specific piece of property. Both studies may include land absorption rates. Neither study requires calculating a likely return on investment or consideration of nonpecuniary factors except as they may affect land absorption. In addition, a marketability study discusses specific conditions (such as financing terms, sales techniques, or amenities) that would encourage relatively rapid sale or rental of the property (29).

This application of market and marketability study techniques to the uses being considered in a highest and best use study will generally eliminate several more use possibilities, leaving only two, or perhaps three, uses for detailed feasibility analysis.

The use, or combination of uses in a development concept, that provides the maximum return on investment, as shown by a feasibility analysis and within the constraints of legal limitations, represents the highest and best use.

The necessity of considering so many different uses and analytic steps makes the highest and best use study one of the most complex and difficult of all the economic studies that appraisers must perform. As a result, many appraisals contain only cursory examination of all but one or two uses, and perhaps incomplete feasibility analyses of those.

Three Approaches to Valuation

Any review of appraisal literature will quickly reveal the existence and recognition of the so-called "three approaches to value"—the cost approach, the market or comparables approach, and the income approach. These approaches are the basic framework for appraisal, whether it concerns condemnation for highways (66) or private real estate transactions.

Reproduction Cost Approach

In the cost approach an estimate of building cost when new is charged with an estimate of accrued depreciation to reflect present building value. This indicated building value is then added to the land value to reflect market value for the entire property. There are many opportunities for error in this approach. First, the questionable assumption may be made that cost is equal to value. Second, it should be noted that the cost approach provides only a present building value and the land value must be determined through some other appraisal technique, usually comparable sales analysis or the market approach.

Income Approach

In the income approach, the appraiser is required to estimate three things: the amount of anticipated net operating income (gross income less operating expenses); the anticipated period of the income flow; and the appropriate rate of capitalization to yield a property value. All three determinations demand highly developed talents and ability on the part of the appraiser.

Market Approach

Basically the market approach consists of gathering sales data on as many comparable properties as possible. The comparables must be reasonably similar to the property being evaluated and the sales should be recent. The appraiser then equates each comparable with the subject property by a series of adjustments. These many and varied adjustments call for judgmental decisions and are prone to error. Not only is the judgmental decision an opening to error, but the market approach also requires that an appraiser be thoroughly familiar with all the details of each sale he is using as a comparable. This is a difficult task because the fine details of so many realty transfers are obscure, however available the price.

Which Method Is Best?

After reviewing the three approaches to value it is well to ask which method is best. A review of leading articles in appraisal magazines indicates considerable controversy over the so-called "three ap-

proaches." It is ironic that the solution to the controversy can be found by turning to the original source—Frederick M. Babcock. He has indicated that his original discussion of three approaches (in the 1930's) applied to three separate and distinct properties and valuation problems. He insists that the "three approach" system has been erroneously twisted to imply that all three approaches be used in a valuation and then "correlated" into a final value. A restatement of Babcock's intent is that the purpose or function of the appraisal will determine which approach should and can be used (27).

Much appraisal literature is currently encouraging greater use of sophisticated tools developed in the fields of mortgage banking, investment analysis, urban and regional economics, and others. More and more appraisals are being made for special classes of property that require familiarity and use of modern business methods, such as model building and simulation, capital budgeting, regression analysis, and after-tax internal rate of return analysis (89).

A consensus of the most advanced appraisal thinking emphasizes the centrality of the concept of market value or most probable selling price.

Dilmore (27, p. 20) reminds appraisers that "the value estimate is not a denotative fact, but the expression of a probability with a given range of error, which can be expressed with a reasonable degree of precision." The valuation process to be used in deriving this value estimate will be determined by the specifics of the case—the type of property, the client, the purpose, and the market data available.

Leases and Value

A lease is a legal instrument used by a real property owner (lessor) to convey some of his rights in the property to another party (lessee). Generally a lease conveys the rights of use and occupancy to the lessee for a specified time period and reserves the residue of property rights, including the right to collect rents, to the fee owner or lessor.

The property rights conveyed by a lease are known as the leasehold estate. It is evident that interests created, limited, conveyed, or reserved in leases are desired by potential buyers. For this reason a major area of concern to appraisers is the study of the influence of lease terms on valuation procedures and property values (35). Leasehold value is created when the fair rental value of the leasehold becomes greater than the rent reserved in the lease. This may be influenced by improvements to the leasehold property or changing market conditions (60).

CASE STUDIES OF AIRSPACE PROJECTS

The Federal Highway Administration's 1968 status report on highway joint development and multiple use (85) identified approximately 700 projects, proposals, and studies in the United States. It is obvious that the concept of highway joint development has gained widespread

acceptance throughout the country. However, a review of the projects listed clearly indicates a tendency toward two types of development. The first is the use of land under elevated highways for public parking. The second most common use is for public parks or recreation facilities adjacent to the highway.

The space under the highway has been used for the construction of buildings in only a small number of cases. Warehousing and storage have been the primary uses, together with a small number of highway maintenance buildings.

It is important to note that the proposed projects covered in the 1968 status report were generally of a larger and more complex nature than the completed projects. Included in the proposed category were a number of office, hotel, or apartment structures over various highways. In addition, numerous site or corridor studies for major multiple-use projects were under way.

The first impression resulting from the descriptions of completed versus proposed projects was that major projects above the highway, being primarily in the proposal stage, were of recent origin and represented a significant expansion in airspace development. As described in a later paragraph of this section, a survey of highway departments in all 50 States was undertaken to obtain the current status of major projects. The information provided by the State highway agencies indicates conclusively that the proposed private and public developments over highways have remained in the proposal stages, or have been withdrawn. The current research has identified only 9 private developments and 13 major public buildings that actually exist or are under construction over highways in the United States, as follows:

Private Buildings

- George Washington Bridge Apts., over the George Washington Bridge approach, New York, N.Y.
- Gateway Center, over the Massachusetts Turnpike, Newton, Mass.
- Star Market, over the Massachusetts Turnpike, Newton, Mass.
- Holiday Inn Garage, Reno, Nev. (under construction).
- Sutton Place Apartments, over the F.D.R. Drive, New York, N.Y.
- Prudential Center, over the Massachusetts Turnpike, Boston, Mass.
- Fred Harvey Restaurants (5), over Illinois Tollway System, Chicago, Ill.
- Warehousing, over Kennedy Expressway, Chicago, Ill.
- Restaurant, over Will Rogers Turnpike, Vineta, Okla.

Public Buildings

- University of Alabama Medical Center, over city street (three lanes plus diagonal parking), Birmingham, Ala.
- Hartford Public Library, over Whitehead Freeway, Hartford, Conn.

South Portal Air Rights Building (federal office building), over I-95, Washington, D.C.

U.S. Labor Department Building, over I-95, Washington, D.C.

Subsidized housing, over I-95, Washington, D.C.

Office-hotel structure, over 9th Street Expressway (S-225), Washington, D.C.

Prudential Center (including the War Memorial Auditorium), over the Massachusetts Turnpike, Boston, Mass.

U.S. Post Office, over Eisenhower Expressway (I-90), Chicago, Ill.

City Hall and Parking, over I-195, Fall River, Mass.

Cobo Hall Convention Center and parking, over John C. Lodge Freeway, Detroit, Mich.

United Nations Building, over F.D.R. Drive, New York, N.Y.

Bus Terminal, over I-95 approach to George Washington Bridge, New York, N.Y.

County Courthouse Annex, over U.S. 141, Milwaukee, Wis.

Forms of Airspace Development

The numerous cases of private airspace use under or adjacent to highways have involved relatively small capital investments and uncomplicated appraisals. Parking lots under viaducts, for example, require little more than a survey of comparable land values or an estimate of income in order to establish a fair market value and lease rate. Because further development is usually limited to one- or two-story structures for commercial, light industrial, or warehousing and storage uses, under-viaduct structures do not present a serious appraisal problem.

Similarly, the private use of land adjacent to the highway involves valuation methods and considerations applied in private transactions. The fact that public land and airspace are involved introduces a number of special legal and policy considerations regarding the means and terms of conveyance, safety factors, and environmental precautions. Although these factors cannot be ignored, they can be incorporated in conventional appraisals without serious difficulty.

Public use of State-owned land and airspace appears to present even fewer problems with regard to valuation. Although gift clauses in the State constitution may affect conveyance to other public agencies, establishment of fair market value is generally not required if the resulting use is of some benefit to the purpose of the highway agency. Public development with social or environmental benefits would undoubtedly be beneficial to highway purposes also.

The most important consideration involved, even in major construction above the highway, is the allocation of costs among the public agencies participating in joint development. The most complicated example involved the Federal Government, the District of Columbia, the local redevelopment agency, and private interests in the development of an office and hotel complex over the 9th Street Expressway. A simi-

lar approach was used in the Lytle Park air rights easement for I-71 in Cincinnati, Ohio, in which the city acquired the necessary property. This form of public joint development is also implemented in the Los Angeles area for separate industrial and commercial developments. However, the involvement of the redevelopment agency removes the highway agency from direct conveyance to the private interests and eliminates the primary valuation problem being studied. Under these arrangements, the highway agency and the redevelopment agency share in the costs of development, including foundations or decking, with the urban renewal agency ultimately valuing and disposing of the fee and air rights. The highway agency then retains only a three-dimensional easement.

Public, private, and institutional structures using airspace above city streets have also been recognized. The uses range from industrial conveyors and pedestrian bridges connecting two buildings, to major projects such as the University of Alabama Medical Center in Birmingham, spanning three lanes of traffic and two sets of diagonal parking spaces. These uses do not involve a valuation of the air rights in the context of this study, inasmuch as the three-dimensional easements have not been sold or leased for monetary considerations. They have, however, been the subject of appraisal as a part of the structures involved for purposes of sale or taxation.

Public-private joint development over highways, the primary area of concern for this study, is discussed in the next section.

Private Development over Highways

Before discussing a number of highway airspace projects that appear to have successfully overcome the difficulties involved, a summary of the actual experience is desirable. As previously noted, there are only nine known cases of private development over highways. After investigation of these projects, it is apparent that they provide little empirical information on the full range of factors important to a thorough valuation of air rights. The information obtained is useful to the development of a recommended valuation procedure. However, the differences among the projects in terms of geographic location, time, and type of development preclude their use as direct comparables to each other or to future projects.

In addition, differences in the motivation behind the projects present a variety of basic development concepts. The George Washington Bridge Apartments were promoted by the State, the Port Authority, and the city as low-moderate cost housing, with public bidding for the site and construction. The Star Market was rebuilt in airspace over its original site. Gateway Center, in Newton, was originally suggested by the Turnpike Authority as a replacement for city tax losses, then privately developed as a real estate investment opportunity. Prudential Center was conceived almost eight years before the highway align-

ment, and later modified development plans to include a tunnel. Sutton Place Apartments were constructed partly on air rights reserved by the original site owner when a highway easement was sold to the city. The Holiday Inn Garage is a case of air rights acquisition and utilization in the assembly of a large site. Restaurants over the highway near Chicago, Ill., and Vineta, Okla., are a variation on the concept of locating direct-access service stations and restaurants beside limited-access tollways in order to avoid interchanges. Warehouses over the highway in Chicago are in their original location, the highway having tunneled under the area.

Valuations of the air rights, as applied in the transactions for the Star Market, Gateway Center, and Holiday Inn Garage projects, provide the most relevant information on factors considered. The George Washington Bridge Apartments, Sutton Place Apartments, and Prudential Center did not require valuations of the air rights by the developers before undertaking the projects.

It is apparent that the greatest potential demand for highway airspace lies in the private market. Public-private joint development over highways, however, involves the most extensive legal considerations and the most sophisticated valuation procedures, in addition to the physical problems and the size of long-term capital investment. The lack of development to date stems from the following impediments:

- The high cost of construction over a major highway, relative to land values and construction costs on nearby alternative sites.
- Major highway alignments through areas of relatively low land values wherever possible.
- Limited availability of depressed highways in potential high-density development areas.
- Unfamiliarity with highway airspace development on the part of the private real estate development and financial community.
- Lack of legislation, policies, procedures, and precedent enabling State highway agencies to encourage and expedite airspace development.
- Reluctance of State highway agencies to become involved in large-scale, long-term airspace development.

The reluctance of State highway agencies has been justified, to a great extent, because of unfamiliarity and lack of legislative guidelines, and should not be interpreted as a criticism of the agencies. However, as described in the section on "Legal Considerations," recent efforts of state- and nationwide scope have done much to clarify existing legislation and to encourage the implementation of new legislation and policies for the development of airspace.

In view of the capital investment required for a single project, a conservative attitude on the part of the real estate development and

financial community appears natural. The few existing projects may serve as precedents for further development. As the existing developments prove successful, further interests can be expected where projects are economically feasible.

Cost, location, and highway structure are inhibiting factors that may, in certain instances, preclude airspace development in even the distant future. The essential prerequisite to development is the demand for space, particularly large parcels in areas of fragmented ownership. At the present time, market demand for space is sufficient to justify the cost of airspace development in many urban areas, but the potential users are constrained by legal and procedural uncertainty.

Highway Agency Experience With Private Development

In contacting the 50 State highway departments to obtain information on current airspace projects, a number of general questions were asked regarding policies, procedures, and problems of airspace development. Because the survey was informal, the responses were not tabulated but have been briefly summarized.

The right-of-way office is the department most often responsible for airspace disposition and control. In a number of States, a department of property management has also been established. In California, a department of airspace development is responsible for promotion, implementation, and control of airspace projects. In every State, highway agency personnel were well aware of the problems and the potential of public-private joint development. For the most part, right-of-way personnel were familiar with the literature on the appraisal of air rights.

Most of the States that have already utilized highway airspace, or that are actively engaged in reviewing major development proposals, have made use of outside consultants to prepare feasibility studies. In addition, many new highway planning efforts are automatically considering the joint development possibilities so that coordinated planning efforts can maximize the location and construction of future highways.

Independent consultants have also been called upon to study portions of existing highway/freeway, particularly within or near the downtown sector of major metropolitan areas. For example, the State highway agency in Nebraska contracted the services of an outside consultant to study the highest and best use of a six-block area of Interstate 480. The feasibility report is being used to guide the highway department in developing the air rights under the viaduct for maximum value and public good.

The State of Washington has an independent consultant reviewing the entire highway network to determine developable areas. This is a major undertaking, however, and will probably provide general recommendations similar to those made by transportation master plans.

At the time of writing this paper only two States (Connecticut and New York) have passed laws specifically authorizing use, control, and disposition of airspace by the highway agency. Several agencies indicated that by statute they cannot sell, lease, or dispose of any highway right-of-way. In all States disposition by sale requires that the right-of-way, or any portion thereof, be declared excess. Even in cases of leasing, some agencies must declare the right-of-way as "excess with need for retention."

The consensus shows strong support in favor of the highway department retaining full control of the right-of-way. As a consequence, although many agencies are not prohibited from selling airspace over or under the right-of-way, only a few indicated a willingness to sell airspace.

The primary reason given for avoiding sale was the need to retain control of the highway. A few agencies expressed concern with the idea of changing safety standards that might require higher clearances. Also, the need to retain a capability to expand the highway is of prime importance in certain areas.

A number of States prefer to discourage use of airspace over the highway, and in some cases under the highway. In contrast, the New York State Thruway Authority is actively advertising airspace availability with promotional brochures. California has also compiled considerable promotional material for joint development. The Division of Highways in Arizona has received hundreds of "letters of intent" regarding joint development of right-of-way, including airspace, for the Papago Freeway, currently under design and acquisition. The interest has been so great that they are considering the preparation of promotional material when the entire corridor has been acquired. Most States have actively promoted over- and under-highway airspace utilization for public uses, especially parks, playgrounds, and other recreational applications.

All highway agencies, by policy, require conformance with local zoning and building codes. In some States, this policy is enforced by statute. A great many highway departments discussed various methods they have employed, including citizen participation in the review of proposals for highway air rights as well as new route locations.

Lease of airspace for public or quasi-public purposes is made free of charge in all States. A few States have indicated, however, that a subsequent sublease of airspace, or any highway right-of-way, to a nonpublic user would require sharing the rental revenue with the highway agency.

The majority of all airspace uses are under viaducts, with the most prevalent use being public parking, seconded by recreational uses and storage. In the sense that no supporting structures are required, use of airspace under the viaduct is really surface use with certain height and safety restrictions.

Because the majority of airspace cases involve public or quasi-public uses, valuation of the airspace is seldom required or performed. In the case of private and commercial users of airspace, excepting the major projects noted previously, rentals are based on the market as indicated by comparables. Many highway agencies use the services of independent appraisers as well as their own staff appraisers. Several States have regulations requiring that the rental fee provide a minimum annual return either on the market value or on the condemnation purchase price of the property. Where required, the annual figures ranged from 5 to 8 percent.

Other State regulations relate to the user of airspace. For example, in many States there is a priority rating that allows private or commercial use of airspace, or any portion of right-of-way, only by (1) the adjacent owner, or (2) the prior owner, or (3) an owner with direct access. In such cases the rental fee may be negotiated. Other States often allow prior or adjacent owners first right of refusal on right-of-way before entering into negotiation with another developer or offering the property on the market.

Many States require that leases of public land, including highway airspace, be advertised and sold or leased by sealed bid. The value is usually established by appraisal, with the minimum acceptable bid sometimes set slightly below the estimated fair market value.

With regard to the term of the lease, several States have regulations that allow issuance of leases for right-of-way for a period ranging from only one year, renewable, to ten years renewable. These short-term limitations preclude any major development of the leased area. Many States have indicated that they will tailor the lease tenure to the proposed use so that improvements may be amortized. In the States where airspace development over highways has occurred, long-term leases have been negotiated.

As noted previously, the most common method of appraisal of airspace has been the use of comparables. This approach is most adequate where the use is under a viaduct or on right-of-way adjacent to the highway. Although the personnel contacted were thoroughly familiar with the more sophisticated methods of the income approach, the few major private developments obviously provide little experience in its application to the value of air rights.

Nevertheless, there was a strong consensus that the valuation procedure is not a serious deterrent to airspace development. The majority of highway agency personnel contacted believed that the primary reason so few developers from the private commercial sector have been involved in airspace development over highways is that, even in urban areas, very few cities are so densely developed that land becomes scarce enough to generate demand for highway airspace. It is generally assumed, with the exception of a limited number of areas, that comparable or substitute land values do not equal or exceed the cost of development of airspace.

Case Studies

George Washington Bridge Apartments, New York City.—The well-known case of airspace development is the apartment complex over the George Washington Bridge approach in New York City. The four 32-story apartment buildings, constructed in 1961-62, contain 960 units plus parking. They occupy a three-acre site over twelve lanes of depressed expressway, with four clear spans of approximately 44 ft each. Wide openings between the buildings provide natural ventilation.

An excellent discussion of this project by White (91) has received widespread distribution, and is not repeated here. It is important to note that the airspace was sold through public auction and not on the basis of a predetermined valuation by either the buyer or the seller. A feasibility study was prepared in 1956 for the New York Port Authority, which then agreed to quitclaim the air rights to the City of New York, without compensation, for sale at public auction.

The discussion notes that previous planning studies had not visualized the density of the project, and suggests that it was influenced by the purchase price. A recent discussion with Mr. White confirmed the obvious implication that a detailed valuation study was not performed before the sale. The Kratter Corporation's purchase price of \$1,065,-



Figure 3. Apartments and bus station over George Washington Bridge approach, New York City. (July 1963 photo, courtesy of The Port of New York Authority.)

000, the highest bid, was based on informal studies and their experience with real estate development in New York City.

One of the most significant factors in this project was the offer by the Port Authority to incur the cost of beam bearing seats in the retaining walls, column footings between the traffic lanes, and lighting equipment and ventilation below the structures. Also important were the low debt service factor of 5.05 percent provided by New York State under the Limited Profit Housing Companies Law, the reduced property tax assessment by the city, and the limitation of the sponsor's return on equity investment to 5 percent.

Mr. White's hypothetical valuation (91) resulted in an air rights value that was reasonably close to the actual price. Although the problem of fumes, used as a discount factor in the valuation, resulted in a revision of the New York City Building Code to forestall similar open ventilation (84), the project has been financially successful.

Gateway Center, Newton, Mass.—Gateway Center provides an excellent example of private real estate market action in selecting an air rights location as an alternative to other sites. The development was initiated in April 1966, and completed in June 1971. It consists of a 9-story office building, 12-story hotel and restaurant, and 6-story



Figure 4. Gateway Center, over Massachusetts Turnpike in Newton, Mass. (June 1971 photo by Marshall and Stevens, Inc.)

garage. The Massachusetts Turnpike Authority is fee owner of the entire site; however, only portions of the hotel, garage, driveway, and sidewalks are over the Turnpike and two railroad tracks.

The site was selected on the basis of its favorable prospects for commercial development, and the developer is quite satisfied with the location.³³ The site is located approximately 8 miles from Boston via the Massachusetts Turnpike, with an interchange nearby. The highway and railroad are sufficiently depressed to permit construction at grade with parallel surface streets on either side, providing excellent access to the site and an additional highway crossing. Surrounding land uses consist of two- and three-story neighborhood commercial, office, and apartment buildings. The area, referred to as Newton Corner, was unzoned at the inception of the project, and was zoned through the efforts of the Turnpike Authority and the developer. However, the Turnpike Authority had suggested commercial development of the air rights to the City of Newton in 1963, during construction of the highway.³⁴ The Community Renewal Program also recommended development of the air rights.

The developer conducted a thorough feasibility study, but not an appraisal of the air rights. In view of the location and information provided by the Turnpike Authority, an appraisal of the air rights by the developer was not necessary. The Turnpike Authority estimated the value of the air rights on the basis of comparable land values, less excess construction costs, excess labor costs due to work stoppage during peak commuting hours, and the costs of labor on Saturdays and Sundays. Land values were estimated at \$3.00 per square foot, with the increased costs of construction reducing the airspace value to \$1.50 per square foot. Rent was set at 8 percent of land value on the land occupied and the same percentage on the airspace.³⁵

In the developer's opinion, the use of airspace resulted in approximately the same total costs as a similar project on fee land. He noted that extra utility costs were minor, because much of the project is on land adjacent to the highway, the first level is on grade with existing streets, and the wide spans are over only three lanes. No special protection from fumes or vibration was required. Precise estimates of cost on an alternative site were not made, making it impossible to test any assumptions regarding additional construction costs due to airspace use.

In view of the developer's acceptance of the estimated value of the air rights, it is reasonable to conclude that any excess construction costs above \$1.50 per square foot were offset by the benefits of a readily assembled parcel, a prime location, and land costs on an alternative

³³ Interview with Michael C. Madeira, Development Manager, Gateway Realty Trust, Lessee.

³⁴ Memorandum, James A. Miller, Plan-

ning Director, City of Newton, April 17, 1967.

³⁵ Interview with John M. McCue, Chief Real Estate Officer, Massachusetts Turnpike Authority, June 1971.

site. At the present time, the development is not fully assessed for property tax purposes, because it has just reached completion and is not fully occupied.³⁶ Although the Turnpike Authority is subject to local taxation on improvements when land or air rights are leased, the responsibility for all taxes is transferred to the lessee. Final details on the method or extent to which property taxes will be applied were unavailable.

The mortgage holder is satisfied with the project and will consider financing others.³⁷ An air rights project is considered similar to a leasehold loan. A slight premium (unspecified) in the interest rate was charged, but the amount of the premium depends on the degree of additional risk, if any, involved.

The Turnpike Authority subjected the project to full review and approval by the City before proceeding. After study by the City Planning Department, it was concluded that the project was beneficial in uniting a portion of the community, stimulating economic development, and replacing property on the tax rolls, and did not cause traffic or environmental problems.³⁴

Star Market, Newton, Mass.—The Star Market is located approximately 1½ miles from the Gateway Center. It is likely to remain a rarity in airspace development, and appears to be an example of misplaced development (84). However, information provided by the Massachusetts Turnpike Authority has clarified the rationale for its location and use of airspace.³⁸

The market was an important feature in the small neighborhood shopping center of Newtonville when highway construction in 1962–63 required a portion of the site. Relocation of the market would have had a severe impact on the immediate area. The Turnpike Authority acquired the site, then leased the air rights back to the market. The lease rate was set at a percentage of site value less additional costs incurred in rebuilding over the highway. A major portion of the excess costs were paid by the Turnpike Authority as part of the highway construction.

The case is an interesting example, and indicates the advantages of airspace development during highway construction in reducing costs. However, it is difficult to anticipate a repetition of the circumstances for other relatively low land value uses.

Holiday Inn Parking Garage, Reno, Nev.—Parking garages have been suggested as one of the most appropriate uses of highway air space. This development represents a relatively common situation for their construction by a private interest.

³⁶ Interview with Isabelle R. Mackey, Real Estate Tax Assessor, City of Newton, Mass.

³⁷ Interview with Richard Ellis, Mortgage

Officer, Connecticut General Life Insurance Company, Hartford, Conn.

³⁸ Interview with John H. McCue, Chief Real Estate Officer, Massachusetts Turnpike Authority.



Figure 5. Star Market, over Massachusetts Turnpike in Newton, Mass.
(October 1966 photo by Real Estate Research Corp.)

The developer required the assembly of a parcel large enough for a hotel, casino, and parking structure in the downtown area. As a result of the fractionalization of land ownership in the area, it was suggested that a parcel abutting the freeway (I-80) be acquired in fee for the hotel and casino, and a lease of the air rights over the freeway be negotiated for construction of the four-level parking garage.³⁹ After an extensive period of negotiation (more than two years) the project is presently in the initial construction stages. The freeway is expected to be completed within the next three years.

The location has high visibility from the freeway, an exchange within one-half mile, and good access to surface streets. Consideration has been given to further construction of hotel rooms over the garage.

An appraisal of the air rights was conducted by the highway agency, using comparable land values, plus assembly and visibility benefits, less excess costs of construction.⁴⁰ At the developer's request, an independent appraisal was conducted. This resulted in a slightly lower value, which was finally accepted by both parties.⁴¹ The only significant

³⁹ Interview with Gene R. Brown, Gene R. Brown Co., realtors for the transaction.

⁴⁰ Interviews with Richard R. Cordain, Supervisor, Department of Relocation and Property Management, and Ernest Nord,

Division of Right-of-Way, Department of Highways.

⁴¹ Interview with William G. Kimmel, M.A.I., Reno, Nevada, independent appraiser.

difference between the two appraisals was the comparable land values used. At the highway agency's request, the air rights were valued on the basis of the garage only, and did not involve the adjoining structures. Because the garage is a service function, an income approach could not be used.

The developer is responsible for all construction costs, tunnel lighting, and pollution sensors, and their future maintenance. Property taxes, including those on the value of the air rights, are also the developer's responsibility. The excess construction costs were estimated at approximately \$7 or \$8 per square foot, leaving a similar residual air rights value. However, a nominal payment of \$100 per year is required until the freeway is completed. At that time, the lease rate will be \$31,000 per year.⁴¹ Reappraisal is required in five years, which would tend to reduce the importance of the initial valuation. It does, however, suggest an interesting approach to valuation before a joint development project is completed.

The developer experienced minor difficulty in obtaining financing. It was necessary to obtain modification of the State law in order to establish the highway agency's authority to lease the air rights before mortgage insurance could be obtained. Other than a short delay, the lease of air rights did not hamper financing.³⁹

Sutton Place Apartments, New York City.—Sutton Place Apartments consist of two adjacent high-rise apartment buildings, portions of which are built over the Franklin D. Roosevelt Drive, along the East River between 54th and 56th Streets. The project is presently a co-operative, owned by the tenants.

Contacts with the present management agency⁴² and attempts to contact the original developers⁴³ were unproductive with regard to valuation factors considered in the original development decision. This was understandable, considering that the project was constructed more than 20 years ago. The management agency did indicate, however, that tenant owners have not complained of noise, fumes, or vibration from the heavily traveled highway below.

The origin of the project remains somewhat obscure. It was determined, however, that the original landowners sold a three-dimensional easement, in fee, to the City of New York for construction of the double-deck highway. The owners retained the air rights above a designated plane. When development was later considered, it was recognized that the use of the air rights would add substantial value to the remaining narrow parcel of fee land. Permission to use the air rights was granted, apparently without consideration, by the city.⁴⁴

⁴² Interview with John Pasco, Douglas
Elliman & Co., N. Y., N. Y.

⁴³ Cohen Bros. Construction Co., N. Y.,
N. Y.

⁴⁴ Interview with Alfred Schimmel, Ap-
praiser, New York City Department of
Highways.



Figure 6. Sutton Place Apartments, over Franklin D. Roosevelt Drive, New York City. (October 1966 photo by Real Estate Research Corp.)

The only known appraisal was conducted for property tax purposes.⁴⁵ The conventional income capitalization approach was used, based on gross income less return on investment in the building to yield residual income to the ground and air rights. In the appraiser's opinion, this is the only valid approach to determining the value of air rights in similar projects after the project is in operation. Unfortunately, it does not require consideration of specific airspace factors, as would a valuation of the air rights before development.

Prudential Center, Boston, Mass.—The Prudential Center is an excellent example of joint development in which the fee owner, Prudential Insurance Company, conveyed an easement to the Massachusetts Turnpike Authority for the highway and the Penn Central Railroad before construction was begun. Turnpike Authority permission was then obtained for construction over the easement. Prudential purchased the site from the Boston Redevelopment Agency in 1950 and conveyed the easement in 1962. The highway and railroad tunnel was constructed at the same time as Prudential Center, with the section of highway being completed in 1965.

The development consists of a 52-story office tower, Sheraton Hotel,

⁴⁵ Conducted by Alfred Schimmel, Property Manager, Douglas Elliman & Co., at the time of the appraisal.



Figure 7. Prudential Center, with War Memorial Auditorium in foreground, over Massachusetts Turnpike, Boston. Office tower and hotel utilize airspace beside the highway. (October 1966 photo by Real Estate Research Corp.)

two apartment towers, a parking garage, a shopping center, and a plaza. The shopping center and plaza are the only structures over the easement at the present time. Adjacent to the complex, Boston's War Memorial Auditorium is also constructed over the Turnpike. Turnpike Authority permission is required for further development over the easement.

Unfortunately, this project does not provide valuation data on the airspace from the developer's point of view. No consideration was given to air rights at the inception of the project,⁴⁶ and as far as is

⁴⁶ Interviews with John J. Wilson, Vice President, and Roger Heinen, Real Estate Department, Prudential Insurance Company.

known the numerous considerations involved in airspace development have not been explicitly valued. The price paid for the easement by the Turnpike Authority was negotiated in 1958 at approximately \$4 per square foot,⁴⁷ which appears to have been extremely reasonable, given the intensive use of the site and its location near downtown Boston. The Turnpike Authority paid additional costs of tunnel construction and is responsible for tunnel maintenance costs.

Private Development over Railroads

Railroad airspace development over the past 70 years provides the greatest number of case studies of major structures over transportation rights-of-way. Although the appraisal profession has used the valuation techniques developed by the railroads as material for present theory and practice, there are three major differences that limit the usefulness of railroad airspace experience. First, the railroads are private entities and have the power to enter into a joint financial venture with a private developer. In addition, the railroads have traditionally been recognized as members of the investment community, operating under a similar set of motivations and policies as other sectors of the private economy, and lacking the State's power of condemnation. Second, the railroads are not constrained by "highway purpose" or "public good" considerations, as is the State highway agency. Although development may not interfere with railroad operation, and they are regulated at the State and Federal level, numerous railroads have formed subsidiary real estate development corporations to communicate and negotiate on an equal basis with private investors.

Finally, and perhaps most important, the physical problems of construction over railroad right-of-way are significantly different from those over highway right-of-way. Supporting columns can be located between the fixed rail lines with much more flexibility and closer tolerances than between highway lanes. In numerous cases, normal column spacing has been achieved, eliminating the need for wide spans. Safety considerations, in terms of protection for the railroad and passengers, are minimal. The probability of collision, relative to that on highways, is insignificant due to lower speeds and automatic controls. Since the advent of electric locomotive power, ventilation requirements have become minimal and much longer enclosures are possible. Traffic interruption during construction over railroads can be minimized, but is difficult and costly to avoid over existing highways. Despite these significant differences between highway and railroad airspace development, the general background of railroad airspace use is informative.

The Park Avenue development in New York City represents the origin of significant air rights use in this country. The wide, depressed

⁴⁷ Interview with John H. McCue, Chief Real Estate Officer, Massachusetts Turnpike Authority.

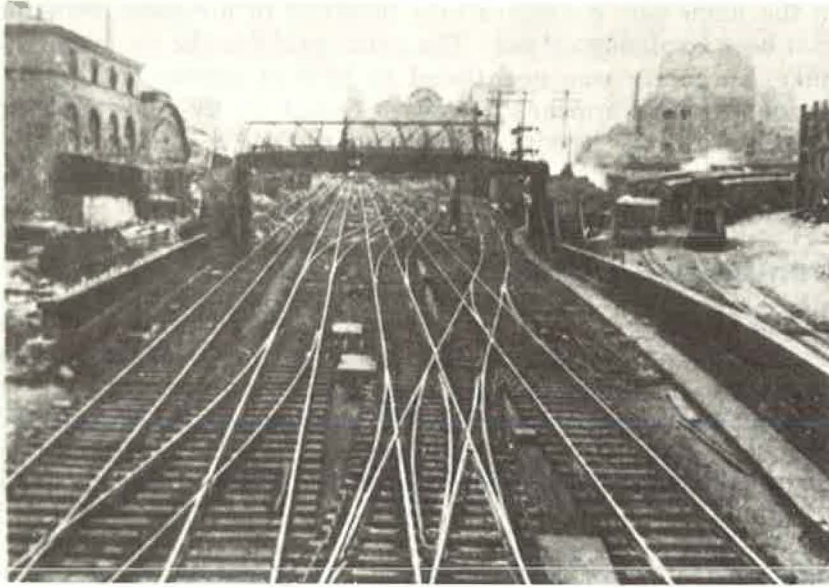


Figure 8. Park Avenue (New York City) in 1903, looking south from 50th Street, when occupied by the New York Central Railroad.

right-of-way was considered detrimental to the surrounding environment. Under pressure from the city, the New York Central Railroad undertook the decking of approximately 20 acres, north of Grand Central Terminal. Beginning in 1913, the project included Park Avenue and numerous major structures, eventually including the Waldorf-Astoria Hotel, the Pan Am Building, and numerous other hotels, office buildings, and high-rise luxury apartments. Other projects in and around New York City are currently under development.

Chicago experienced significant requests for air rights over railroad right-of-way around 1930. The Daily News Building and the Merchandise Mart were the earliest structures, with the Prudential Mid-American Building and the twin Marina Towers being constructed in the 1950's. Extensive use of Illinois Central Railroad air rights continues today, especially in the area south of downtown, along Lake Michigan.

In Philadelphia, the Penn Center project provided more than 20 acres of prime space just west of City Hall in the early 1950's. The Pennsylvania Railroad's elevated rail yard, terminating at the City Hall, was scheduled for demolition. In cooperation with the city, the remaining tracks and passenger station were placed underground, thus eliminating a major barrier (known locally as the "Chinese Wall")



Figure 9. Park Avenue in the 1930's, after development over the New York Central right-of-way.

and permitting a westward expansion of the central city for approximately one mile. The air rights development now includes major office buildings, hotels, and combined high-rise office-apartment buildings.

Numerous individual cases of railroad air rights development exist in these and other cities (93, Ch. VII). A complete inventory would be of questionable value; it is clear that such development is a continuing phenomenon with new cases to be added every year. The most significant factor in the development of railroad air rights, with few exceptions, has been their location in central, high land value areas of cities. The historical development of the city around the railroad right-of-way and terminals has provided the demand for use of the airspace.

Valuation has not been a serious issue in the history of railroad airspace development, probably because commercial transactions between private parties are seldom subject to judicial review. (It is noted that the value of air rights has apparently never been established in court other than in instances of public condemnation.) Also, although rail-



Figure 10. The 59-story Pan Am Building, over two levels of railroad track, New York City.

roads are required to maintain records of the value of their assets, including land and air rights thereon, accounting records normally differ substantially from actual valuation at the time of sale or lease.

One method of valuation employed by the Illinois Central Railroad has led to the mistaken impression that air rights were merely valued at an arbitrary percentage of the underlying fee value. The actual approach was somewhat more realistic and, although it usually resulted in a lower than fee value, the percentage was a result of the valuation rather than the basis for it.

As described by the Illinois Central (93, p. 323), the fee value of the land was first estimated by normal appraisal methods, with an addition for assembly of a large parcel. The second step involved estimation of total floor area permitted by the zoning limitations, assuming development to the highest and best use. The unavailable floor area, as a result of the volume of space retained by the Railroad, was deducted from the total. The ratio of the available floor area to total floor area was then



Figure 11. Penn Center (Philadelphia) in 1950, looking west from City Hall, as occupied by elevated tracks and station of the Pennsylvania Railroad.

applied to the estimated value of the fee to obtain the value of the air rights. Wide variations in the ratio can, and in fact did, result, because each parcel was treated separately. The methods referred to have been used in the past, but the Illinois Central is continually reviewing, updating, and improving its method of valuation as new information becomes available.

A similar approach, using the dollar value of a square foot of building space, is commonly applied in midtown Manhattan, where land prices force development to the highest and best use permitted by floor area ratios.⁴⁸ In the densest urban centers, such as Manhattan and Chicago, comparable square foot values for building space are relatively easy to establish. Two interesting examples of this approach in Manhattan are the sale of excess airspace over St. Peter's Center, and the purchase of the airspace on an adjacent parcel for the Seagram Building.

Inquiry into the Penn-Central air rights transactions was kept to a

⁴⁸ Interview with Robert Quinlan, James New York, N.Y.
B. Landauer Co., Valuation Consultants,



Figure 12. Penn Center in 1965, after tracks and station were placed underground.

minimum in view of the Railroad's bankruptcy and pending sale of approximately ten blocks of air rights in the Park Avenue area. Appraisers for the Railroad indicated that an income approach was being used to value the property. Each parcel is being treated separately, with full consideration of its specific locational factors and income production.⁴⁹ It was also indicated that the long history of air rights in New York City has eliminated any financial risk premiums for the use of airspace. Other experienced appraisers voiced their opinion that the income approach was the most realistic method of valuing developed air rights from a private purchaser's viewpoint.⁵⁰

Two recent developments in Chicago were investigated during this study. The Outer Drive East Apartments, a 40-story, 940-unit, luxury apartment building, is not actually over operating right-of-way. Tracks were removed before construction began in 1962. The building is at grade with the Outer Drive and Randolph Street, providing excellent access.

⁴⁹ Interview with John P. Dolman, Executive Vice President, Jackson-Cross and Co., appraisers for the Penn-Central Railroad.

⁵⁰ Interview with John R. White, Executive Vice President, James B. Landauer Co., N. Y., N. Y.; and Alfred Schimmel, Appraiser, New York City Department of Highways.



Figure 13. Outer Drive East Apartments (Chicago), with Prudential Building and Randolph Terminal area in background over Illinois Central Railroad right-of-way. (August 1966 photo, courtesy of Prudential Insurance Company of America.)

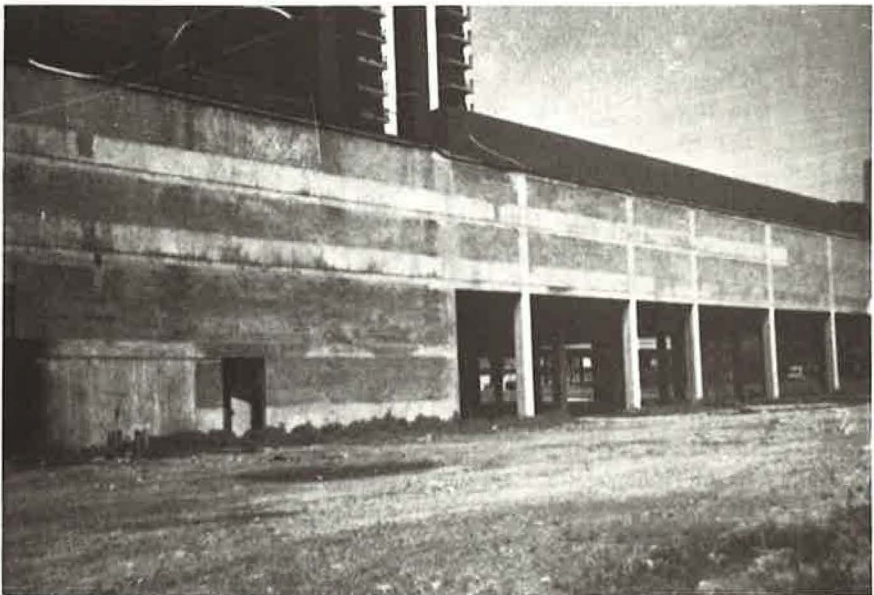


Figure 14. Outer Drive East Apartments; detail of foundation. (June 1971 photo by Marshall and Stevens, Inc.)

The air rights for approximately 90,000 sq ft were purchased in 1961 at a price of \$35.00 per square foot, after negotiation with the Illinois Central Railroad.⁵¹ Caisson lots for the supporting columns were included in the total price, but were not costed separately. The initial valuation by the Railroad was based on the traditional approach previously described.

The only significant increase in construction costs resulted from portions of the lower level being at 32 ft above ground. Basement and utility space is at ground level. The total excess construction cost resulting from the use of air rights was estimated at 1 to 2 percent, inasmuch as the foundations and supporting columns were similar to those required on other sites. Total project costs were \$27 million.

The mortgage holder indicated that financing was no different from that employed in a fee project.⁵² It was noted that FHA insurance was obtained on the \$20 million mortgage. However, the mortgage holder indicated that it would consider other air rights projects without FHA assistance.

At the time of writing this paper, Illinois Central Industries and Ogden Corporation were involved in a joint development project, tentatively planned to include a major office building, two 1,000-unit apartment buildings, a 1,250-room hotel, shops, restaurants, and an Amtrak rail center.⁵³ The office building was scheduled for construction in late 1971 at an estimated cost of \$40 million. Other portions of the project were scheduled to start in 1972. These plans, timing, and costs are tentative and do not represent the final development that may occur.

Boundaries of the site have not been finalized; however, the general location is south of the Outer Drive East Apartments, between the Outer Drive and Lake Michigan. Much of the construction will be over the Illinois Central tracks.

Because the project is being undertaken as a joint venture, conveyance of the air rights is not required—valuation of the air rights is internal to the project. Joint financing is also involved, and it was stated that air rights projects are neither more difficult nor more expensive than conventional fee projects.

Property taxes, according to the assessor's office, are levied on the improvements and the value of the air rights when developed. A new taxing formula is presently being developed. However, in the past a residual approach has been used in which the excess construction costs, time delays, and income losses were considered in valuing the air rights.⁵⁴

⁵¹ Interview with Howard Ross, Jupiter Corporation, owner-developer.

⁵² Interview with Steven Cohn, Greenbaum Mortgage Co., mortgage holder.

⁵³ Interviews with H. S. Jensen, Illinois

Central Industries; and Robert Levina, Ogden Development Corporation.

⁵⁴ Interview with Joseph A. Scheibel, Chief of Real Estate Division, Cook County Assessor's Office.

RECOMMENDED METHOD FOR VALUATION OF AIRSPACE

On the basis of discussions with representatives of State highway agencies and private appraisers, it is concluded that there is widespread agreement on the most appropriate method of appraising highway airspace. With the exception of five States, the private use of airspace has been limited to that above land adjacent to the highway or under viaducts. As described in the section on "Case Studies of Airspace Projects," the income or comparable sales methods of valuation are most appropriate and therefore most widely accepted for under-highway uses. Parking lot improvements, under-viaduct buildings, or buildings adjacent to the right-of-way, entail relatively simple valuation exercises. A detailed statement of the techniques and factors to be considered does not appear to be necessary for these uses.

However, the construction of major private buildings over highways presents one of the most detailed, if not conceptually difficult, valuation approaches in modern real estate appraisal. This section presents a thorough description of the recommended method of appraising airspace over a highway where the airspace is to be leased to a private real estate developer for construction of a major building or complex of buildings. The factors considered are necessarily comprehensive, and are therefore sufficiently inclusive for the valuation of any private development on highway right-of-way.

Much of the discussion material related to the valuation factors has been confirmed during this study and represents the current opinions of experienced highway agency personnel, private appraisers, and real estate interests. However, the underlying considerations were described in 1930 with regard to the Chicago Merchandise Mart and Daily News Buildings over Illinois Central Railroad right-of-way (23). It is interesting to note that the authors of this article argued against any use of a rule of thumb employing a ratio of airspace value to fee value for appraisal purposes. Although their conclusion that each case must be treated in full detail has stood the test of time, the use of ratios has been proven unacceptable.

Numerous articles on airspace valuation have been published since 1930, primarily concerned with airspace over railroads (see App. B). A review of many of these indicates little conceptual disagreement among the proposed methods of valuation. Although various authors have considered different items, the basic methodology has not been significantly altered in 40 years. Wright (93) gives an excellent summary of the historical development of airspace valuation. Although he claims to present only an introduction, his discussion on airspace valuation (93, Ch. IX) should be considered indispensable to the attorney as well as the appraiser. The summary is sufficiently comprehensive; any attempt to repeat or expand on it would be of little marginal value. The appraiser with experience in airspace valuation undoubtedly will have read the many articles cited. The novice should

study at least the selected articles noted in Appendix B of this paper.

The description of a recommended valuation approach resulting from this study is essentially a detailed variation of the Kuehnle method (50). Wright (93, p. 341) notes:

In the last analysis, therefore, it would appear that the Kuehnle method of commercial airspace valuation and related derivations are of sufficient theoretical soundness to be able to withstand any judicial scrutiny which might ultimately be applied, as far as the legitimacy of the methodological framework is concerned.

As noted previously, highway airspace valuation has not received the judicial scrutiny required to prove or disprove this opinion. It is entirely unlikely that the method described herein will be rejected unless a more acceptable framework for valuation is developed. There is no evidence of any attempts in this direction at the present time. It can be anticipated, however, that the actual values placed on a single valuation factor will be open to controversy, given the subjective nature of the appraisal process.

The valuation methodology described in the following represents a formalization of the approach employed by commercial real estate developers in determining the offer or bid price for a site. Experienced developers are, in most cases, familiar with the over-all real estate market, land prices, construction costs, rent levels, and financing terms in their geographic area of interest. It is safe to assume that the most experienced developers undertake the least formal valuation studies, especially in areas and projects in which they have been successful.

A basic approach would usually involve the following items, and might not require more than a few days of the developer's time to prepare his offer or bid price for an available site:

- Determination of the highest and best use (or his intended use) and appropriate structure.
- Selection of an approximate land value, based on the sales prices of comparable sites.
- Estimation of site development and construction costs.
- Estimation of square-foot rents, gross income, operating costs, and net income.
- Estimation of debt service, taxes, and net profit.
- Calculation of the estimated return on equity.

The comparison of the resulting return on equity with the desired return, if unfavorable, results in a reconsideration of all factors involved. However, if it is impossible to achieve the desired project and rate of return using the assumed land value, the analysis is recalculated to determine the land price that will provide the desired rate of return. A significantly lower offer or bid is then made in order to begin negotiation toward a final purchase price.

The effort involved can range from calculations of a very preliminary nature to a thorough feasibility study incorporating architectural, engineering, city planning, real estate, legal, and financial advisory services. Regardless of the effort expended or the mathematical approach, there is no significant difference between actual practice and the established theories of land economics, real estate investment, and appraisal. The process involves elements of the cost, market, and income methods of appraisal, with the desired after-tax rate of return as the critical parameter for the developer.

The recommended method of valuation assumes an extensive and costly study for a particular site. However, the highway agency's responsibility in the event of financial failure of a major project is too serious to permit uneconomical development. Assuming and describing a comprehensive study to be made by the developer before actual conveyance of the airspace serves the following purposes:

- State highway agencies are occasionally confronted by private developers with requests for the purchase or lease of airspace. If the developer is as thorough in his analysis as is suggested, the highway agency should be prepared to evaluate the proposal and terms accordingly. If the developer has not performed a thorough analysis, the highway agency should be prepared to advise him on the potentials and problems of airspace projects.

- A number of State highway agencies (notably California and New York) have undertaken promotional campaigns to stimulate airspace development. The response to their efforts appears to present problems in the form of overreaction from brokers or inexperienced developers seeking options on numerous parcels. The approach being developed in California contemplates the offering of a limited number of carefully selected parcels. If the recommended valuation procedure was applied to each selected parcel to establish desirable, marketable uses and possible lease rates, it would serve to eliminate many unrealistic and unacceptable proposals.

- Dissemination of a detailed recommended method of valuation together with legal, policy, and administrative considerations can help to generate interest and understanding in the real estate and financial community. Inasmuch as few real estate developers have had experience with State highway agencies, the opportunities for communication have been limited or in most cases nonexistent.

Highest and Best Use

The application of a thorough highest and best use study is theoretically sound with regard to air rights. However, the special nature of an air rights location over a major highway presents serious practical problems. Although there may be a demand for the various uses that could be developed on air rights, there has been little market interest in

using air rights. Nor can any effective market for air rights over highways in the near future be envisioned. As noted later in this section, the lack of demand is not based solely on quantifiable financial considerations.

Few private developers undertake thorough highest and best use studies in purchasing a site, because each usually has a specific use in mind. In an active market, the highest bidder sets the value of the site and determines the highest and best use. The knowledgeable appraiser can generally forecast the use and a reasonably close estimate of the price. Similarly, an experienced developer with a specific project normally selects an appropriate site for his use on the basis of market indications.

Although the theoretical highest and best use for an air right site can be determined on the basis of market demand for various uses, costs, and income estimates, the lack of demand for the site itself tends to invalidate the analysis. Until experience and confidence in highway air rights development increase significantly, the private market is unlikely to undertake even financially feasible projects. The uncertainty factor is apparently so great as to suggest a negative value except in special cases, as demonstrated by the few existing projects.

Every attempt should be made to promote development of the highest and best uses. However, strict adherence to this concept by the highway agency in valuing airspace will severely limit development in the near future. The researchers cannot anticipate a highest and best use study on the part of a private developer, nor do they recommend its application by the highway agency to establish a firm minimum acceptable price or lease rate.

Further consideration is given to highway agency policies in the next section. For the present it is assumed that a private developer has determined his desired use of the airspace and must prepare an estimate of its value, or his offering price. It must be noted that a single bid and proposed use, following advertisement and sufficient time for response, can be interpreted as evidence of highest and best use and fair market value at that time.

Appropriate Structure

Selection of the appropriate structure for the site must consider the specific site conditions as well as the determined use. At this point in the analysis, it is necessary to study the site in sufficient detail to develop a reasonably accurate engineering and construction cost estimate. The developer must consult with the highway agency's engineering staff to obtain physical conditions and limitations of the proposed site, and to determine the feasibility of various development plans.

These conditions and limitations are discussed in the following as they affect construction costs. However, the final selection of the

appropriate structure or complex of structures will ultimately result from the estimated construction costs, and will also influence construction costs. Without carrying the analysis to the point of final detailed engineering and design, it is impossible to develop a precise estimate of costs. Nor can the developer be expected to proceed further than a reasonably accurate estimate until he has obtained at least an option on the site. The same situation generally prevails with regard to a typical parcel of land. The following sequence of cost and income estimates is based on the assumption that preliminary studies have resulted in the selection of the desired use and structure for the site, and an intention to lease if financially feasible.

Development Costs

Foundation

Previous authors have referred to a "deck" under an airspace structure, providing the impression of a platform on which the structure rests. A more realistic approach is to recognize the special nature of the foundation as an integral part of the structure, consisting of load-bearing retaining walls at the sides of the highway, supporting columns between the lanes, and supporting beams spanning the highway.

Cost estimates must be based on the underlying soils, the existing highway structure, and the proposed building to be supported.

Structure

Numerous construction costs are peculiar to airspace development and, to a certain extent, prohibit the use of standard square-foot costs developed on the basis of non-airspace structures. Among the most important are the following:

- Lack of a basement or subbasements for elevator maintenance, utilities, and services, possibly requiring their placement in other areas of the building.
- Reinforced floor on the first level above the highway, for safety purposes.
- Insulation of lower floors from noise, vibration, and fumes.
- Construction of safety provisions to protect the highway from falling objects.
- Construction of ventilation shafts and equipment over large enclosures.

In view of the limited number of airspace structures over highways, it is impossible to develop standard construction cost data. It is also unlikely that cost standards for estimating purposes will be available in the near future. It is therefore necessary to prepare preliminary engineering and architectural drawings in order to develop reasonable

cost estimates. The level of detail required is, of course, subject to the specific site and proposed structure, and a general rule cannot be determined here.

Access

Special access to the building in the form of elevated pedestrian and service entrances may be required if portions of the first level are above grade. In addition, utility connections may entail special costs.

Timing

Because of the complexity of the construction and the requirement that traffic not be interrupted or endangered, the over-all construction time may be extended. As a result, the costs of labor and construction loans may be abnormally high.

It is reasonable to expect that negotiations and approvals from federal, state, and local agencies will entail time delays and additional costs.

Design

Final engineering and architectural plans undoubtedly will require innovative designs and new techniques that entail an additional expense. The relative complexity of an airspace project will involve a longer time period for consideration of all highway traffic and safety factors.

Project Income

Rental Income

Gross rental income must be estimated on a square-foot basis, in consideration of comparable, competitive buildings. Among the factors to be considered are the relative:

- Quality of the proposed structure.
- Accessibility.
- Visibility.
- Floor plans.
- Noise, vibration, and fumes.

Vacancy rates are not necessarily related to the development of airspace, and must be estimated with regard to the local conditions.

Operating Costs

There is no evidence to suggest that operating costs are necessarily higher for an airspace structure. In estimating operating costs it seems safe to rely on available standards, with due attention to the specific

building characteristics. Difficulties in access to utilities or portions of the building requiring maintenance are the major considerations.

Property Taxes

There is no standard method of assessment and taxation currently applied in the United States. Therefore, in locations where development on tax exempt public property is subject to property tax of any form, the developer must consult the local taxing authority. Unless assurance to the contrary can be obtained, property taxes based on the value of the structure and some portion of the value of the air rights or leasehold interest can be anticipated.

Financing

Financial commitments from a lender are required before a responsible bid or offer can be made. These commitments generally are obtained on the basis of the total cost of the proposed project. However, the possibility of land purchased is not considered here. The developer is obviously aware of the interest rate and terms available to him. It is important to note that borrowing is in the form of construction loans, with the value of the lease and the proposed structure as security. This consideration generally requires a financially sound developer, inasmuch as there is no land value involved.

Interest rates reflect the financial position of the borrower as well as the proposed project. A risk premium can be anticipated on an air-space project, but its application will depend on the individual developer.

Restrictive lease clauses and the interests of the fee owner may also increase the interest rate or make financing difficult to obtain. In addition, the inability of the highway agency to participate financially, as in the case of railroads, may make the project less favorable from the lender's point of view.

Income Taxes

Income taxes on project income are specific to the developer and must be determined on the basis of his total financial situation, as projected to the time of completion and operation. Two important considerations are the ability to depreciate the entire cost of the improvement and the annual lease payment.

Summary of Valuation Factors

The following outline of valuation factors is suggested as a checklist of items to be considered in estimating costs and income for development of air rights over a highway. For the most part, these items would be considered in a non-air rights project, but are often treated as rules of thumb.

Development Costs

Foundation:

- Subsurface conditions
- Retaining walls
- Supporting columns
- Spanning beams
- Impact and fire protection

Structure:

- Reinforced floor on lowest level
- Lack of basement
- Location of offsite utilities
- Placement of onsite utilities
- Elevator maintenance
- Internal columns
- Floor plans
- Insulation from noise
- Reduction of vibration
- Protection from fumes
- Construction employee safety

Highway safety:

- Ventilation
- Lighting
- Protection from falling objects

Access:

- Pedestrian entrances
- Service entrances

Timing:

- Design problems
- Noninterruption of traffic
- Interest on construction loans
- Lease negotiations
- Financial arrangements
- Legal approvals
- Public agency approvals

Design:

- Site limitations
- Novel engineering
- Innovative architecture

Project Income and Expenses

Rental income:

- Market considerations
- Competitive projects
- Quality
- Accessibility
- Visibility and publicity

- Floor plans
- Noise and vibration
- Fumes and dust
- Vacancy rates
- Operating expenses:
 - Utility costs
 - Access to utilities
 - Access to maintenance areas
 - Security
 - Highway-induced maintenance
- Property taxes:
 - Local practices
 - Assessment of lease
 - Assessment of improvements
- Financing:
 - Risk considerations
 - Terms and length of lease
 - Interests of fee owner
 - Nonparticipation of fee owner
- Income taxes:
 - Full deduction of lease payment
 - Depreciation of additional construction costs

Developer's Worksheet

The summary worksheet given in Table 1 is for illustrative purposes only. All values are hypothetical and, although within the realm of possibility, are not based on an actual site or building. The general assumptions include: a private developer, considering lease of an airspace location over a highway; a preliminary feasibility study for a specific structure; preliminary cost and income estimates; and an annual lease rate of 10 percent of site value. The desired rate of return represents a project capitalization rate and avoids the controversy over land residual versus building residual approaches. For simplicity of calculation, the rate of return on original equity is used as the investment criterion. The recommended criterion is the internal rate of return over the life of the project.

Use of comparable land values and a 10 percent lease rate results in an after-tax return of 14 percent based on the original equity and net cash earnings given in Table 1. If it is assumed that the developer's desired return is 15 percent, and all other cost and income factors remain the same, the lease payment must be reduced, implying a significantly lower value for the airspace site.

As a brief explanation of the calculation of the lease payment and air rights value in Table 1, it should be noted that the net annual cash income required is \$750,000 if a 15 percent return is to be achieved on the original equity of \$5 million. Working back from this figure, the

\$600,000 depreciation indicates a required after-tax net profit of \$150,000. Given a tax rate of 50 percent, net income before taxes must be \$300,000. Assuming that gross income and all costs other than the lease payment are fixed, the maximum lease payment is \$100,000. The implied value of the air rights is therefore \$1 million because the assumed lease rate was 10 percent of land value.

The basic rationale behind this approach is quite common where, given a target rate of return, the maximum lease payment is to be determined. Lest it appear deceptively simple, it is important to note the effort involved in preparing each of the construction and operating cost estimates, gross income estimates, and calculations of interest, depreciation, and taxes. Although this type of analysis is often performed quite casually for a familiar project, it requires full study for a new and different type of real estate development. More sophisticated mathematical techniques of investment analysis are also recommended. However, most large office or apartment structures involve a

TABLE 1

EXAMPLE OF PRIVATE AIRSPACE DEVELOPER'S INVESTMENT ANALYSIS WORKSHEET: DETERMINATION OF ANNUAL LEASE PAYMENT

	USING COMPARABLE LAND VALUE	CALCULATION OF AIR RIGHTS VALUE	
Comparable land value	\$ 2,000,000		
Calculated air rights value ^a		\$ 1,000,000	
Construction cost	20,000,000	20,000,000	
Original equity	5,000,000	5,000,000	
Annual			
Gross income, net of vacancy	\$5,000,000		\$5,000,000
Less:			
Operating costs	\$2,500,000	\$2,500,000	
Property taxes	500,000	500,000	
Interest	1,000,000	1,000,000	
Depreciation	600,000	600,000	
Lease payment (10% of land value)	200,000	100,000 ^a	
	\$4,800,000	\$4,800,000	\$4,700,000
Net income for tax purposes		200,000	300,000
Less income taxes		100,000	150,000
Net profit		100,000	150,000
Plus depreciation		600,000	600,000
Net cash earnings		\$ 700,000	\$ 750,000
Return on original equity		14.0%	15.0%

^a Calculated on basis of desired return of 15% on original equity.

relatively small land cost in relation to total project costs. Land cost (or the lease payment) decreases in importance as the total project cost increases. Thus, it should not be overemphasized as the most important variable.

It must be noted that the developer is concerned only with the annual lease payment, and is thereby imputing a value to the air rights. In a negotiated lease, it is safe to assume that he would offer a substantially lower annual lease payment to compensate for unforeseen costs or overestimated income. In a bid situation, the developer would in all probability submit the highest annual lease rate, subject to a similar safety margin.

If the worksheet is adapted to a situation in which the air rights are purchased, the original equity and the interest payment must be increased. Although the mathematics are more complicated, the analysis is essentially the same, with the purchase price of the air rights to be determined.

Before examining the decision to purchase or lease, it is clear that from a private commercial real estate developer's point of view the valuation of air rights does not require the estimation of comparable land values and the costing of a hypothetical comparable building on an alternative site. In the case of a developer interested only in a specific project on a specific air rights site, the costing of a comparable project on an alternative site is irrelevant. Comparable land values are relevant only for purposes of suggesting the use and type of structure. After the proposed project is in operation, the pro forma income approach is the only realistic method of valuation for the private real estate developer.

It is concluded that the income approach is the most appropriate method for the private developer and, ultimately, the highway agency in determining the value of air rights (30). It is essential that the after-tax capitalization rate⁵⁵ be used in order to incorporate the tax shelter aspects of real estate investment and the particular tax position of the developer, as well as his perceived risk factor.

The after-tax internal rate of return on the entire project is recommended as the investment criterion (90, 88). Use of different capitalization rates for the air rights and the structure, as employed in the land residual approach, is not considered appropriate. The implication of the land residual approach—that risk or desired rate of return on land and buildings can be estimated separately—is not realistic from the viewpoint of the real estate developer as investor in a total project (27). Because the air rights and the improvements thereon cannot be separated, the total project capitalization rate should be used.

⁵⁵ In his preface, Ellwood (30) notes that investment are matters of fact, not appraisal opinion.

The General Case

Although each private developer can be expected to value a specific air rights site with an approach similar to that previously described, actual operation of the real estate market results in use of comparative valuations as noted in the literature. Inasmuch as most projects can be constructed on a number of alternative sites near a specific air rights site, the alternatives must be considered before a bid or an offer is made for the air rights. A decision to purchase or lease air rights would be made on a comparable basis with other desirable and potentially available sites.

It is necessary, therefore, to assume construction of a comparable project on an alternative parcel of land, and develop all estimates of cost and income for a comparable financial analysis. Two valuation factors must be considered in addition to those previously discussed. First, demolition costs will be incurred if a vacant parcel is unavailable. Second, land assembly costs will be incurred if a parcel of sufficient size is unavailable.

By use of the same procedure as incorporated in the example analysis previously described, an estimate of the maximum purchase price or annual lease payment can be made. If, as assumed, the project represents highest and best use, the purchase price will be within the prevailing range of land values.

The comparisons of air rights values and fee land values, to date, have generally resulted in a significantly lower air rights value, owing to the higher development costs. The situation is similar to comparisons of any two sites where one requires special site development costs due to slope, poor geology, access, or other important considerations. Unless the development costs are prohibitive, development occurs on the inferior site when the demand for land is sufficient and the reduced land value reflects the excess cost.

The valuation of the air rights and a comparable site suggests a simplified version of the Kuehnle (50, p. 5) and White (91, p. 29) formulas incorporating the income approach, as follows:

$$V - A = R \quad (5)$$

in which

- V = the value of a comparable fee parcel;
- A = the value of the air rights; and
- R = the value of the residual (highway) interest.

To the private developer the value of the highway interest is the increased cost of development, or loss in value of the air rights, relative to a comparable project on a comparable site. As is often assumed in theory, if all other considerations are equal, the private developer (or active private market) will determine the value of R at which development of air rights is as equally desirable as on alternative non-air rights sites.

Although the existing projects over highways demonstrate the financial feasibility of airspace development, they do not provide sufficient empirical data on the problems to be overcome in further development. The researchers' survey of State highway agencies found that the "high cost of development" was the most common reason for the lack of interest and the withdrawal of proposals by private developers. Obviously, private development can not be expected to occur where the value of air rights is negative. However, there are areas in almost every major city where development is financially feasible from an objective analysis incorporating a relatively high financial risk factor.

It must therefore be concluded that the private market is simply unwilling to undertake air rights development over highways for subjective, nonquantifiable reasons over and above the financial considerations involved. These reasons can be summarized as lack of experience and lack of confidence in even the most thorough feasibility study, and a general inability to estimate the over-all risk or problems involved. With the possible exception of Gateway Center in Newton, the existing projects are not representative of the private market in general, as noted in "Case Studies of Airspace Projects," *supra*. The Holiday Inn Garage in Reno, however, does suggest a case in which air rights should be valued by the traditional approach.

In the event that the proposed use is not an income-producing entity, but is a service function (such as a garage connected to a hotel), the original Kuehne and White formulas are appropriate. With minor modification, the recommended formula is

$$V + D + S + P - X - Y - I = A \quad (6)$$

in which

- V = comparable land value;
- D = savings due to absence or reduction in demolition and foundation costs;
- S = value attributed to site prominence or improved access;
- P = savings due to readily assembled large parcel;
- X = reduction in utility of structure due to design or functional obsolescence;
- Y = excess construction costs due to underlying highway;
- I = additional interest incurred over a longer construction period; and
- A = residual value of the air rights.

This approach has been, and will undoubtedly continue to be used in the valuation of air rights for income-producing development. However, it involves most of the factors included in the income approach and if, as suggested in the original versions, loss of income due to the nature of the structure is included, the only missing factor is the capitalization rate. The approach is valid for income properties only to the extent that realistic comparable land values are available. However, in any case, it avoids explicit recognition of the essential investment motivation behind real estate development—i.e., the desired rate of return or capitalization rate.

Further considerations of State policies for valuation are included in the following section, together with suggestions for the selection of a private developer.

FEASIBILITY AND PUBLIC POLICY

When questioned about the most common type of proposals for the use of highway airspace, one State highway official replied: "Architects' pipe dreams." In the researchers' survey of the literature it was noted that many of the renderings of proposed projects have indeed involved rather imaginative concepts, ranging from linear cities to multiple-use megastructures. The fact that these projects are physically feasible today is a tribute to the competence of modern engineering. It is apparent that these "pipe dreams" are previews of the future of highway airspace development. However, the reality of trains rumbling under New York's Park Avenue or Philadelphia's Penn Center lends emphasis to their immediate potential.

The limited variety of airspace projects considered in this section does not in any way imply a negative outlook on complex, innovative joint development. Rather, it reflects the relatively narrow topic of the study—valuation—and the need to identify most probable conventional uses of highway airspace for the present and near future. It is enjoyable to speculate on the possible combinations of uses in a single project (for example, an office-apartment-hotel-shopping complex) and to recognize that the whole may be more valuable than the sum of the uses valued individually. But, for practical purposes, one must begin with the feasibility of a limited number of uses and defined highway structures. In addition, it is necessary to base the feasibility analysis on development above or below existing highways. For the most part, the results apply to future highways, with many of the uses becoming more feasible if joint development is begun in the highway planning stages.

Preliminary Constraints to be Overcome

If it is assumed that state legislation permits private use of highway airspace, four preliminary constraints must be overcome. These are: safety and use of the highway; highway structure; zoning; and market demand.

Safety and Use of the Highway

The primary limitation on airspace development reflects the underlying purpose of the highway: safe and efficient movement of persons and goods. Controls and safety provisions are clearly set forth in PPM 80-10.2 (83), and are supplemented in further detail by various State laws and policies.

It is obvious that any use of airspace endangering the highway user

or airspace occupant cannot be considered feasible. The manufacture and storage of highly flammable or explosive substances would immediately be excluded from consideration. However, other hazards will require individual consideration and varying degrees of protective measures, and may reduce but not totally eliminate the feasibility of certain uses. Traffic generation and interference with highway access must similarly be evaluated for each proposed use.

Combined highway and air rights structures, if constructed jointly, provide additional possibilities. Examples are a parking garage under a highway at grade, or a single building under, around, and over an elevated highway. These configurations are somewhat difficult to achieve after the highway is in operation, and are not considered further.

It must also be assumed that airspace above ramp or interchange structures will not be used because of interference with sight distance and general visibility. As noted previously, the physical limitations can ultimately be overcome, but for present purposes three basic configurations are considered most feasible with regard to existing highways.

Highway Structure

The four types of highway structures—at grade, elevated on viaduct, elevated on fill, and depressed—contain inherent limitations on the feasibility of airspace development. Three basic configurations of airspace and highway structure have been selected for further consideration. In order of ease of utilization, they are: airspace below, highway on viaduct; airspace above, highway depressed; and airspace above, highway at grade.

The use of airspace above a highway on viaduct appears limited, because the first level of the building would generally be at least 30 ft above surface streets and sidewalks. A similar limitation would apply to the use of airspace above a highway elevated on fill.

However, it is important to note that the ability to use land immediately adjacent to the highway increases the feasibility of using airspace above any of the four highway structures. A parcel large enough to provide building access, elevator shafts, and major utility equipment will reduce the complexity of the airspace structure actually over the highway.

Zoning

Conformance with local zoning is required in a number of States, and should generally be regarded as a limitation on the feasible uses of airspace. The limitation, however, is no more serious than that imposed on any parcel of land. It may in fact be less serious if the proposed use is beneficial to the surrounding area. For example, the commercial

use of air rights in a residential area might reduce the barrier effect of a depressed highway. Acceptance of this use over the highway might be more readily obtained than on an adjacent site.

Market Demand

Market demand for a proposed use, in the general vicinity of a specific air rights location, is the initial criterion of economic feasibility. Structural characteristics of the use, such as high-rise or low-rise building, are of prime importance. As a policy, the highest and best use should be considered wherever possible. Thus, surrounding land uses and land values will generally govern the use of the airspace. Although it is possible to compensate for low market demand for a certain use by offering the air rights at a relatively low price, this type of subsidization should be reserved for socially or environmentally desirable uses, in coordination with local planning.

If it is assumed that there is sufficient market demand for a proposed use, the basic test of economic feasibility incorporates the valuation factors and methods discussed previously. As the minimum criterion, the value of the air rights, used as proposed, must be equal to or greater than comparable land values. In a given location, numerous uses may be feasible. The extent of competition among various feasible uses will ultimately determine the price and use of the air rights.

Feasibility Matrices: Private Development

Two feasibility matrices have been constructed to evaluate the relative feasibility of private airspace uses, above and below the highway. Before describing the methodology involved, a number of general considerations and assumptions must be stated. Most important is the subjectivity of the evaluation, resulting from the small number of highway airspace projects in existence and the short period of time since their completion. Under these conditions, the evaluation in Tables 2 and 3 is more a forecast than an objective summary.

The evaluation, or rating, in terms of high, medium, and low feasibility reflects the general inability to measure safety, public acceptability, or cost factors in comparable quantitative terms. Subjective probabilities of success would serve only as a basis for more specific arguments. The matrices must be recognized as a general overview rather than a mathematical model for evaluating the feasibility of a specific use and location.

With regard to the four types of highway structures, only depressed highways and highways elevated on viaducts have been considered in detail. Airspace development appears most feasible in conjunction with these two structures. Highways at grade suggest airspace uses similar to those above depressed highways; however, the feasibility of each use appears to be somewhat lower above at-grade highways. High-

TABLE 2

RELATIVE FEASIBILITY MATRIX,³ PRIVATE USES OF AIR SPACE ABOVE DEPRESSED HIGHWAY

FEASIBILITY CRITERIA USES OF AIR SPACE	SAFETY AND TRAFFIC				LOCATION AND LAND USE						ECONOMIC CONSIDERATIONS: VALUATION FACTORS												
	SAFETY		USE		URBAN			SUBURBAN			EXCESS COSTS						BENEFITS OR SAVINGS						
	SAFETY OF HIGHWAY USER	SAFETY OF AIR SPACE USER	AIR SPACE EFFECT ON HIGHWAY USE	HIGHWAY USE EFFECT ON AIR SPACE	CENTRAL BUSINESS DISTRICT	RESIDENTIAL COMMERCIAL	INDUSTRIAL WAREHOUSING	COMMERCIAL	RESIDENTIAL	INDUSTRIAL	FOUNDATION OR DECKING	STRUCTURE	PROTECTION	ACCESS AND PARKING	DEVELOPMENT TIMING	RENTAL LOSS	MAINTENANCE	LAND ASSEMBLY	SITE PROMINENCE	DEMOLITION AND RELOCATION	DEPRECIATION	\$A \$L	
Office building:																							
1 to 3 stories	H	H	H	H	M	M	L	H	L	M	M	M	M	M	M	M	M	M	M	H	H	M	
4+ stories	H	H	H	H	M	M	L	M	O	L	H	H	H	H	H	H	H	H	M	M	M	H	
Apartment building:																							
1 to 3 stories	H	H	H	L	L	H	O	H	M	O	M	M	L	L	L	L	L	L	M	L	H	L	
4+ stories	H	H	H	M	H	H	O	M	L	O	H	H	H	M	H	H	M	H	M	M	M	H	
Hotel-motel:																							
1 to 3 stories	H	H	H	L	M	H	O	H	L	L	M	M	L	L	L	L	L	H	L	H	L		
4+ stories	H	H	H	M	H	M	O	M	O	L	H	H	H	M	H	H	M	H	M	M	M	H	
Retail stores:																							
1 to 3 stories	H	H	H	H	L	H	L	H	L	L	M	M	L	M	L	M	L	M	L	H	M		
4+ stories	H	H	H	H	H	H	O	M	O	L	H	H	H	M	H	H	M	H	M	M	M	H	
Restaurant/club:																							
50-200 seats	H	H	H	H	L	H	L	H	M	M	L	L	L	L	M	L	L	H	L	H	L		
200+ seats	H	H	H	H	M	H	O	H	M	L	M	M	M	M	M	M	M	H	M	M	M	M	
Recreation:																							
Sports stadium	H	H	H	H	M	H	L	M	O	O	M	H	H	L	H	H	M	H	M	H	M	M	
Movie theater	H	H	H	M	M	H	O	H	M	O	M	H	L	L	M	H	M	M	H	M	M	M	
Automobile:																							
Sales	H	H	H	H	M	H	L	H	O	L	L	M	M	L	M	M	M	H	L	M	L		
Services	M	H	M	H	M	H	M	H	O	M	L	M	M	M	M	M	L	M	L	M	L		
Parking:																							
Lot	H	H	H	H	L	M	L	M	O	O	L	H	M	H	L	H	M	L	L	L	H	L	
Garage	H	H	H	H	H	M	L	M	O	L	M	M	H	H	L	M	M	M	L	L	M	M	
Manufacturing:																							
Light	M	H	H	H	M	M	H	M	L	H	L	M	M	L	M	M	L	L	L	M	L		
Heavy	L	H	H	H	L	O	H	L	O	H	M	M	L	L	H	M	L	L	L	L	L		
Warehousing:																							
High value	H	H	H	H	M	L	H	M	O	M	M	M	H	L	M	H	M	L	L	L	M	L	
Bulk	L	H	L	H	O	O	H	L	O	H	M	M	H	L	M	H	M	L	L	L	L	L	
Institutions:																							
Hospital	H	M	H	M	M	H	O	H	M	O	M	M	L	M	M	H	M	M	L	M	L	M	
School	H	H	H	M	M	H	O	H	M	O	M	M	L	H	M	H	M	M	L	M	L	M	

* H= High feasibility; M = Medium feasibility; L = Low feasibility; O = Infeasible or unacceptable; see text for explanation of evaluation procedures.

TABLE 3
RELATIVE FEASIBILITY MATRIX,* PRIVATE USES OF AIR SPACE BELOW VIADUCT HIGHWAY

USES OF AIR SPACE	SAFETY AND TRAFFIC				LOCATION AND LAND USE						ECONOMIC CONSIDERATIONS: VALUATION FACTORS											
	SAFETY		USE		URBAN			SUBURBAN			EXCESS COSTS					BENEFITS OR SAVINGS						
	SAFETY OF HIGHWAY USER	SAFETY OF AIR SPACE USER	AIR SPACE EFFECT ON HIGHWAY USE	HIGHWAY USE EFFECT ON AIR SPACE	CENTRAL BUSINESS DISTRICT	RESIDENTIAL COMMERCIAL	INDUSTRIAL WAREHOUSING	COMMERCIAL	RESIDENTIAL	INDUSTRIAL	FOUNDATION OR DECKING	STRUCTURE	PROTECTION	ACCESS AND PARKING	DEVELOPMENT TIMING	RENTAL LOSS	MAINTENANCE	LAND ASSEMBLY	SITE PROMINENCE	DEMOLITION AND RELOCATION	DEPRECIATION	\$ ≤ \$
Office building: 1 to 3 stories	H	H	H	L	H	H	M	H	O	M	H	H	M	H	M	H	M	M	L	L	L	L
4+ stories	H	M	H	L	L	L	O	L	O	O	H	H	L	H	M	M	L	M	L	L	L	L
Apartment building: 1 to 3 stories	H	H	H	L	H	H	O	H	L	O	H	H	L	H	M	M	L	M	L	L	L	L
4+ stories	H	H	H	M	H	H	L	H	L	L	H	H	M	H	M	H	M	M	L	L	L	M
Hotel-motel: 1 to 3 stories	H	H	H	M	H	H	L	H	L	O	H	H	M	H	M	H	L	L	L	L	L	M
4+ stories	H	H	H	M	H	H	L	H	L	O	H	H	M	H	M	H	L	L	L	L	L	M
Retail stores: 1 to 3 stories	H	H	H	M	H	H	L	H	L	L	H	H	M	H	M	H	M	M	L	L	L	M
4+ stories	H	H	H	M	H	H	L	H	L	O	H	H	M	H	M	H	L	L	L	L	L	M
Restaurant/club: 50-200 seats	H	H	H	M	H	H	M	H	L	M	H	H	M	H	M	H	L	L	L	L	L	M
200+ seats	H	H	H	M	H	H	L	H	O	O	H	H	M	H	M	H	L	L	L	L	L	M
Recreation: Sports stadium	H	H	H	M	H	O	H	O	O	O	H	H	L	H	M	L	M	M	L	L	L	L
Movie theater	H	H	H	M	H	O	H	O	O	O	H	H	L	H	M	L	M	M	L	L	L	L
Automobile: Sales	H	H	H	M	L	H	L	H	O	L	H	H	H	H	M	M	L	M	L	L	L	M
Services	H	H	H	H	L	H	M	H	O	M	H	H	H	H	H	H	H	M	H	L	L	H
Parking: Lot	H	H	H	H	H	M	L	M	O	O	H	H	H	H	H	H	H	L	L	L	L	H
Garage	H	H	H	H	H	M	L	M	O	O	H	H	H	H	H	H	H	M	L	L	L	H
Manufacturing: Light	H	H	H	H	M	M	H	L	L	H	H	H	H	H	M	H	L	L	L	L	L	H
Heavy	M	H	M	H	L	O	H	L	O	H	H	H	L	H	M	M	H	L	L	L	L	M
Warehousing: High value	H	H	H	H	M	L	H	M	O	M	H	H	H	H	M	H	H	M	H	L	L	H
Bulk	H	H	H	H	O	O	H	L	O	H	H	H	H	H	M	H	H	L	H	L	L	H
Institutions: Hospital	H	M	H	L	M	H	O	H	M	O	H	H	L	H	M	M	L	M	L	M	L	L
School	H	M	H	L	M	H	O	H	M	O	H	H	L	H	M	M	L	M	L	M	L	L

* High feasibility; M = Medium feasibility; L = low feasibility; O = Infeasible or unacceptable or explanation of evaluation procedures

ways elevated on fill present the lowest over-all feasibility ratings for the uses considered.

Each use has been evaluated separately, although it is recognized that combinations of compatible uses may have a much higher degree of feasibility. In addition, low feasibility uses may experience economies of scale when included in large multi-use projects. Unfortunately, the number of possible combinations, including public and private uses, is far too large for detailed evaluation.

The basic assumptions preliminary to the feasibility evaluation are as follows:

- State legislation permits leasing (or sale) of air rights to private users.
- Uses that obviously endanger the safety of the highway or air-space user are not feasible.
- Uses that obviously impair the movement of traffic are not feasible.
- Uses that infringe on the rights of abutting properties are not feasible.
- Agricultural or mineral extraction uses are not feasible.
- Single-family residential uses are not feasible.
- Medians are sufficient for supporting columns where required.
- Uses are entirely on the right-of-way, with sidestrips available where required.
- Approval of the local jurisdiction is required before any project can be developed.

Specific definitions of the airspace uses listed in the matrices have not been attempted. Regional differences in the concept, size, and form of these uses require that details be left to local interpretation. The variety of highway structures in terms of width of right-of-way, depth below grade, elevation, and intensity of use also reduce the applicability of specific or average highway conditions.

Explanation of Feasibility Criteria

The evaluation factors, or feasibility criteria, shown as column headings require a brief explanation. These factors were selected from a much more extensive listing in an effort to eliminate redundancy and condense the matrix to a manageable scale.

Safety and Traffic.—Even if all reasonable precautions are taken to protect the highway user and the airspace occupant, negative impacts of one upon the other are still possible. A high feasibility rating indicates that negative impacts are insignificant. A low or medium rating indicates possible negative impacts; for example, a major industrial accident in a manufacturing plant above the highway, or traffic noise and fumes penetrating the lower floors of an apartment building above the highway.

Location and Land Use.—Market demand and public acceptance, through zoning, are both included under this heading. With regard to market demand, six general locations, or land-use areas, have been considered. Classification of land use as urban and suburban appears adequate for a preliminary identification of areas in which airspace development may be feasible. The boundaries between urban and suburban areas have, however, become increasingly difficult to define in most metropolitan areas; thus, both are further defined, with regard to specific uses, as:

Urban—

Central Business District: a high-density concentration of office, commercial, entertainment, and high-rise residential uses.

Residential/Commercial: the major portion of the urban land area, containing a medium-density mix of residential, commercial, and light industrial uses.

Industrial/Warehousing: the area of predominantly heavy manufacturing, warehousing, and certain light industry, served by rail yards, trucking terminals, and, in many cities, near major ports.

Suburban—

Commercial: a medium-density concentration of office, commercial, entertainment, and apartment uses, in the form of shopping centers, major strip commercial, or small city central business districts.

Residential: low-density residential areas, predominantly single-family homes, with low-density apartments permitted.

Industrial: concentrations of heavy and light manufacturing, warehousing, and agricultural or mineral products storage, including planned industrial parks.

On the basis of long established land-use patterns and existing location theory, normal market demand for various uses can be estimated in relation to each of these six general areas. For example, it is reasonable to assume that the greatest market demand for high-rise offices exists in the urban central business district. Similarly, it can be assumed that there is little demand for parking structures in suburban residential areas.

Zoning is premised on protection of health, safety, and welfare of local residents. Properly administered, it reflects the market for various land uses and the community's environmental preferences. Local public acceptance of a specific airspace use generally implies that it is physically, socially, and economically beneficial. For the most part, the level of acceptability of various uses in each of the six general locational categories is either obvious or as flexible as the number of communities considered.

A high feasibility rating under "Location and Land Use" implies normally adequate market demand and a high degree of public ac-

ceptability. A low-rise office building in a suburban commercial center is an example of a highly feasible combination of use and location. Conversely, apartment uses in industrial areas are hardly in demand and may in fact be prohibited, resulting in a feasibility rating of zero.

Although the evaluation has considered the general patterns of location in existence today and the general characteristics of zoning, it is hardly definitive. The variety of land-use patterns in the nation's cities and suburban areas clearly indicates the practical impossibility of specifying the proper location for each use. Thus, one can readily expect an exception to each feasibility rating in the matrix.

Previous research (44) has identified the majority of uses of right-of-way in rural areas as those serving the long-distance traveler. Most of these are public uses, such as rest areas, scenic overlooks, parks, recreational parking, and highway control and maintenance facilities. Direct-access service plazas in the median, in sidestrips, or above the highway appear to be the only private uses of airspace at present. Pipelines and plant nurseries along sidestrips were also identified as possible uses. Only one further possible use, with admittedly low potential, can be suggested. This is the placement of agricultural processing or storage sheds under the elevated portion of a highway at grade separations for rural roads or railroads. Rural areas are not considered further in this section.

Economic Considerations: Valuation Factors.—The final set of feasibility criteria in Tables 2 and 3 incorporates the valuation factors discussed in previous sections. They have been grouped under three headings—excess costs of airspace development; special savings or benefits from airspace development; and a final airspace-land value comparison.

Excess Costs—

Foundation or Decking: costs of special retaining walls, supporting columns, wide spans, and reinforced first floor.

Structure: costs of structural reinforcement resulting from the placement of foundation supports and problems of elevator or utilities location.

Protection: costs of protecting the highway user and/or airspace occupant, including impact resistance, fire- and soundproofing, ventilation, lighting, and dust and fume controls.

Access and Parking: costs of additional sidewalks, driveways, and decking or garages for parking.

Development Timing: extra costs of development resulting from additional construction labor, interest on construction loans, equity commitments, planning, engineering, and public agency approvals.

Rental Loss: reduced rentable square footage due to unusual structural characteristics, lack of basement for utilities, or negative impacts of highway traffic.

Maintenance: costs of maintenance on foundations or decking, highway lighting or ventilation, building protection equipment, and building cleaning.

Benefits or Savings—

Land Assembly: plottage value of large sites in areas of fragmented land ownership.

Site Prominence: advertising value of highly visible location or novelty publicity during planning and development.

Demolition and Relocation: savings due to lack of old structures to be demolished and tenants to be relocated.

Depreciation: additional tax shelter resulting from ability to depreciate a higher proportion of the total investment where added construction cost replaces a portion of site costs.

$\$ A \geq \$ V$ —

Comparison of air rights value and comparable land value: summary criterion that the value of the air rights must be equal to or greater than comparable land value before a private developer will choose to develop the airspace.

Feasibility ratings under the cost factors reflect the extent of their effect on each use and the likelihood of each use's ability to absorb the cost. For example, low-rise apartments do not normally require extensive foundation, structural, or protection costs, and might find it difficult to include these costs in rent schedules. In contrast, these costs would be relatively minor additions to the total cost of a high-rise building. A high feasibility rating implies that the excess costs are financially acceptable or, for certain uses, not applicable. Conversely, a low feasibility rating implies that the excess costs would tend to discourage development.

The feasibility ratings under the benefit or savings factors reflect only positive contributions to the feasibility of each use. A high feasibility rating indicates that the benefit factor is significant in the valuation of the air rights for a specific use. A low rating indicates that the benefit is minor or irrelevant. Thus, hotel uses are highly feasible with regard to site prominence, whereas this factor is unimportant for an industrial use.

The final criterion ($\$ A \geq \$ V$) is a summary evaluation of the economic feasibility of airspace development for each use. It is not a mathematical average of the cost and benefit factors, however, because the weights of the various factors can be determined only through an actual appraisal. In view of the limited experience of air rights development and the difficulty in valuing hypothetical projects, the over-all economic feasibility of each use is, of necessity, a subjective estimate. To the extent possible, it is based on known construction costs and the land values that can be absorbed by the various uses, with full recognition of the extent to which these can differ in most areas of the country.

Summary of Feasibility: Private Uses

Table 4 presents a summary of the feasibility matrices for private development above depressed highways and below viaduct highways. The summary includes an over-all feasibility rating and a most feasible location for development. Safety and highway use, market demand, zoning, public acceptance, and economic feasibility factors have been considered in assigning the over-all ratings.

The ratings for each use in Table 4 are generally lower than those in the feasibility matrices would suggest. This is the result of a conservative approach to assigning an over-all feasibility rating that considers a number of intangibles. It has been assumed that a specific use, although meeting general safety requirements, would be discouraged if even a remote possibility of serious accident was foreseen. Heavy industry, bulk warehousing, and automotive services above the highway are examples of this consideration. Social or environmental acceptability would, in all probability, prevent development of certain uses. As an example, low-rise apartments or hospitals probably would be prohibited under the highway, even if all safety precautions were taken and the uses could be economically justified. As a third intangible, the subject risk factor employed by private developers will undoubtedly reduce the feasibility of uses that are safe, publicly acceptable, and economically justified. This third factor may require considerable time before the uncertainty of inexperience is overcome.

In conclusion, it is important to note that feasibility, as analyzed herein, represents possibility rather than probability. The feasibility ratings serve as an indication of the uses most likely to be proposed by the private market and accepted by the local residents or public agencies. The ratings are also useful in indicating the uses toward which a promotional campaign should be directed. As noted previously, multi-use projects are quite likely to prove highly feasible and to include uses that have been rated low on an independent evaluation. It is obvious, as required by federal policy, that each proposal must ultimately be thoroughly evaluated with regard to the specific factors involved.

Feasibility of Public Uses of Airspace

To date, public agencies have been the primary users of highway airspace. Although the total space needs of public agencies are limited relative to potential private demand, a significant increase in public uses appears desirable and highly probable. The current public uses are described in "Case Studies of Airspace Projects," and it is reasonable to assume that major public buildings above the highway are a highly feasible form of development. The valuation methodology recommended for private development is not totally applicable to public projects. Therefore, similar feasibility matrices have not been developed.

Two critical factors influence the decision by a public agency to utilize airspace—service to the public and development costs. The first

TABLE 4
SUMMARY OF FEASIBILITY,^a PRIVATE AIR SPACE USES AND LOCATIONS^b

AIR SPACE USES	MOST FEASIBLE LOCATION(S)					
	ABOVE DEPRESSED HIGHWAY			BELOW VIADUCT HIGHWAY		
	FEASIBILITY RATING	URBAN AREAS	SUBURBAN AREAS	FEASIBILITY RATING	URBAN AREAS	SUBURBAN AREAS
Office building:						
1 to 3 stories	L	Commercial	Commercial	L	Central business district	Commercial
4+ stories	H	Central business district		O		
Apartment building:						
1 to 3 stories	L	Commercial/residential	Commercial/residential	O		
4+ stories	M	High-density residential		O		
Hotel-motel:						
1 to 3 stories	L	Commercial	Commercial	L	Commercial	
4+ stories	H	Central business district		O		
Retail stores:						
1 to 3 stories	M	Commercial	Commercial	M	Central business district	Commercial
4+ stories	H	Central business district		O		
Restaurant/club:						
50-200 seats	L			M	Commercial	
200+ seats	M	Central business district	Commercial	L	Commercial	
Recreation:						
Sports stadium	M	Commercial/residential		O		
Movie theater	L	Commercial/residential		L	Residential/commercial	Commercial
Automobile:						
Sales	L	Commercial		L	Commercial	Commercial
Services	O			H	Commercial/industrial	Commercial
Parking:						
Lot	O			H	Commercial	Commercial
Garage	M	Central business district		H	Central business district	Commercial
Manufacturing:						
Light	L	Industrial		H	Commercial/industrial	Industrial
Heavy	O			M	Industrial	Industrial
Warehousing:						
High value	L	Industrial/warehousing		H	Commercial/industrial	Industrial
Bulk	O			H	Industrial/warehousing	Industrial
Institution:						
School	L	Commercial/residential		L	Commercial	
Hospital	L	Commercial/residential		O		

^a H = High feasibility; M = Medium feasibility; L = Low feasibility; O = Infeasible or unacceptable. ^b Based on Tables 2 and 3.

of these requires a locational decision based on the location of the population to be served and the nature of the public activity. Although public demand for services is similar to market demand for various private activities, the public agency as a captive monopolist has little locational choice.

The actual site selection is, of course, more flexible. Within the general location required for efficient service, alternative site and development costs are the basic decision factors. Subject to the requirements of safety, highway structure, and general location, the primary decision criterion for the utilization of airspace is the traditional valuation procedure, using cost minimization, formulated as

$$\$ A \leq \$ L \quad (7)$$

in which \$ A is the cost of using airspace and \$ L is the cost of using a comparable site.

If the cost of the airspace, including over-all efficiency of service, is equal to or less than the over-all cost on a comparable site, the use of airspace is feasible. Inasmuch as public users of highway airspace are given first priority, free of charge for public uses, feasibility in general is somewhat higher than for private uses.

Table 5 presents a summary of the relative feasibility of a number of public uses of airspace above and below the highway. Safety, highway structure, and cost factors have been considered in assigning the feasibility ratings, similar to the approach used in the private use feasibility matrices. Locational factors have not been included, because the majority of the public uses have relatively little choice of general location. Although the ratings are subjective, it is noted that the majority of the uses are presently occupying highway airspace.

One of the primary benefits of public use of airspace is increased property tax revenues where public facilities do not remove land from

TABLE 5
RELATIVE FEASIBILITY,^a PUBLIC USES OF HIGHWAY AIRSPACE

PUBLIC USES	ABOVE	BELOW	REASON FOR
	DE- PRESSED HIGHWAY	VIADUCT HIGHWAY	LOW OR O FEASIBILITY RATING
Parking garage	H	H	
Parking lot	O	H	Cost
Transportation terminal	H	H	
City hall	M	O	Height limit
Central administration bldg.	H	O	Height limit
Local administration bldg.	M	M	
Police—fire station	L	H	Cost
Public warehousing	L	H	Cost
Maintenance buildings	O	H	Cost
Equipment storage	O	H	Cost
Convention center	M	O	Column spacing
Sports stadium	M	O	Space limitations
Concert hall	M	O	Column spacing
Art museum	M	L	Esthetic considerations
Library	M	M	
High school	M	L	Safety and environment
Elementary school	L	O	Safety and environment
Hospital	M	O	Safety and environment
Subsidized housing	L	O	Cost and environment
Parks and recreation	L	H	Cost
Playground	O	H	Cost

^a H = High feasibility; M = Medium feasibility; L = Low feasibility; O = Infeasible or unacceptable.

tax rolls. Because a number of the highly feasible uses listed in Table 5 apply to private nonprofit tax-exempt institutions, their utilization of highway airspace is also desirable.

As a public or quasi-public user of airspace, mass transit has not been considered as a feasible public use. The highway structure, over long distances, must obviously be designed to accommodate fixed rail transit. The evaluation has been based on existing highways which, unless designed with rail transit in mind, require substantial study before evaluating the feasibility of implementation. Further comment is reserved for a subsequent paragraph of this section.

The provision of exclusive bus lanes, as has been tested in the Washington, D.C., area and is under development in Los Angeles and other cities, is a use of the highway rather than the airspace. Transportation terminals, whether bus or rail, have been rated as highly feasible on the assumption that adequate parking and direct access to the highway are provided.

Public Policies and Procedures

The foregoing analysis leads to the conclusion that numerous private and public uses of airspace are physically, socially, and economically feasible. Under the proper conditions, it can be expected that there will be continued interest and a gradual increase in serious proposals from both private and public users. In this concluding section, a number of policies and procedures related to valuation and feasibility remain to be discussed. Disposition of air rights above and below existing highways is considered before acquisition of right-of-way for new highways is discussed.

For present purposes it is assumed that Federal and State enabling legislation is sufficiently well developed to permit conveyance of air rights to private parties. It is also assumed that the highway agency is prepared to engage in public-private joint development as an active promoter or passive recipient of proposals. As required by Federal and State legislation or policy, other public agencies are assumed to have first right of refusal before air rights are conveyed to a private developer. Local planning agencies are assumed to have veto power over private development where it conflicts with zoning or master plans.

Means of Conveyance

Previous studies have expressed concern over the means of conveying interest in the air rights from the highway agency to a private party (3, Ch. X and App.). The actual transaction and the documents involved may take numerous forms, and an extensive discussion would be required to describe and evaluate the possibilities. Inasmuch as the subject is peripheral to the main topic of this study, only the two basic methods—sale or lease—are considered.

From the viewpoint of the highway agency, leasing is preferred as a

means of retaining close control over the use of airspace. In contrast, a private developer would generally prefer to obtain fee title to the underlying land and airspace, reserving a perpetual three-dimensional easement for the highway. However, the significant amount of private development occurring on leased land indicates a widespread acceptability of leasing. It is also important to note that the full description of the highway interest and the responsibilities of the airspace user will necessarily be included whether the conveyance is by deed or by lease agreement.

There appears to be little difficulty in obtaining financing for airspace developments on a lease basis if a number of conditions are met. The most important of these require that: the term of the lease, as a minimum, be sufficient for amortization of the mortgage (and generally ten years longer than the mortgage term); the developer and the mortgage holder be permitted to assign the lease; and the developer's title be as secure as in a transaction between two private parties. Subordination of the fee interest is not required if the lessee is permitted to assign the lease and improvements to the mortgagor.

Although it appears desirable to develop a standard lease agreement, this approach does not seem realistic. The full statement of terms and conditions of the lease agreement between the Massachusetts Turnpike Authority and the White and Walth Trust, for the Gateway Center project, required 65 legal-size pages. Differences in the nature of development, geographic location, highway structure, State legislation, and regional real estate practices preclude the use of standard forms. Although the basic considerations for protecting the highway and the public in general can be standardized, the actual agreement should be suited to the individual project. If an acceptable lease agreement can not be drafted, valuation is irrelevant, because the project will not proceed beyond the discussion stages.

Valuation and Selection of Developer

In addition to responsibility with regard to the highway and airspace users, the highway agency must consider public interest on a wider scale. It is apparent, therefore, that the agency has a much greater responsibility in the disposition of airspace than does a private seller or lessor.

In a transaction involving two private interests, the fee owner, as seller or lessor, would normally undertake a highest and best use study for a large parcel of uncertain value. The purpose of the study would be justification of the highest possible asking price or lease rate, with the results of the study available to potential buyers or lessees. The costs of the study, as a promotional expense, would be included in the asking price for the site. In the event that the market value is underestimated, the seller or lessor suffers an opportunity loss of little consequence so long as he achieves his required profit on the transaction. Furthermore, he is concerned with the financial success of the project

only if the lease is based on a percentage of gross income or the fee is subordinated for the lessee's borrowing. Financial failure of the buyer is of no concern to the seller after the transaction is finalized. Financial failure of the project and the lessee places the lessor in a joint venture with the mortgage holder, with the value of the improvement as uncertain as that of the site. Inasmuch as the highway agency cannot separate its interest from the air rights, even through sale, the financial success of the project and the lessee or buyer are extremely important. In addition to obtaining fair market value, the highway agency must be reasonably certain that the proposed project is financially feasible if it is to avoid abandoned buildings along the right-of-way. As an absolute minimum, the project income must be capable of maintaining the improvements over the foreseeable future.

Although the financial failure of projects and developers is not an uncommon occurrence, lending institutions obviously make every reasonable effort to avoid high-risk projects. However, it is appropriate at this point to note that the development of air rights, per se, does not necessarily constitute a high-risk project requiring a higher interest rate for project financing. If the basic project concept is sound with regard to market demand, the financial stability of the developer will determine the application, if any, of a risk premium. A conservative attitude on the part of lending institutions will tend, to a great extent, to protect the highway agency. It may therefore limit major projects above the highway to large well-established developers who can absorb any additional planning, engineering, negotiating, and construction delays.

A number of approaches are available to the highway agency seeking to promote the private use of airspace and, in the process, attempting to obtain fair market value for the air rights while establishing the financial soundness of the project and the developer. The most comprehensive might involve a study of the State highway system to determine the general areas of potential demand for airspace, followed by more detailed analysis and selection of developable sites. The use, or uses, of each site could then be specified after consideration of safety and highway use, local planning and zoning, and the needs of the community. Valuation of the air rights could be performed for the purpose of setting the minimum price or lease rate for public bid. However, application of the recommended method of valuation, as described in the section on "Recommended Method for Valuation of Airspace," entails a substantial effort on the part of the agency staff if numerous sites are considered and planned in sufficient detail for appraisal. In addition, the general lack of demand for highway airspace, especially above the highway, is likely to result in a lack of response. Although this approach may be perfectly adequate for uses such as parking lots when the demand is evident, it may inhibit private development in more complex situations.

A less expensive procedure would involve specification of the use or uses, with competitive bidding for an option to develop a site.

Regardless of the number of private parties interested in the airspace, consideration for the option should be required. In the event that a single developer is interested, the consideration might be in the form of a well-defined feasibility study, to be undertaken by the developer during the term of the option. The feasibility study would become the property of the highway agency at the end of the option period. Thus, if the developer decides against entering a long-term lease, the highway agency has a basis for evaluating the air rights and advertising to the private market again.

If a number of developers are interested in a specific airspace location, consideration could consist of a feasibility study, as described, and a monetary bid. The minimum bid might be set at a year's rent or an arbitrary percentage of that rent, based on a very preliminary estimate of the value of the airspace. The essential purpose of this procedure is to reduce the possibility of speculation and to engage a developer to study the airspace potential without entering the full long-term lease agreement. Selection criteria, in addition to the high bid, might include evaluation of developers' experience and general financial situation.

During the term of the option, the selected developer would be required to work closely with the highway agency staff in preparing feasibility studies, working drawings, and performance and completion standards as related to the physical aspects of the project. In addition, the developer would secure financial and insurance commitments and work with the agency to develop the basic terms and conditions of the lease. Upon completion of these steps, the highway agency is in a position to undertake a full appraisal of the air rights, using the specific cost and income estimates of the project. The developer's desired return on investment, tax situation, and other financial details are not necessary, inasmuch as market averages can be estimated. The agency's appraisal and the developer's offer provide the basis for negotiation toward the final valuation and lease rate. An independent appraisal may, of course, be required in order to finalize the agreement.

It is concluded that few private developers will undertake a thorough highest and best use study for an air rights location unless they have obtained at least an exclusive option. It is therefore in the highway agency's interest, with regard to obtaining fair market value for air rights above the highway, that final valuation of the air rights be performed after the general nature of their use is specified and a detailed development plan has been prepared. It is quite possible that an innovative development plan will indicate a higher value than that resulting from the agency's hypothetical highest and best use study. Nor should development be strictly limited by highway agency and local planning concepts.

The disposition procedure applied in the more common situation,

in which a developer approaches the highway agency with a proposal for development of airspace, requires consideration of the individual State's statutes and policies. So far as is known, public notice of sale or lease of public property to a private party is required in all States before the transaction can take place. If additional developers request the opportunity to purchase or lease the air rights, there appears to be little choice other than competitive bidding, with the permitted use or uses specified in advance. This level of market demand should be welcomed wherever it arises, because it substantially increases the potential of obtaining a higher value for the air rights.

In special circumstances it may be desirable (and in some States required) to negotiate only with the previous owner, the abutting owner, or a single developer with a socially beneficial proposal. Valuation of the air rights can still employ the recommended methodology. However, concern for obtaining fair market value may be unnecessary, because most States permit disposition of public property at less than fair market value if it is clearly in the public interest to do so.

Acquisition of Air Rights for Joint Development

Throughout this study, little consideration has been given to valuation of air rights where the highway agency plans in advance to acquire a three-dimensional easement rather than fee title to land and airspace. It has been suggested that this procedure might reduce the cost of right-of-way acquisition, especially in urban areas. Previous research has also predicted that the State will generally be forced to acquire less than fee interests (84).

Acquisition of an easement, strictly for highway purposes, does not present a new problem of valuation and has been thoroughly covered in the literature on condemnation appraisal. A much more complex valuation problem is encountered if the full utilization of airspace above and/or below the right-of-way is considered in the advance highway planning. With few exceptions, highway construction will necessitate removal of improvements in the right-of-way. The exceptions include cases where the highway can be constructed above an existing structure without serious disruption, or where the highway tunnels under or through a major structure, such as the United States Post Office in Chicago. Aside from these exceptions, the usual result is that acquisition costs for the easement are equivalent to condemnation of the fee, and no saving is obtained. In urban areas this may also apply to vacant land, because the owner can neither develop nor sell the parcel until highway construction is complete.

The value of the air space, to a private commercial user, is a residual value derived from its use and revenue production. To the extent that highway planning and construction restricts use of the airspace for a considerable period of time and introduces severe uncertainty regarding the future use, assignment of a fair market value to the airspace is

impossible for all practical purposes. Although numerous private owners may wish to retain the air rights for future development, it is apparent that the cost of acquiring the highway easement will continue to approach the cost of the fee. Public-private joint development, from the planning and acquisition stage, does not appear feasible on any large scale.

Serious legal, procedural, and administrative problems accompany the highway agency's acquisition of property adjacent to the right-of-way in order to facilitate private development of airspace during or after highway construction (45). Public joint development remains the most practical approach to reducing right-of-way acquisition costs and increasing the highway's compatibility with the environment. As has been done in the past with varying scale and degree of success, local government agencies actually acquire the necessary property for right-of-way and joint development. And, ultimately, the local agency is responsible for valuation and conveyance of the air rights. Where the highway is a viaduct structure in an industrial area, the process may be relatively simple and the normal highway acquisition cost may be reduced to only the additional cost of viaduct construction.

In urban areas of higher land-use intensity, a sophisticated planning process and a high degree of intergovernmental coordination are required. The "deck equals land" concept can be applied where the highway agency absorbs the cost of a highway tunnel, foundations, and decking for development of the airspace above the right-of-way. However, this process is burdened with a problem that is in addition to those encountered in urban renewal. In order to develop the airspace at the same time as the highway is constructed, a specific use, structure, and private developer must be committed. Despite the problems, this process provides the greatest and perhaps the only potential for joint development of large-scale projects in urban areas.

Rapid Transit

As previously noted, the use of highway airspace for other forms of transportation is an unlikely possibility unless the highway has been constructed with this purpose in mind. With regard to existing highways, the physical problems of implementation appear to overshadow thoroughly any considerations of valuation of the air rights.

Future planning for the use of highway airspace by other forms of transportation suggests a sharing of right-of-way acquisition costs by the agencies and programs involved. Valuation of the airspace used by a public rapid transit system is not required.

An interesting situation results from the acquisition of railroad air rights by the highway agency, construction of the highway above the railroad's operating right-of-way, and subsequent private development above the highway. The valuation methodology recommended herein is applicable to the private development of the air rights; however,

disposition of revenues obtained from use of the airspace presents a complicated problem. Although actual procedures were not investigated in this study, it is noted that a similar situation has arisen in the development of Illinois Central airspace in Chicago. In addition, acquisition of unused railroad right-of-way in Los Angeles, for express bus lanes in the median of the San Bernardino Freeway, poses substantial valuation problems if commercial activities are permitted in bus terminals above the right-of-way.

CONCLUSIONS AND RECOMMENDATIONS

The conclusions resulting from the research reported herein and a number of recommendations for public policy and further research are summarized in the following.

Valuation

Existing theory and practice with regard to land values, real estate investment, and appraisal are adequate for the valuation of airspace above and below highways for purposes of conveyance to private users and real estate developers.

Valuation of airspace below viaduct highways does not entail significant problems and requires special considerations only as to physical limitations imposed by the highway structure, safety, and environmental conditions. Use of comparable land values or the income capitalization and residual approaches to valuation are both adequate.

Valuation of airspace above highways requires an extensive investigation of special costs resulting from foundation and structural requirements, safety precautions, access and utility problems, over-all planning, design, engineering and construction timing, and reduced future income. Special benefits may also result from the assembly of a large parcel, elimination of demolition needs, and site prominence.

Valuation on the basis of comparable land values, with adjustment to reflect the special costs and benefits noted in the foregoing, does not appear to be the best procedure. Rather, an income capitalization and residual approach is recommended in order to reflect the special nature of each highway airspace development, and to recognize the risk as perceived by the private real estate investor.

Use of a ratio of value of the airspace to value of the fee, as a rule of thumb for appraising airspace, is not acceptable. It is unrealistic to assume that the ratio derived from valuation of one site and use will apply to any other project.

The concept of highest and best use is theoretically applicable to the valuation of airspace. However, the practical application is somewhat limited because the use or uses will be determined to a great extent by the highway agency before valuation.

Legal

Federal legislation and policies are permissive with regard to the conveyance of air rights above and below existing highways to private parties. Federal interest in the valuation of the airspace pertains only to the sale of airspace, and does not prescribe the methods of valuation.

Only two States have adopted comprehensive legislation for utilization of highway airspace. Most States permit utilization by private parties under interpretation of existing legislation, whereas a few states specifically prohibit conveyance to private parties.

Although there are no known court cases specifically involving valuation of highway airspace in the present context, the recommended methods for valuation of airspace have been accepted by the courts for the valuation of real property in general.

Experience

Utilization of airspace under highways by private and public users has been successfully implemented in almost every State, and does not appear to have resulted in any significant problems.

Only nine cases of private development and thirteen cases of major public developments are known to have utilized airspace above the highway. Valuation of the air space for private development, where applied, has been based on comparable land values with adjustment for additional costs and benefits of using airspace.

Extensive development of airspace above railroad right-of-way has provided a substantial body of knowledge covering problems, costs, benefits, and valuation factors. However, physical and institutional differences between railroads and highways limit the direct application of the valuation methods and policies of the railroads to highway airspace disposition and valuation.

The lack of private development above highways is attributed to three basic factors—excess construction costs relative to surrounding land values; unfamiliarity on the part of private real estate developers; and lack of legislation, policies, and procedures for State highway agencies.

Feasibility

A wide variety of public and private uses of airspace below viaduct highways is highly feasible. This feasibility has, in fact, been demonstrated for most of the uses considered as appropriate for airspace below the highway.

The public and private use of airspace above depressed or at-grade highways is highly feasible for major projects that normally involve substantial foundation and structural costs. Although their implementation is generally restricted to areas of intensive land use and high land

values, special circumstance may justify development in lower-density commercial areas.

Physical construction problems appear to present only minor limitations on the feasibility of airspace utilization. Safety considerations, however, are a significant limitation of the feasibility of numerous uses, especially above the highway.

From an objective analytical viewpoint, financial feasibility appears to be sufficient for many projects above the highway. However, subjective judgment of the risk and uncertainty inhibits the private real estate market demand for highway airspace.

Utilization of land adjacent to the right-of-way can significantly increase the feasibility of large-scale development of airspace above the highway. Similarly, multi-use projects appear to have a higher degree of financial feasibility than single-purpose structures.

Local zoning and public acceptability do not restrict the feasibility of airspace development to any greater degree than they restrict normal real estate development. In most cases, zoning and public acceptance can be expected to be permissive.

Public Benefits

The most significant public benefit resulting from airspace development appears to be a higher degree of compatibility between the highway and the surrounding community. Although public-private joint development of the urban highway corridor is difficult to implement, public joint development involving a local redevelopment agency is highly feasible.

Local property tax revenues may be increased to the extent that airspace utilization stimulates a net increase in private real estate development, air rights are subject to possessory interest taxation or contributions in lieu of property taxes, and public facilities can utilize airspace rather than land normally on the tax rolls.

Revenue to the highway agency results from the leasing of airspace to private interests. Substantial reduction in right-of-way acquisition costs can be achieved through public joint development involving a local redevelopment agency.

Public Policies

Adoption of State legislation specifically authorizing the highway agency to sell or lease airspace to private parties is recommended as a minimum with regard to existing highways. Adoption of comprehensive legislation enabling the highway agency to participate in joint development is recommended for the utilization of airspace in conjunction with new highways.

Promotion of airspace utilization by the highway agency is recommended as the most appropriate method of informing and stimulating the private market. A full set of policies regarding local planning,

permitted uses, controls, methods of disposition, and valuation of airspace must be developed in advance of promotion.

Selection of economically feasible projects and financially sound developers is of critical importance, especially for major developments above the highway. Thorough market analysis, project cost studies, and financial feasibility studies are recommended before conveying air rights for major projects.

Valuation by the highway agency, on the basis of a hypothetical highest and best use of the airspace, is not recommended as a general policy in view of the detailed nature of the valuation required, the extent of the highway system, and the lack of demand for airspace. Rather, it is suggested that final valuation be performed after selection of a developer and careful preparation of development plans.

Further Research

The topic of valuation does not appear to require further study. Discussions with highway agency personnel and independent appraisers have revealed an awareness of the important valuation factors and a high degree of familiarity with the literature on valuation of airspace. The recommended valuation procedure incorporates elements of real estate investment analysis, but does not involve new factors for which additional research is required.

Further research is suggested in two areas of design and engineering. The first is the study of depressed and at-grade highway structures to estimate the excess costs of foundations, supports, and decking for a wide variety of uses above the highway. The second area is that of safety requirements and costs for various uses and highway structures. Comparative analysis of these two major cost factors, for airspace and non-air construction, would be extremely helpful to the private developer in evaluating the opportunity to utilize airspace. Existing airspace projects provide only one set of costs, and the popular belief is that the excess costs are prohibitive for most uses.

Procedures for intergovernmental coordination in joint development require further exploration. A thorough analysis and documentation should be conducted for cases in which the highway agency and a local governmental agency have coordinated right-of-way acquisition and subsequent joint development.

The Federal Highway Administration's surveys and reports on joint development should be continued. Annual summaries would be most helpful in maintaining an awareness of airspace projects and identifying sources of information.

APPENDIX A

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APPENDIX B

SELECTED READINGS ON THE VALUATION OF AIR RIGHTS

These selected readings are included in the "Bibliography" (Appendix A), but the sequence is given here in chronological order for the convenience of the user.

YEAR	ENTRY NUMBERS (APPENDIX A)
1935	23
1955	62
1956	39
1961	33 (Ch. 33)
1963	10, 53, 66 (Ch. 16)
1964	20, 4
1965	31
1966	59, 49, 9
1967	47
1968	84, 93 (Ch. IX)
1969	46
1971	22, 41

