

Transportation Planning for New Towns

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The development of new towns is a growing phenomenon. These self-contained communities offer the transportation planners an opportunity to build on the basic research that has been carried out in urban areas in recent years. Employment opportunities juxtaposed with residential development, in conformance with accepted site-planning concepts, can reduce trip lengths. This is particularly true in the larger new towns. Street standards related to function can optimize construction costs and minimize the negative effects of noise and induced commercial development on residential areas. In spite of generally moderate intensity of land use, the cluster development concept can make good-quality public transit operation feasible. Exclusive rights-of-way, with linkages more direct than those that can be provided by automobile, ensure good transit service at relatively low cost. Parking can be designed according to realistic demands for space as functions of land use and characteristics of the residents. Good site planning can permit joint use of parking facilities.

•THE NEW TOWN concept that burst into full bloom in Europe shortly after World War II has become of increasing importance in American urban development. The role of new towns as a partial answer to growing urban problems received congressional recognition in the Housing Act of 1968. Title IV of this landmark legislation, known as the New Communities Act of 1968, authorizes federal guarantees to lenders who supply private capital for appropriate new town developments. It is clear that the handful of starts in this direction in the United States will soon be accompanied by a great many comparable developments. As is the case with the older established cities, the viability of the new communities will depend to a large degree on the effectiveness of their transportation systems.

Planning for the new towns involves two transportation considerations: an internal system to serve the new town and an external system to link the new town with the "mother" city. That is, new towns are clearly related to large metropolitan areas from which are drawn the population and business activities. Although they are designed as complete, self-contained communities, the new towns must have a basic link with the large established urban areas. (No inference should be drawn from the expression "self-contained" that these communities exist in isolation, independent of other urban areas nearby. Rather, they should be regarded as communities offering all the opportunities and advantages that can be found in any fully developed city.) For example, Reston is a part of the metropolitan Washington area, Columbia is related to Baltimore and Washington, Irvine Ranch is linked to Los Angeles, and Litchfield Park is connected to Phoenix.

LAND USE

The basic element of the new town, of course, is the residential area. Generally speaking, these communities have been planned for middle-income families. The

TABLE 1
POPULATION, HOUSING, AND EMPLOYMENT RELATIONSHIPS
IN NEW TOWNS

Town	Population	Dwelling Units	Employment
Basildon	75,000	16,199	20,136
Crawley	63,700	13,753	17,595
Harlow	75,800	19,203	15,524
Stevenage	61,700	15,415	18,453
Tapiola	16,000	4,575	6,000
Fort Lincoln (planned)	16,000	4,500	5,000
Columbia (planned)	110,000	30,107	40,000
Reston (planned)	75,000	21,000	23,000

poverty element is often excluded by the planning and financing process rather than by policy. At the opposite end of the scale, one rarely finds real luxury in a new town. The reasons for the concentration on the middle-income levels of society are complex, primarily financial, and beyond the scope of this paper. Nevertheless, housing types are varied, ranging from single-family, detached dwelling units to high-rise apartments.

The concept of the self-contained community is carried out by providing job opportunities for those residents who wish to work near their homes. Such opportunities are of great importance to many

people. For instance, the Fort Worth Community Planning Survey (1) in 1963 discovered that 57 percent of the residents of that city rated inadequate job opportunities as the most serious regional problem. A similar study in Albany, New York, revealed comparable findings. Many new towns plan employment approximately equal to the number of workers who will be living in the community.

Because it is not possible to match housing with jobs and because of the penchant of many people for living in places somewhat remote from their employment, many home-to-work trips will have one trip end outside the new town. As the size of the new town increases to a population of 100,000 or more with comparable job opportunities, the percentage of home-to-work trips remaining within the new town will likely increase.

Other uses of the urban land are related primarily to the residential areas and to lesser degrees to each other. In planning for Belconnen, Australia, a matrix of functional interrelationships for a typical town center was developed (Table 2). Most intimately related to the residential areas is the educational system, whose elementary schools serve their traditional role as a neighborhood focal point. Linking and serving the various land uses is the transportation system. Because mobility is important to the American public, and perhaps to others as well, the quality and adequacy of this system is of great importance to prospective residents. A comprehensive attitude survey taken in Greensboro, North Carolina (2), showed that, among 13 values rated by the residents, good roads and sidewalks ranked first. Social values came close behind, with convenient public transportation in fifth place. Accessibility seemed less important. Schools close enough so the children can walk to them ranked eighth, while closeby shopping facilities

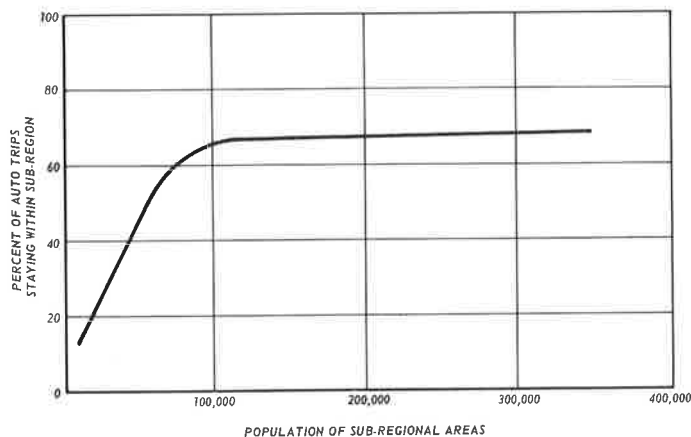


Figure 1. Effect of size of subregional areas on internal trips.

TABLE 2
FUNCTIONAL INTERRELATIONSHIPS OF TOWN CENTER COMPONENTS

Plan Elements	Retail	Commercial Services, Banks, and Offices	Public Services and Civic Buildings	Entertainment, Hotels, and Recreation	Social Institutions, Churches, and Clubs	Hospital	Recreation, Stadium-Extension	College	Government Offices	Service and Trade	Spine Transit	Collector-Distribution Transit	Peripheral Freeway	Town Arterial System
Retail	Concentration required; activity should not be dispersed	Provides market support; pedestrian proximity required; moderate competition for parking	Provides market support; pedestrian proximity desired; medium interaction	Provides good market support; pedestrian proximity required	Little or no support	None	Little or none	Some market support; action likely without close proximity	Provides market support; competition for available parking	Storage and warehouse support; good service vehicle access desired	Relatively unimportant	Enforce market support	Relatively unimportant	Prerequisite for market support
Commercial Services	Provides market support; close proximity required	Concentration desirable	Some support; pedestrian proximity desired	Provides service function; close proximity desired	Little or none	Little or none (doctors' offices)	Incompatible	Little or none	Some market support	Incompatible	Important for regional business contacts; access to labor force	Some support	Important for regional business contacts	Prerequisite for market support
Public Service Buildings	Little or none	Little or none	Concentration desired	Service function; close proximity desired	Little or none	None	None	Little or none	Little or none	None	Little or none	Important	Little or none	Prerequisite for market support
Entertainment	Some support; pedestrian proximity desired	Good market support; pedestrian proximity required	Minor market support	Concentration desired	Some support for clubs	None	Some support; many in-compatible factors	Good support; interaction desired	Some support	None	Little or none	Little or none (age groups)	Fairly important	Prerequisite for market support
Social Institutions	Little or none	Little or none	Little or none	Little or none	Can be dispersed	Little or none	Little or none	Little or none	Little or none	Little or none	Little or none	Little or none except for youth clubs	Little	Low traffic generator but good access desired
Hospital	None; incompatible	None; incompatible	None; incompatible	None; incompatible	None	Single unit	None	None	None	None	Important	Important	Important	Important
Recreation	Some joint use of parking facilities possible	Some joint use of parking facilities possible	Some joint use of parking facilities possible	Service support	None	None; incompatible	Single unit	Could be important; possible joint use at facilities	Some joint use of parking facilities possible	None	Important	Important	Important	Important
College	Service function; relatively close proximity desired	Service function; relatively close proximity desired	Little or none	Service function; close proximity desired	Little or none	None	Possible joint facilities	Single unit	Could be dispersed; research support	None	Important	Important	Minor	Important
Government Offices	Employee service; pedestrian proximity desired	Employee service; pedestrian proximity desired	Employee service; pedestrian proximity desired	Employee service; pedestrian proximity desired	None	None	Possible joint use of parking facilities	Possibly important	Could be dispersed	None	Very important	Very important	Very important	Very important
Service and Trade	None; incompatible	None; incompatible	None; incompatible	None; incompatible	None; incompatible	None; incompatible	None; incompatible	None; incompatible	None; incompatible	Could be dispersed	Little importance	Little importance	Very important	Very important

TABLE 3
AVERAGE WALKING DISTANCES

Trip Purpose	Walking Distance (ft)	
	Children	Adults
Play	400	
Recreation	800	
School	1,600	
Services		200
Business and Shopping		300
Work		400

ranked eleventh. The street system and the transit system planners must take these values into account.

THE PEDESTRIAN

Despite the importance of mobility, walking is a prominent means of transportation in new towns as well as in older cities. The United Nations' Symposium on the Planning and Development of New Towns found that "... those institutions, services, and amenities that are visited by the public frequently, but not necessarily daily, such as cinemas, clubs, health clinics, shopping centers,

... should be sited within easy walking distance of all dwellings they serve (3)." The question of walking distance is, of course, a relative one. The studies for Fort Lincoln, in the District of Columbia, indicated that walking distances are a function of age and trip purpose. The approximate ranges for these walking trips, shown in Figures 2 and 3, are based on very small samples and should not be interpreted as the result of definitive studies.

Planning for a pedestrian network deserves the same consideration as that given to the street plan. Where feasible and where particularly heavy conflicts exist, grade separations should be provided between vehicular and pedestrian ways. This is particularly important where school children are involved. Good site planning can minimize the number of such grade separations and thereby reduce the total cost of public improvements. Cost reductions are of major consideration to developers who must provide huge sums of money well in advance of their having sufficient cash flow to pay debt service on the loans.

THE ROAD SYSTEM

New town development creates an unusual opportunity for building a road system that is tailor-made for the specific functions that it will serve. The very low cost of land in new towns, compared with land value in established urban areas, makes freeways feasible for substantially lower volumes than those considered in existing cities.

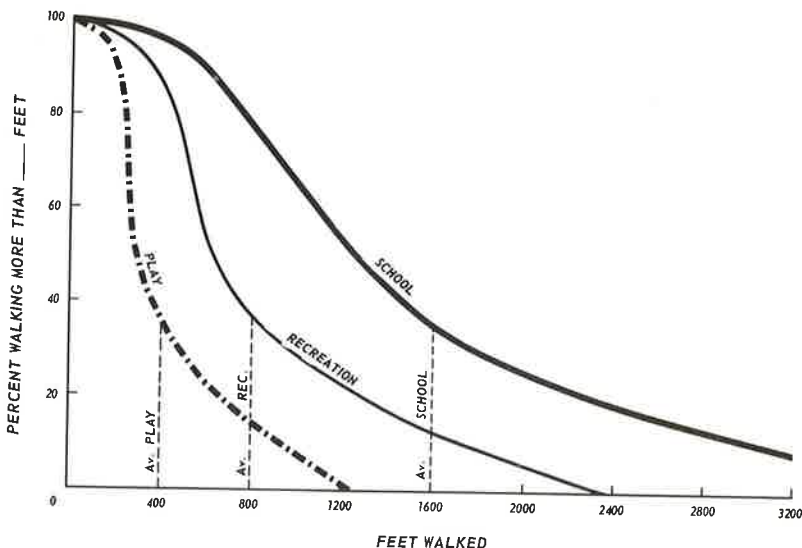


Figure 2. Children's walking trips.

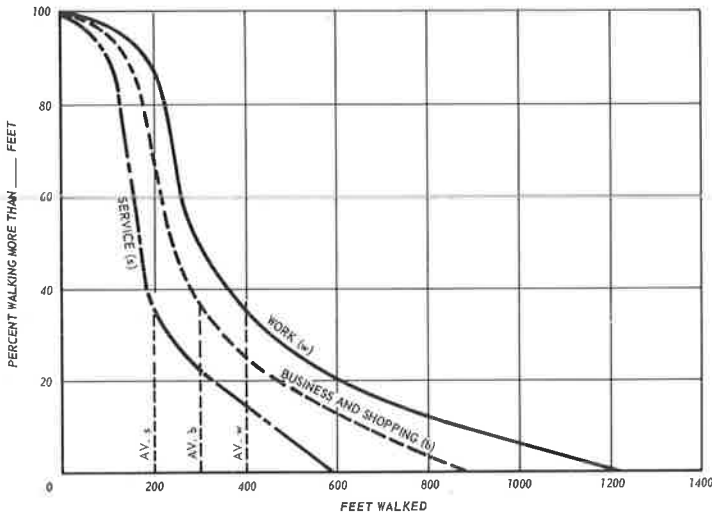


Figure 3. Adults' walking trips.

The general plan for Canberra, Australia (4), demonstrates the practicality of free-way development for daily traffic volumes in excess of 20,000 vehicles (Figs. 4, 5 and 6). The data for these figures are based on experience in Australia and Chicago. Capital costs do not include land. Construction costs are capitalized at 5 percent compound interest over 30 years. Average operating costs include the running cost of vehicles, cost of passengers' time, accidents, and road maintenance.

Richard Llewelyn-Davies has noted that ". . . the basis generally used for computation of network capacity is that there should be no delays to traffic by congestion at peak hour at the turn of the century when motor car ownership will have reached, or nearly reached, saturation point (5)." Admittedly, this is a very high standard. It may be achieved in Great Britain, where new town developers have the advantage of being able to borrow directly from the treasury of England. Where new towns are constructed by private enterprise, such high standards that provide capacity well in advance of need are not generally practicable. Nevertheless, a limited number of freeway miles is feasible not only to serve the highest internal volumes but also to link the new town with the mother city.

In addition to freeways, other streets should be developed to serve the specific needs of the new community. These streets can be classified according to the amount of traffic that is generated on them. The lowest class of streets will serve 25 dwelling units or less. Observed parking practices and probability estimates indicate that on streets in this class the chance that one driver will meet an oncoming car where two cars are parked opposite each other occurs about once every two months for an average driver.

$$\text{Probability of meeting} = 1 - e^{-(V_a/t)(2L/V)} + e^{-[(V_a+V_b)/t](2L/V)} - e^{-(V_b/t)(2L/V)}$$

where

V_a = peak 15-min volume in "a" direction or 70 percent of the peak 15-min volume in both directions,

V_b = peak 15-min volume in "b" direction or 30 percent of the peak 15-min volume in both directions,

t = time in sec (900 for 15 min)

L = length of street (500 ft)

v = velocity of vehicles in ft per sec (36.7 ft per sec or 25 mph)

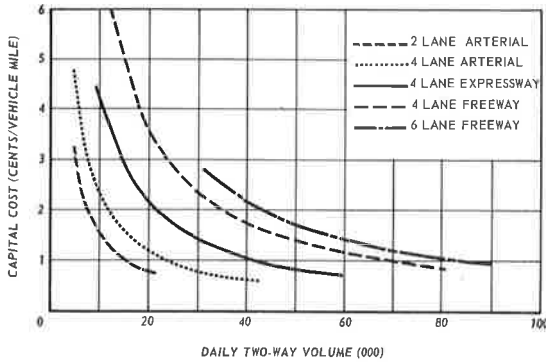


Figure 4. Capital cost versus traffic volume.

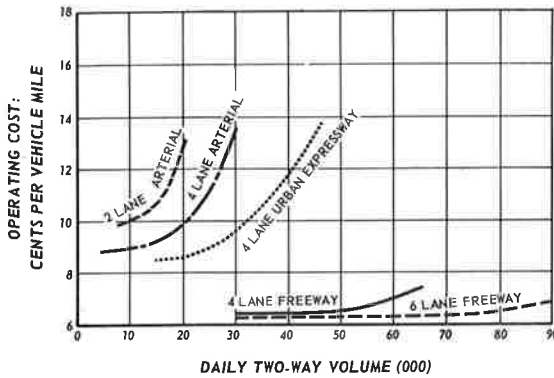


Figure 5. Unit operating cost versus traffic volume.

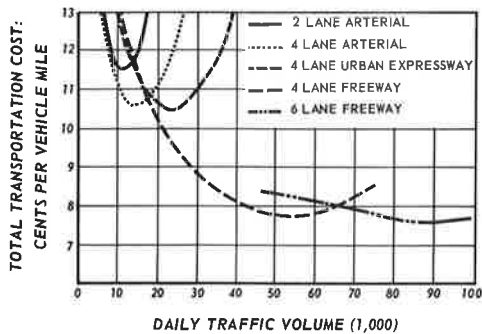


Figure 6. Unit transportation cost versus traffic volume.

This would indicate that on such streets two parking lanes and one moving lane are required. When a street serves more than 25 dwelling units or more than 250 average daily traffic (ADT), two moving lanes are required. When volumes exceed 1,500 ADT, vehicles will meet more frequently so that wider moving lanes are desirable.

The cluster-development concept, which is the basis for new town site planning, requires street design directly related to function. Streets can be used as parking lots or as parking connectors. With appropriate standards, the street will serve the desired function. These standards must realistically relate to criteria developed from field studies; this was done in Broward County, Florida (6). (See Table 4.) There it was found that as traffic increases on urban streets, two things occur: the noise level increases concomitantly, and land along the street tends to be used for commercial purposes. Figure 7 indicates the relationship between noise and daily traffic, and Figure 8, the relationship between traffic volume and commercial development in Jacksonville. These factors must be considered in street standards. A solution to the noise problem is to provide proper setbacks for buildings (Fig. 9). For residential areas, 70 decibels is considered the maximum acceptable noise level. Therefore, residential development should not be permitted to face streets that reach a volume of 10,000 vehicles per day.

Increasing volumes of traffic will likely result in pressures for commercial development. It is, therefore, essential to plan proper cross-sectional designs and controls of access as well as building setbacks for these heavily traveled streets. Table 4 indicates the street standards that have been designed to meet the criteria described above.

THE TRANSIT SYSTEM

The principal function of a transit system is to improve circulation within the new town and to provide opportunities for those who do not have access to automobiles; it does not supplant automobile service. A good road system must be provided throughout the community because it provides people with the freedom to travel anywhere they want. Only in areas of great intensity of pedestrian activity, such as the town center, should the primary emphasis be on transit.

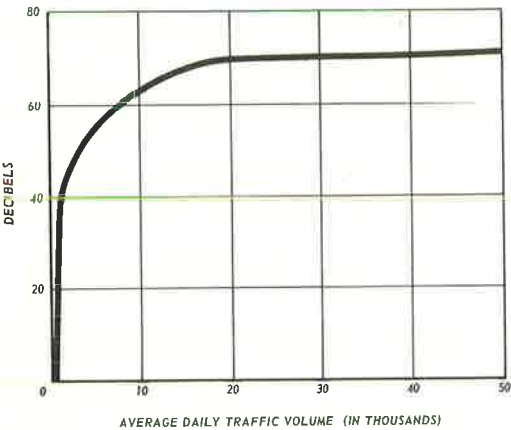


Figure 7. Relationship of traffic noise to traffic volume.

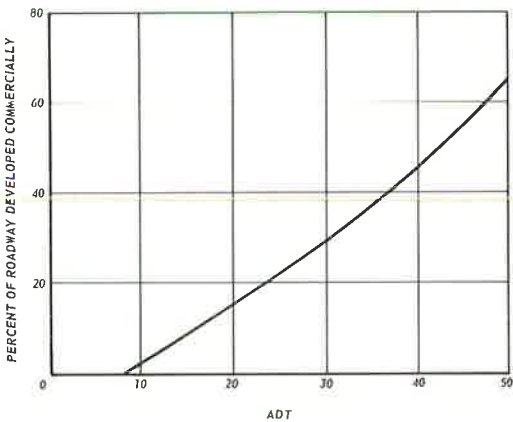


Figure 8. Relationship of commercial development and traffic volume.

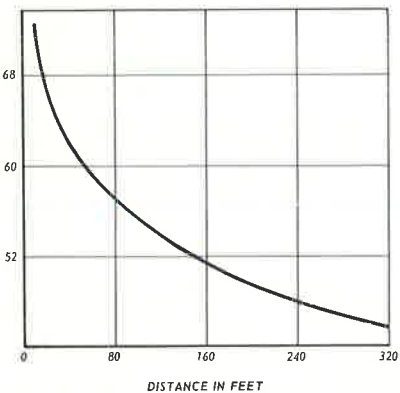


Figure 9. Relationship of noise level and distance from noise (10).

It is well recognized that successful transit systems require appropriate densities of development. The sparser the development, the less frequently can transit service be provided and, therefore, the less desirable will it be. For this reason, it may seem at first incongruous to discuss public transit with relation to new towns. However, many new towns have moderate densities, as shown in Table 5.

Notwithstanding their lack of intensive development, the new towns generally follow the cluster-development pattern, with large areas of open space and residential development concentrated in proportionately small areas of the total community. Such cluster development not only lends itself readily to mass transit operations, but also permits more economical road systems. Columbia, with cluster development has only 8 percent of land consumed by streets. In a typical subdivision, where travel is domi-

nated by automobile movements, 20 percent of the land might be in streets. In many suburban areas, about 10 trips per day are produced by an average dwelling unit; 6 of these are automobile-driver trips, 3 are automobile-passenger trips, and depending on the degree of transit service, 1 is a transit trip.

TABLE 4
STREET STANDARDS

Traffic Volume (ADT)	Moving Lanes		Emergency Storage Lanes ^a	Design Speed	Building Setback
	No. Required	Width			
Under 250	1 ^b	10	8	25	20
250- 1,500	2	10	8	30	25
1,500- 5,000	2	12	8	35	30
5,000-10,000	4	12	10	40	40
10,000-20,000	4	12	12 ^c	50	60
Over 20,000	4	12	12 ^d	60	100

^aRequired only if adjoining land use dictates.
^cplus 20-ft divider.

^bTwo lanes if no emergency or storage lane.
^dplus 40-ft divider.

TABLE 5
NEW TOWN DENSITIES

Town	Planned Population	Area (acres)	Persons per Gross Acre
Tapiola	16,000	6,150	26
Hemel Hempstead	80,000	4,980	16
Harlow	75,800	3,000	25
Columbia	110,000	13,690	8
Reston	75,000	6,800	11
Fort Lincoln	16,000	340	47
Litchfield Park	100,000	13,000	8
Cumbernauld	70,000	4,150	17
Typical subdivision	—	—	10
District of Columbia	—	—	20

The more variety that is built into the transportation system and the land it serves, the greater will be the ability of people to reach their own goals. In the typical suburb, the predominant trip purpose—about 35 percent—is for work or related activities. About 20 percent of the trips is for shopping, 25 percent for social-recreation purposes, and 20 percent for personal business and other reasons. The last category includes a substantial number of trips by housewives transporting children to various activities. A transportation system that relieves the housewife of these chores would give her more freedom, and it would also give the children greater opportunity to do things

on their own. Such a system would undoubtedly generate trips beyond those that might be calculated empirically. If a child could go to the library any time he desired, he would certainly make use of the transportation system that affords this accessibility. The system would thus provide for many more social opportunities. Therefore, transportation in new towns should offer a variety of services—transit as well as automobile.

With good site planning, a transit system can provide internal transportation for trips to school, convenience shopping, work, social-recreation activities, and cultural and health facilities. In fact, a well-planned community with satisfactory transit service can reduce the need for automobile ownership and thereby save some development costs in terms of roads and parking spaces. Admittedly, this is a theory that has yet to be fully substantiated. As Columbia, Maryland, and Runcorn, England, among others, develop, it will be interesting to observe if practice follows theory.

The configuration of the new town transit system will be related to land development and vice versa. Each, in turn, will be governed to a large degree by topography. However, it can be demonstrated that the concept of a double loop, in the form of a figure eight, is more effective than the more common concept of radials. These configurations, depicted in Figure 10, each involve about the same length of routing, and each require the same number of vehicles for comparable service. However, the double loop permits passengers to go anywhere on the system without a transfer. Models developed in Washington, Caracas, and Toronto have shown that the inconvenience of making transfers is a strong deterrent to mass transit usage. (Each minute involved in transferring equals 2 to 2½ min travel time.) Because it offers convenience and minimal travel time, a figure eight transit system was called for in the original plan for Columbia (7).

It must be emphasized that, for the transit system to be effective, land use development must be intimately related to the routing and particularly to the location of the stations. Generally speaking, a range of 25 to 30 percent of the residents can be expected to use public transit where there is satisfactory service. Good land use planning will provide a high degree of convenience for 25 percent of the residents in relationship to the transit stations. With a really good system, additional trips will be attracted beyond these 25 percent close-in residents so that a total of 40 percent might be attracted. Concentrations of high-rise apartments in the immediate proximity of the stations, with townhouses and single-family developments at more remote distances, provide an ideal solution. For example, in Columbia, 40 percent of the residents will be within a 2-min walk of a minibus stop.

The new town offers a unique opportunity to carry out basic planning concepts. A genuine choice between automobile travel and truly comparable public transit travel can be offered to the residents. It is possible to build communities that are free of automobile congestion and that, at the same time, offer fast, convenient, and comfortable transit service. The better the transit system is—that is, the more attractive it is to the residents of the community—the more likely it is to be a financially viable system.

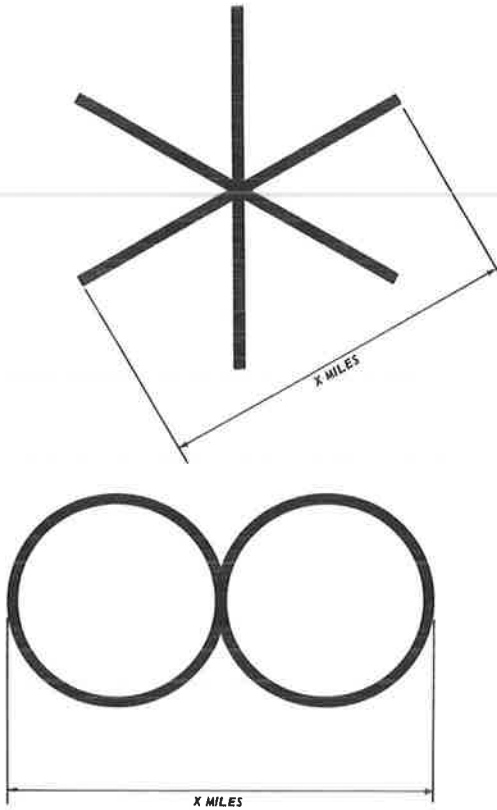


Figure 10. Basic configurations of transit systems.

It may not be essential, however, that the system be supported out of the fare box. This argument has been presented many times in regard to existing cities. The value of a transit system to a resident of a community who never uses the system is easily established. Increased property values, accessibility to the resident's home for those who do not have automobiles, and decreased traffic interference for the resident's automobile trip are all tangible, quantifiable benefits that can be taken into account to justify community support for the transit system.

Development of the new town provides a unique opportunity to relate land use to transportation as it can never be done in an established community. The provision of intense development around transit stations justifies adding an increment of these properties to the tax burden to assist the transit operation. Furthermore, the concomitant development of a road system and a public transit system permits alignments and configurations that can make transit more direct and therefore, to some degree, more appealing for some trips. A good example is the plan for Belconnen, the new town just outside Canberra, Australia (Fig. 11). Here the public transit line that links the new town with the mother city provides station stops directly in the intensively developed core of the town center. The convenience

of this direct access, as compared with the walking trip that would be required from the automobile parking lot, adds to the attractiveness of the transit system. Public transit in Belconnen serves primarily as a link between towns. Other examples of internal transit systems in Figure 11 show alignments for Columbia, Runcorn, and Ft. Lincoln. In each of these three examples it can be seen that the public transit system offers more direct service for many trips than the road system can provide.

The equipment that can be used for public transit depends on a number of factors. Runcorn proposes using standard buses. The original plan for Columbia contemplated the use of minibuses, although this equipment for the long-range development of the community is being reconsidered. In each of these instances, exclusive rights-of-way were proposed for public transportation to ensure reliability and high-quality service. Buses that operate in mixed traffic are always subject to delays because of conflicts with other vehicles and pedestrians. Even on streets with adequate capacity, delays can be expected during periods of rain or snow or when accidents occur. (A study made in St. Louis (8) showed that 28 percent of all buses ran late during the afternoon rush hour and over 15 percent ran early. Even during the off-peak period, 12 percent of the buses ran late.) Clearly, the schedule-makers face a dilemma. If schedules are slowed down to permit more on-time operation, then the buses would not be providing service as fast as they are capable. Furthermore, costs would be increased because more driver-hours would be required to provide the same number of bus-miles. Providing service regularity is particularly troublesome because a bus running only slightly behind schedule sets in motion forces that tend to make it even slower. The time gap between an on-time bus and a following late bus is greater than normal. During this longer gap, more people arrive at the bus stop, board the late bus, and cause it to fall

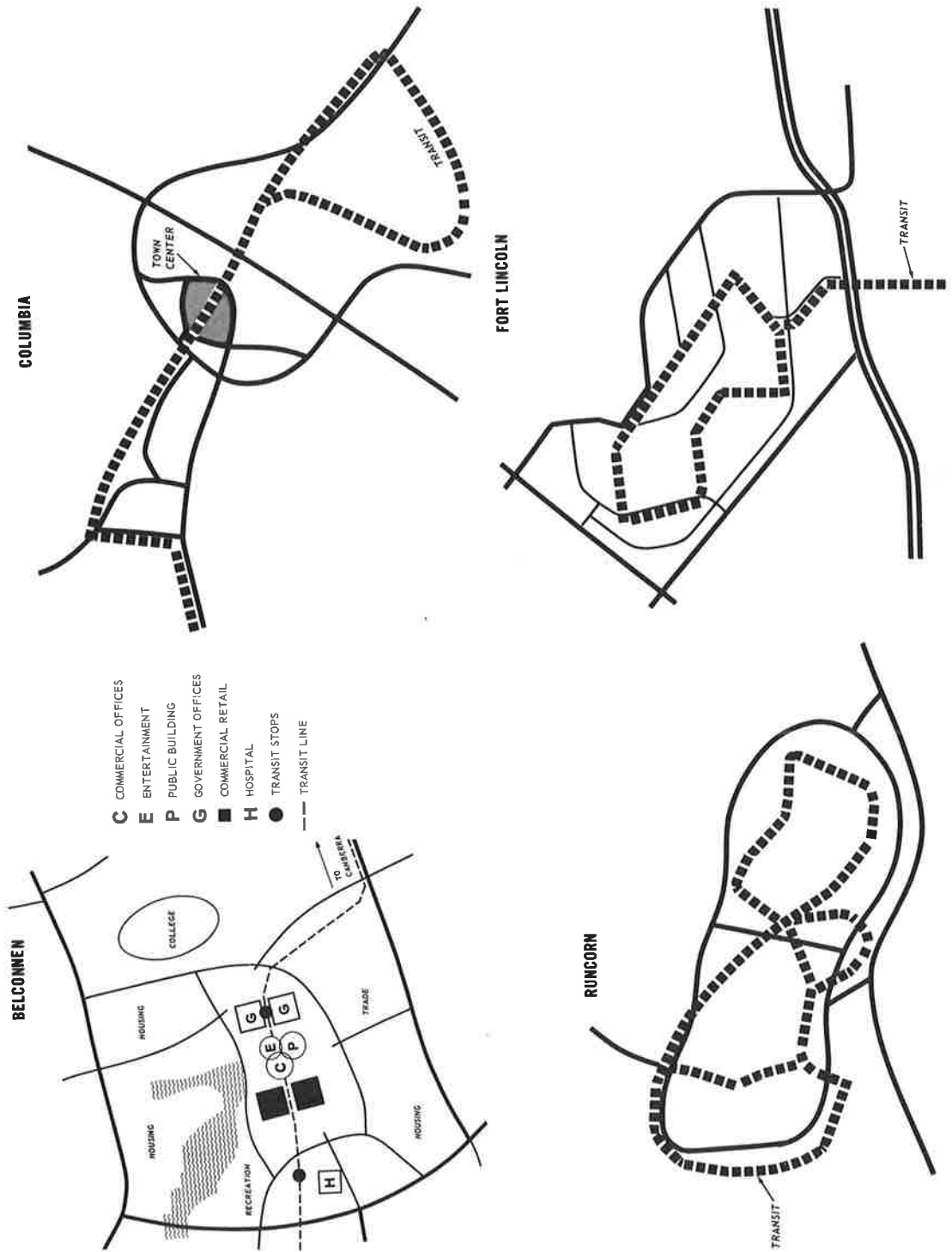


Figure 11. Transit plans for Belconnen, Columbia, Runcorn, and Fort Lincoln.

further behind schedule. The result of this is a tendency for buses to become bunched or to move in platoons instead of in evenly spaced units.

Buses on their own rights-of-way would largely avoid this problem. The use of exclusive busways would decrease travel time for bus passengers in two ways: by increasing scheduled speeds and by decreasing distances traveled. The usual transit delays, which account for about 15 percent of total bus travel time, caused by congestion, pedestrians, signals, and stop signs could be largely eliminated by the use of exclusive busways. For example, scheduled speeds of 15 mph have been anticipated for Columbia transit where, without busways, 12½ mph would be more likely.

Busways can also provide more direct routing patterns through some residential areas than would otherwise be possible. Main arterial roadways would purposely not be routed through residential concentrations or the city center. If busways were eliminated, then either additional main roads would have to be cut through these areas, or buses would have to be circuitously routed. Additional local streets of a continuous nature could not be added, because automobile traffic would tend to use these streets and to make them, in effect, through streets but without adequate capacity.

During the testing process that preceded the actual development of the proposed Columbia system, it was assumed that the busways were not developed. Therefore, buses were routed on the street system through Village I and II to the central business district to test the effect of the circuitous routing required. The route was 9,450 ft in length. The route over the more direct busways that serve the same area was only 7,000 ft. Thus, the street route was 35 percent longer than the busway route. For this particular service area, total travel time by busways was 50 percent less than that by street routing because of the reduction in traffic complex and more direct routing. At the same time, a 50 percent increase in operators' wages was required to provide the service on the streets. While it is conceivable that these differences might be narrowed by the judicious redesigning of the street system, it is apparent that the busways significantly improve the performance of the transit service to the consumer and reduce the cost of providing the service by the operator. The quantified effects of exclusive busways in Columbia, given in Tables 6 and 7, show that busways can make the difference between a profitable, or at least breakeven, operation and a deficit operation.

The Fort Lincoln plan contemplates an attractive, small-scale automated train that virtually dictates an elevated system throughout the community. Although automated systems promise savings in labor costs over the long-term operation, the more flexible bus system more readily lends itself to staged construction.

PARKING

Parking requirements for residential land use are related to a variety of factors such as family size, family age, availability of transit, family income, level of automobile service, character and density of area, general climatic conditions, and kind of

housing. Many of these factors are difficult to quantify. However, there is strong evidence that some basic relationships hold. Figure 12, derived by implication from studies by the Tri-State Transportation Commission, indicates a relationship among income, transit service, and automobile ownership. In planning for Fort Lincoln, measurements were made in the Washington, D. C., area of automobile ownership according to characteristics of housing and their residents. The findings are given in Table 8.

Demands for parking space at other land uses can be similarly measured. A study by the Urban Land Institute (9)

TABLE 6
DAILY BUS OPERATING COSTS

Cost	For 20 Buses With Busways	For 28 Buses Without Busways	Percentage Increase, No Busways ^a
Maintenance	\$ 240	\$ 693	25
Operators	640	896	40
Supervisors	20	28	40
Administration	100	140	40
Payroll taxes	48	67	40
Vehicular taxes	4	6	40
Depreciation	140	196	40
TOTAL	\$1,240	\$1,693	

^aBus units increase from 20 to 28; bus miles increase from 4,800 to 6,000 per day; bus hours increase from 320 to 448 per day.

TABLE 7
ANNUAL TRANSIT COSTS AND REVENUES^a

Costs and Revenues	With Busways	Without Busways
Revenues	\$495,000	\$372,000
Operating costs ^b	372,000	508,000
Cost of busways	100,000 ^c	—
Maintenance of busways	5,000 ^d	—
Total costs	477,000	508,000
Revenues less costs	18,000	-136,000

^aDaily costs and revenues are annualized by a factor of 300.

^bIncludes equipment depreciation.

^cCalculation assumes 10 miles of exclusive busway estimated to cost \$125,000 per mile or \$1,250,000.

^dMaintenance costs for busway are estimated at \$500 per mile per year.

TABLE 9
AVAILABILITY OF RESIDENTIAL OFF-STREET
PARKING SPACE IN DAYTIME

Kind of Housing	Percentage in Good Transit	Percentage in Fair Transit
Public	25	30
Middle-Income	45	55
High-Income	65	70

TABLE 6
AUTOMOBILE OWNERSHIP RELATED TO RESIDENT
CHARACTERISTICS

Kind of Housing	Income Level	Age Group	Automobile Ownership
High-rise	High	Elderly	0.33:1
High-rise	High	Other	1.30:1
High-rise	Middle	Elderly	0.20:1
High-rise	Middle	Other	1.10:1
High-rise	Low	Elderly	0.10:1
High-rise	Low	Other	0.20:1
Low-rise	High		1.50:1
Low-rise	Middle		1.30:1
Low-rise	Low		0.40:1

parking. Other opportunities exist for multiple use of parking space. Where daytime and nighttime activities are in close proximity, there is normally no need to duplicate parking space for the nighttime uses. Table 9 gives findings, again from the Washington, D.C., area, as to the availability of parking space of residential areas during the daytime. This would indicate that joint use can be made of parking spaces for residential and commercial or other uses.

Walking distances are an important factor in the location of parking. If a walk in excess of 250 ft is required, there is a strong likelihood that streets more convenient

indicated that 5.5 spaces per 1,000 sq ft of retail space would be appropriate for regional shopping centers. This might be a proper value in the town center of a new town where there is not good transit service. The same Urban Land Institute report showed that up to 20 percent of office space can be superimposed on the retail space without increasing the demand for

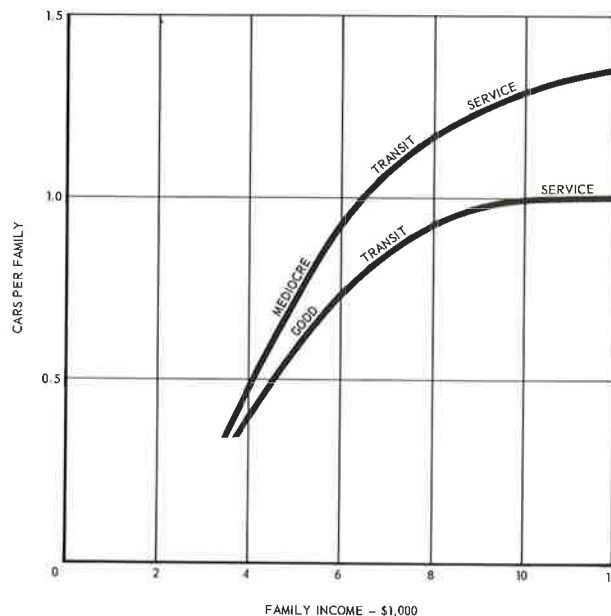


Figure 12. Automobile ownership versus income as a function of transit service.

than the planned parking lots may be used for parking. Many streets that do not have active uses fronting on them would not normally require parking space and the design cross section would not provide for this use. The excessively long walking trip, then, from the parking lot or garage to the building, which it is intended to serve, tends to be self-defeating.

Appearance is always an important consideration in site planning. Large areas of parked automobiles exposed to public view are not generally considered desirable. At the same time, low land values dictate against the construction of expensive garages. Careful site planning with good screening of both walls and natural growth can do much to improve the appearance of parking lots.

SUMMARY

The planning of new towns is a combination of art and science. To a large degree, the art aspect has dominated because of lack of information on basic travel habits and living patterns in these new communities. Much has been learned, of course, in the mistakes as well as with the successes of older established cities. Perhaps the most important lesson that can be learned from the new towns is the advantage of flexibility in planning. Standards for development, including streets, parking, and densities, that vary according to actual conditions can provide economic benefits while enhancing the functional aspects of the community.

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