CHAPTER VII

DISCUSSION OF RESULTS

It is shown that over the range of each data set, there seems to be an exponential relationship between the space mean speed of traffic and its density. From flow-speed-density measurements in Table B-1 to B-17 and data point plotted in Figure C-1 to C-17, the features of the observed original data sets were the points seemed to occur in bunches in the non-congested condition, i.e. major traffic operated in non-congested condition during the period (2:30 p.m. to 5:30 p.m.) of collecting data, except, for RamaI Road, Yaowaraj Road, and Raj Prarop Road. For RamaI Road and Raj Prarop Road, traffic operated uniformly over the full range of operating characteristics. For Yaowaraj Road, major traffic operated in congested condition.

The results of data point plotted indicate clear relationships between speed and density and between flow and density, but speed-flow data show considerable scatter. It is the characteristic of speed-flow data that there is a scatter of speeds at any given flow,[32] points do not fall along a definite line. The scatter of points also depend on the manner in which observations are recorded and plotted. If individual speeds, or the means of speeds recorded over short time intervals, are plotted, the scatter of points will be greater than if the means of observations recorded over longer time intervals are plotted.

From observations of traffic it appeared that, with flows and densities below those at the capacity, traffic movement was fairly orderly. As the flow approach capacity, marked fluctuations in speed seemed to occur, and, in contrast to the reasonably orderly traffic flow at lower flows and densities, flow seemed to be disorderly or unstable. As the density increased above that at the capacity, flows were reduced; but flow seemed to return to a more orderly pattern, with lower speeds. Thus, it seemed that there were two distinct flow zones, each with reasonably orderly traffic flow and seperated from each other by a transition or unstable zone. Further support for this view can be found by examination of plots of data appearing in the Figure C-1 to C-17and Figure D-1 to D-51

They generally show a large scatter of points, usually are not easy to obtain, in the vicinity of the capacity.

From data that have been examined they can be concluded that:

1) The zone of normal flow (flows and densities below the capacity) will alter for different facilities. The intercept on the speed axis will all vary.

2) The zone of unstable flow may have about the same density limits for all facilities.

3) The zone of forced flow (above the capacity) may remain substantially constant for all facilities.

For the streets studied (city street), generally, operating speed with in the zone of normal flow are relatively low. This could be brought about by speed limits, frequent intersections, parked vehicles, bus stops, pedestrians, and so on.

From flow-speed-density diagrams, Figure D-1 to D-51, they can be concluded that density measurements obtained by $k = q/u$ could be satisfactorily employed in the analysis.

The curves (models) for Rama I Road, Yaowaraj Road , Phaholyothin Road, New Petchbury Road, and Ramkhamhaeng Road were drawn through, but not statistically fitted to, the points. These curves give a good indication of the trend of the points. Because of the scatter of data points by this method of collecting data, the criteria for statistical parameter of these streets are not satisfied. The other streets result in the models which all criteria are satisfied.

Particular attention was given to the values of the exponent m and l in Eq.25. In each category of street studied, the acceptable m, l combinations are not close together. May and Keller(24) found that the acceptable m, l combinations are reasonably close together for the great differences between the two data sites, freeway and tunnel. Thus, in this research, it was also concluded that certain categories of traffic facilities could not be indicated by the m, l combinations.

The results are also discussed for models considering previously identified macroscopic models. In reference to Figure F-5 as an example and the selected traffic flow models, it is interesting to note the position of previously proposed microscopic and macroscopic traffic flow models on the m, l matrix. The m, l coordinates which represent these earlier models are given in Table 8.

Table 8 Existing traffic-flow models.

	m	l	Macroscopic equation
Chandler[23], Reushel[23], Pipes[23]	0.0	0.0	$u = \frac{1}{s}(\frac{1}{k} - \frac{1}{k_j})$
Gazis[12], Greenberg[11]	0.0	1.0	$u = u_o \ln(k_j/k)$
Drew[17]	0.0	1.5	$u = u_f \left[1 - (\frac{k}{k_j})^{\frac{1}{2}}\right]$
Greenshields[6]	0.0	2.0	$u = u_f \left[1 - (\frac{k}{k_j})\right]$
Edie[5], Underwood[15]	1.0	2.0	$u = u_f e^{-(\frac{k}{k_0})}$
Drake[19]	1.0	3.0	$u = u_f e^{-\frac{1}{2}(\frac{k}{k_0})^2}$

None of macroscopic integer models appears to be superior to the others. It should be noted that the Greenshields model[6] results in a linear speed-density relationship and usually exhibits the undesirable characteristic of an extremely low jam density. The Greenberg model[11] results in a concave-shaped speed-density relationship and does not have a y-intercept (free-flow speed of infinity). The Underwood model[15] results in a concave -shaped speed-density relationship and usually exhibits the undesirable characteristic of an extremely high free-flow speed and does not have an x-intercept (jam density of infinity). The Drake et al. model[19] results in a concave-shaped speed-density relationship in the low density range and a convex-shaped relationship in the high density range . It has the undesirable characteristic of not having an x-intercept (jam density of infinity). Consequently, the advantage of the non-integer m, l models, as in the research, is to minimize or eliminate the undesirable features of the integer m, l models

According to the present traffic congestion and operating characteristics of traffic flow in Bangkok, the traffic stream model is great useful in improving the present traffic efficiency. By defining the maximum traffic flow, capacity, from the model, traffic should be forced to move at a speed (and density) corresponding to maximum traffic flow. Some streets can be utilized by prohibit parking along the streets or arranging traffic to move orderly on all possible running lane.