Proof of Value in Eminent Domain: Air Space

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•IN the last few years air rights projects and air tunnels have created millions and billions of dollars in new economic development all over the country, just as they have saved millions of dollars in highway land acquisition costs. Great as this past activity has been, it is only a forecast of what the future offers. Our cities are going to grow much larger and become much more densely populated. Land will become scarcer, and, with increasing scarcity, land—particularly in urban areas—will be increasingly valuable. This prospect is the motivating force behind the great interest in air rights at the present time. Greater use of air rights and air tunnels, both above-the-ground and subsurface, will be a necessity in minimizing land acquisition costs, and perhaps even in the basic matter of finding space for further development of the urban center.

With this activity in prospect, the realtor and appraiser, the attorney and the engineer, and the agencies which are interested in acquiring land for various purposes, must be familiar with the basic concept of air rights. Tax assessors also need to become familiar with this concept, as do the financier and economist. In discussing why potential air rights and tunnel locations will be in demand, and how this may concern land acquisition in the highway programs, I would like to first indicate some of the history of the development and use of air rights. Next I will describe their nature, ownership and special features, and a formula for their appraisal. And finally, I have some comments on the prospects for their future use.

DEVELOPMENT AND USE OF AIR RIGHTS: HISTORICAL PERSPECTIVE

In 1965, A. M. Hill, Director of the Bureau of Right of Way and Land in Los Angeles, California, became greatly interested in air rights and made a comprehensive study which showed that air rights over and under railroad rights-of-way, streets and highways were being utilized in most major cities of the United States. The range of uses of these facilities included

office buildings	hospitals
hotels	heliports
auditoriums	department stores
mercantile buildings	apartments
industrial plants	parks and playgrounds

parking lots

Many of the developments on air rights were large and important projects, involving investments of many millions of dollars. In addition, tunnel easements, saving millions on highway acquisition cost, had been acquired and were in use.

Most instances of air space use involved acquisitions of air rights separate from the land. In some cases, however, there was acquisition of land with agreement to keep it vacant. Typically this occurred where adjoining property might need to have light and air space around it. Thus the developer of land might wish to acquire adjoining land without the air rights, and thereafter use this factor in his formula for height planning. By varying the factors of floor area and ground area, he might work

Paper presented at the Sixth Annual Workshop on Highway Law, University of Wisconsin, July 24-27, 1967.

out a plan for building higher than he would ordinarily be able to on a particular piece of land. All major cities have their own formulas for granting high-rise building permits. Under the technical formula required by the city his objective is to reduce his land acquisition and construction costs to the minimum while still staying within the terms of the formula.

In Detroit, the city was helped when the expressways were brought under its famous new convention facility, Cobo Hall. In Chicago, when the Congress Street Post Office was built, it was designed so that tunnels could be used to run an expressway through the building. Other buildings built with attention to the use of air rights include the Merchandise Mart and Prudential Building in Chicago. In Boston, where a shortage of land is being experienced, the city acquired 30 acres of air space over railroads and turnpikes and is planning a project twice the size of Rockefeller, including a 52-story office building, banks, an auditorium, hotel, shops, and almost 10 acres of parking. In New York, high-rise apartment buildings have been built on air rights in many places, but most recently over the depressed expressway approach to the George Washington Bridge. The buildings are built on steel platforms extending across the depressed expressway. Cincinnati has acquired highway tunnel access under valuable property in the city's central business district, and by purchasing only the tunnel space and not acquiring the surface space above, it has greatly minimized the cost of this route. In Washington, D. C., the General Services Administration successfully used the aesthetic approach to argue in favor of a proposal to build a $48 million building for the Department of Labor over the entrance to an underground freeway "hiding a gaping gulch with traffic pouring through it."

With this background of air space use, we must anticipate increased pressure for land development, and a resultant increasing demand for air space and subsurface tunnel rights in all major metropolitan areas. Chicago recently proposed building a freeway over 20 miles of railroad rights-of-way. This freeway formerly was suggested for a route that would go through some residential areas, and this proposal had brought delegations protesting to the mayor and council demanding that another route be chosen. Practically every alternative surface route had the same consequences, so the mayor began to look with some interest at the proposal for using the space above the railroad tracks.

This proposal illustrates another factor which enters into the use of air space, namely, the cost factor. In this particular instance, the 25 miles of elevated expressway was estimated at $500 million, including land and air space acquisition and highway construction. This is just about $25 million per mile, and even in this day of expensive highways this figure would seem to present a financial problem that could be overcome only by heavy contributions from the Federal Government matching proportionately heavy contributions from local government. To date, the financial obstacles have proved to be decisive in delaying approval of this project; but the sheer boldness of even suggesting it as an idea that is within the reach of engineering technology is significant. Perhaps such ideas as this will become common in the future, whereas today such a project would have to be solved with construction on the ground and relocation of the residents who are displaced.

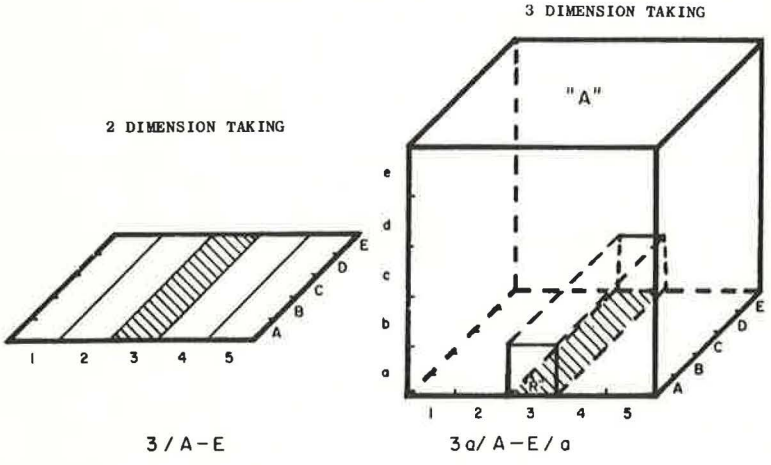
At the present time, Chicago also has an elaborate system of underground tunnels and walkways between downtown area buildings and stations. There are plans to expand it vastly. But even today, one can use tunnels beneath the Loop area to come and go from all of the major office buildings without ever coming up to the surface. One of the ramifications of this planned system is to have a circulating subway transit system to get the people from the suburban railroad stations and the centers of parking to their downtown offices and stores. This would naturally eliminate a lot of surface traffic.

It is my understanding that the city of Los Angeles has acquired the state's rights to areas of air space over the freeways, and is contemplating the use of this space for parking and other facilities. It is also planning a subway under Wilshire Boulevard, and a 2-mile long space city over the planned Beverly Hills Freeway. These ideas are occurring with regularity among those who are planning our major urban areas of the future.

Sacramento plans to lease the space above an 8-level parking structure for 17 additional stores to serve as hotel accommodations. Pittsburgh already has done something similar to this over an existing structure without bothering to demolish the older structure when it appeared too valuable to be destroyed. During the preparation of this project, I was called in several times to advise on the unusual aspects of the case, and we had to go beyond the usual concepts of air rights appraisal in this particular problem. Even in Springfield, Illinois—a city of 120,000 people—there is an instance where a savings and loan company built a building of 10 stories over an existing structure of 8 stories entirely in air space leased from the owners of the lower building.

NATURE, OWNERSHIP AND VALUATION OF AIR RIGHTS

What is an air right? It can be described as a vertical subdivision of a property in contrast to the traditional and familiar horizontal subdivision of land on a plane surface. It can be illustrated graphically (Fig. 1). In the case of horizontal subdivision, the property is divided up in parts according to their frontage and their depth—a two-dimensional concept. The concept of air rights divides an existing site (which already has been subdivided on the two-dimensional concept) into layers, like a layer cake. It describes these layers or levels in relation to some fixed point, such as "city datum." Thus, for example, one may acquire all of the air rights beginning from a point 23 feet above city datum, and extending indefinitely to as far as the reasonable use concept



NOTE:
SPACE MODULES OF 3 DIMENSION SUBDIVISON MAY BE VARIED TO ACCOMMODATE MOST EFFICIENT DESIGN OF AIR-RIGHTS IMPROVEMENT.

Formula

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

V = Value of the land before taking 3 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 "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 3 dimensional interest.

R = Remainder 3 dimensional interest.

Figure 1. Valuation of vertical highway tunnel easements for highway right-of-way.

permits. In this regard, the "reasonable use concept" is today favored over the old common law notion that one's property right extended indefinitely upward without limits. In the theory of the common law a property owner's air rights extended upward without regard to the practical extent to which the property owner reasonably could use the air space according to the highest and best use of his property. Today, however, it is more usual to see air space conveyed between two measurable points which are described in their relation to a known point, such as city datum.

Such a layer of air space, if you want to visualize it as one of the possible vertical subdivisions, is designated as an "air lot." With respect to any given parcel of land we might have several lots at various levels above the surface. A sophisticated instrument for the creation of an air rights interest might, therefore, have to include a number of elements. It would have the "air lot"—the layer—as described in terms of a certain point above the city datum. It might possibly also have to have a freehold interest for the boiler-room and the elevator shafts, which probably would require digging down to solid rock or earth. It also would probably have space or lots reserved for columns to support the deck, and subsurface structures, such as caissons, to go below the surface.

There are several types of title to air rights and tunnel rights. Interests of this sort are usually created either by lease or fee title, and in most cases the lease or fee title describes this air lot, together with the various fee areas for supporting columns, and perhaps caissons or cross-members. These latter would also be described as lots, and would be transferred either by lease or by fee title. Less common is the practice of selling or leasing the property with reservation of easements for specific surface uses. There are certain disadvantages in leasing, as far as financing is concerned. Therefore, in many cases the best method is to sell the air rights and lots for supporting structures in fee. Occasionally this may not be feasible, as where one is dealing with the air space over railroads, which the railroads may not sell, but be willing to lease. What method is best? The one that best meets the needs of the particular situation.

There is going to be a great demand for well-located air space sites due to the impact of population growth in our cities. This demand, and the requirements of zoning which require that more land be devoted to buildings for floor area, parking space, auxiliary features, height restrictions and buffer space around the edges of the built-up areas, all have to be considered in determining how a site is to be developed. Cities like Chicago, New York, Los Angeles and San Francisco just do not have new and unused space available in the central city any more. So, the city must often engage in an extensive urban renewal program in which older sections of the cities are torn down to make space. This is frequently expensive, involving from $2 to $10 per square foot for acquisition cost. It is not unusual to find land in the central business district ranging from $10 to $50 a square foot. In such cases the use of air rights in connection with urban renewal is economically justified. When land is worth only 50 cents a square foot the extra cost of building in air space is not justified.

THE DEMAND FOR AIR SPACE

The 15,000 to 30,000 square foot sites, which were typical in the central city areas before World War II, are no longer suitable. Directly east of Chicago's central business area are 70 acres of Illinois Central Railroad tracks. Title to the air rights in the space over these tracks was recently cleared after a lawsuit which took 2 years. In this case the state of Illinois and city of Chicago challenged the railroad's ownership of these air rights, claiming that the Illinois Central had the right to use this property for railroad purposes only, and this did not give the railroad the right to build office buildings and apartments over the tracks. The issue became one of interpreting the railroad's original charter, and the Illinois supreme court ruled that it was within the railroad's charter powers to develop the air rights as they desired. Now that this has been settled, 70 acres of land in the vicinity of the Prudential Building (which is also built on air rights) is not available for air rights development, and should be extremely interesting to watch in the future.

Another example of what is happening in Chicago's central business district is the Field Building. In the 1930's this building was built on one half of a typical downtown block, about 60,000 square feet. This was considered to be a very unusual site in its day, with frontage on three streets and an alley. The Prudential Building was built in 1960 in air space over the Illinois Central Railroad and occupies a site of 170,000 square feet, or the equivalent of a block and a half in downtown Chicago. Interestingly enough, however, both the Field Building and the Prudential Building have about the same amount of rentable space inside.

The First National Bank in Chicago, which occupied a half block, needed the other half of the block on which it was located. In order to obtain this additional 60,000 square feet, the bank had to acquire, among other things, a 40-story hotel (the old Morrison Hotel), and pay approximately $30 per square foot of land area to wreck it. This is after deduction of salvage, and is due in part to the need for extreme caution when carrying on demolition of buildings in the heart of a central business district.

It is no wonder, then, that developers are beginning to look with interest at air rights sites, and that this interest is being recognized by highway planners. Rex Whitton, the former Federal Highway Administrator, recently made the proposal that a public corporation or agency undertake to acquire entire blocks in the route of a freeway, and then dispose of the land by selling the air tunnel space to the highway department and the air rights over the tunnel for other types of development. This, of course, would be attractive mainly in areas where there was already a high degree of land development in order to justify the costs involved.

THE VALUATION OF AIR SPACE

Past studies of the division of air rights and railroad rights-of-way have indicated in very broad terms from 75 to 85 percent of the total base value in the air rights. This would indicate that access through valuable central areas might be acquired, ay for highways, for 20 to 25 percent of basic land costs. As the land becomes more valuable, the land cost percentage will probably rise. Like so many complex problems, however, this is a rule of thumb that applies in many cases, but may not apply to any particular case. Accordingly, a formula has been developed. And, as with many other complicated problems, the principle involved in air rights and access tunnel rights is quite simple. It may be expressed in the principle of the value of the land before and after the taking of the vertical access layer. This comparison is based on a consideration of the basic facts of added cost in building in the air space, and loss in economic value in constructing an improvement built in the air space rather than one on the ground. This latter is a factor reflecting the lesser utility of an air space structure as compared with a ground level structure. A simple illustration of this is shown in Figure 1 and its accompanying explanation.

In the formula given, V is the basic value of the land free and clear of railroad tracks or anything else. The X-factor is the economic value which is lost due to reduction of functional utility (net income) in modifying the building for construction. For instance, maybe the building does not have the utility rooms that normally go into a basement, and these have to be transferred to one of the upper floors at the loss of rental use of this space. This would reduce the net income of the building as compared with a building that is constructed on the surface.

The Y-factor refers to the added cost of construction of the building in the air space interest. The Merchandise Mart in Chicago used $500,000 more in steel than would have been the case if it had been built on the ground. Also, at the time this building was built the railway beneath it had not been electrified, and so a special smoke abatement system was installed at the added cost of $100,000.

The I-factor refers to the additional interest which must be paid for funding projects built on air rights. Usually such projects take a little more time to build than ones that are built on the ground, so the bank's money will be tied up in the project for a longer period of construction.

The factors X, Y and I are all deducted from the basic value of the land to compute the value of the air rights. To determine the value of the remainder of the land after

taking the air rights, one simply deducts A (air rights) from V (value of the land before taking).

That sounds simple enough, but determination of some of these costs with any degree of precision may become a difficult exercise. All of the problems which are present in a normal appraisal analysis are present in an air space appraisal, plus the additional ones I have just indicated. Some of these questions may be illustrated by the following example.

Assume the value of the land in question is placed at $25 per sq ft. For the 60,000 sq ft this would be $1.5 million.

Assume also that the architects and engineers determine on the basis of bidding that it is going to cost $275,000 more to build this building on air rights than on the surface, due to the cost of the deck and additional construction. As a result of this analysis, it is further concluded that this building will produce $20,000 per year less rent than a building built on the ground on a site which could be bought for, say, $25 per sq ft. The additional time of construction will be about 3 months, and credit financing can be arranged at 6 percent interest. In capitalizing the value of the property, we use an overall capitalization rate of 8 percent.

Therefore, from this $1,500,000 which is the base value of our 60,000 sq ft of land, we determine the value of the air rights by first taking off the $275,000 additional construction cost, then the capitalized value of $20,000, divided by 8 percent overall rate (the capitalization of that rent loss), or $250,000. One-quarter of a year's interest on the building investment would also be deducted. If we have estimated the building to be worth $5 million, this delay will cost us 3 months' interest, or $75,000.

Deducting those items from the base land value, that leaves $900,000, or approximately 60 percent of $1.5 million. In this hypothetical case, the determination came out at 60 percent, but the figures could come out at anywhere up to 90 percent by varying any of the factors mentioned. On the basis of experience, there has been a tendency for the figures to hit somewhere in the general area of 25 percent as a sort of benchmark. If it departs from that figure, one should take another look at it to see why.

Because these additional construction costs affect the value of the air rights, it is important to provide for them when planning a highway improvement. Those who are familiar with urban renewal know that it is possible for restrictions on a piece of land to affect the value through limiting its highest and best use. A good example of that is in the Carl Sandburg Urban Renewal Project in Chicago where the zoning required that each apartment have 300 sq ft of land. This project was on the edge of an area where land was selling at that time for $20 to $30 per sq ft—now it would be up to $40 or $50—for multi-story apartment use. This land sold for about $9 per sq ft because of this restriction, and the effect of this zoning brought the price of land for each apartment up to about $3,000. In the area to the east, where the zoning was a high-type residential category, developers only had to have 100 to 150 sq ft per apartment, and could buy land for two or three apartments with the amount needed for one in the urban renewal project area.

The same result follows where zoning imposed height restrictions on buildings. So, if landowners intend to take or reserve air tunnel rights over a piece of land, it is very important that they do not overload the land with restrictions in an effort to protect against certain conditions which they feel are unwise. Naturally, all the rights which are necessary to protect the highway must be preserved, but unnecessary limitations can be a dangerous thing, and can hurt the value of both the land and the air space. Also in designing the improvement—in such things as the spans, the columns, and spacing of the columns—is its effect on cost of construction. Good design will usually minimize the cost of the air rights.

CITIES OF THE FUTURE

We have talked about the history of air rights, and the valuation of air rights, in a framework of the past and the immediate future growth of our urban areas. The ultimate potential growth of our great urban areas, however, is less easy to visualize.

One can comprehend something of what is possible by noting that in 1960 there were 100 million Americans—56 percent of the population—living in five great urban regions and 11 smaller ones. These regions covered about 7 percent of the country's total land area. By the year 2000, it is estimated that 240 million Americans, or close to 80 percent of the population, will live in three huge urban regions—megalopolises—and 19 smaller metropolitan areas. These will be in the east, the midwest and California.

Envisioning this development, there will be vast problems of water supply, pollution control, transportation, preservation of amenities, and above all else, the problem of efficient utilization of space. This concentration of population implies a great shortage of land, which obviously will have to be met by making more use of the air space. It is hard to realize that in 1903 New York's Park Avenue was just a railroad track right-of-way with the cross streets dead ending on each side. But New York was one of the first places to face this space shortage, and it solved its problem by building up over the tracks, and designing the buildings so that the new "street level" was at the height of the viaduct. Chicago did the same thing when it double-decked Wacker Drive, and moved the building entrances up to the upper level. Now many cities are looking at their central business districts with this idea in mind simply because they are running out of space on the land itself. Indeed, the new Pan Am Building in New York is bolted onto the deck of a structure which itself is built on air rights. Thus, New York is going into its "second generation" of buildings built in air space.

Population expansion is thus going to bring some serious urban problems which the use of air rights and tunnels will help solve. Most people born between the turn of the century and the 1930's have seen the American city evolve from neighborly communities, each with some identity of its own, to big anonymous collections of buildings, streets and people. Many can remember the streetcar, or even the horse car, moving along streets that were relatively quiet and spacious. But, as the automobile took over the streets, this atmosphere changed, and the demand for street space seemed insatiable. Moreover, streets generally lost their cohesive function in the community, nd had the effect of breaking up neighborhoods by functioning as barriers rather than links. Much of the present urban mobility is the result of people restlessly seeking to find a neighborhood atmosphere in which to live. But, it is a self-defeating process since the shifts in population tend to carry with them the same dependence on automotive transportation which changes the community's character.

Recently the Greek economist and planner, Constantinos Doxiadas, visualized how the earth would look to a spaceman from Mars observing us from his flying saucer. Upon returning home, he suggested, they might give the following description of the Earth People:

> The Earthmen are creatures about 20 feet long, about 5 feet high and wide. They appear to be built of steel with aluminum fittings. They have two big eyes which are illuminated at night; and they roll on round legs at several tens of miles per hour.

Doxiadas properly questions whether the city in which man is stopped by red lights, in which children are not free to roam and play where they please, where the air is rendered impure by automobile exhaust can properly be called a City of Man, even though man has created it. He suggests that a city dominated by the automobile is not the City of Man. However, although the automobile is in danger of throttling the cities in a noose of concrete and polluted air, we know that automobiles are necessary and must be accommodated for the foreseeable future. How to reach an accommodation on this point is one of our principal problems in America today.

What does this mean for us in designing the cities of the future? Perhaps the future Cities of Man, "deepways" or tunnels under the surface may be cheaper than trying to rearrange the buildings on the surface. High-speed express routes can act as buffers and barriers to subdivide the major segments of the urban area into units which can achieve some better form of community life. In these communities, of, say, 50,000 residents, surface street traffic as we now know it would be drastically reduced in

favor of other methods of local transportation. When we consider that in 1810 the population of the United States was about 7,250,000, and grew to 31 million in 1860, to 92 million in 1910, to 196 million in 1967, and it is estimated that it will reach 300 to 400 million by the year 2000, we can appreciate the size of our problem regarding means of transportation.

There is every indication that new means of automotive transportation will have to be developed before the air pollution danger is solved. But urgent as this may be, there is still the problem of a shortage of street space. So in building highways and considering the use of air space we must think of answers that are far ahead of what we have seen up to the present. In Chicago, for example, I recently saw a huge abrasive cutting machine, called "the mole," which will attempt to drive two 15-ft sewer tunnels, each 4 miles long, through solid rock 150 ft below the surface of the earth. The schedule for this work is one year, so the time when extensive subsurface construction may be economically feasible may be close at hand.

If we are going to meet the challenge of the future, it is obvious that we must understand not only all of our many present problems of urban development, but also the various uses of the tunnel principle in dealing with some of these problems, whether we apply it underground or in the air space over the ground.