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ILS LOCALIZER PERFORMANCE PREDICTION OF AN ALFORD 1B ARRAY NEAR A LIMITED ACCESS ROAD AT THE NEW ORLEANS AIRPORT

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16. Abstract

The Transportation Systems Center (TSC) ILS Localizer Performance Prediction Model was used to predict the derogation to an Alford 1B Localizer caused by vehicular traffic traveling on a roadway to be located in front of the localizer. Several different types of car distributions were modeled and found to produce negligible additional derogation to the Alford 1B Localizer performance operating for Runway 10 at the New Orleans airport. However, because of the nature of the scattering causing the derogation and the capabilities of the TSC model (see text), it is suggested that additional validation of the TSC results be obtained.

17. Key Words
- CDI
- New Orleans Airport
- ILS Localizer

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PREFACE

In response to a request from the FAA Southwest Region, the Transportation Systems Center (TSC) ILS Localizer Performance Prediction Model was used to predict expected ILS Localizer derogation caused by scattering from vehicular traffic traveling on a roadway to be located in front of an Alford 1B Localizer system. This report presents the predictions of the TSC model.

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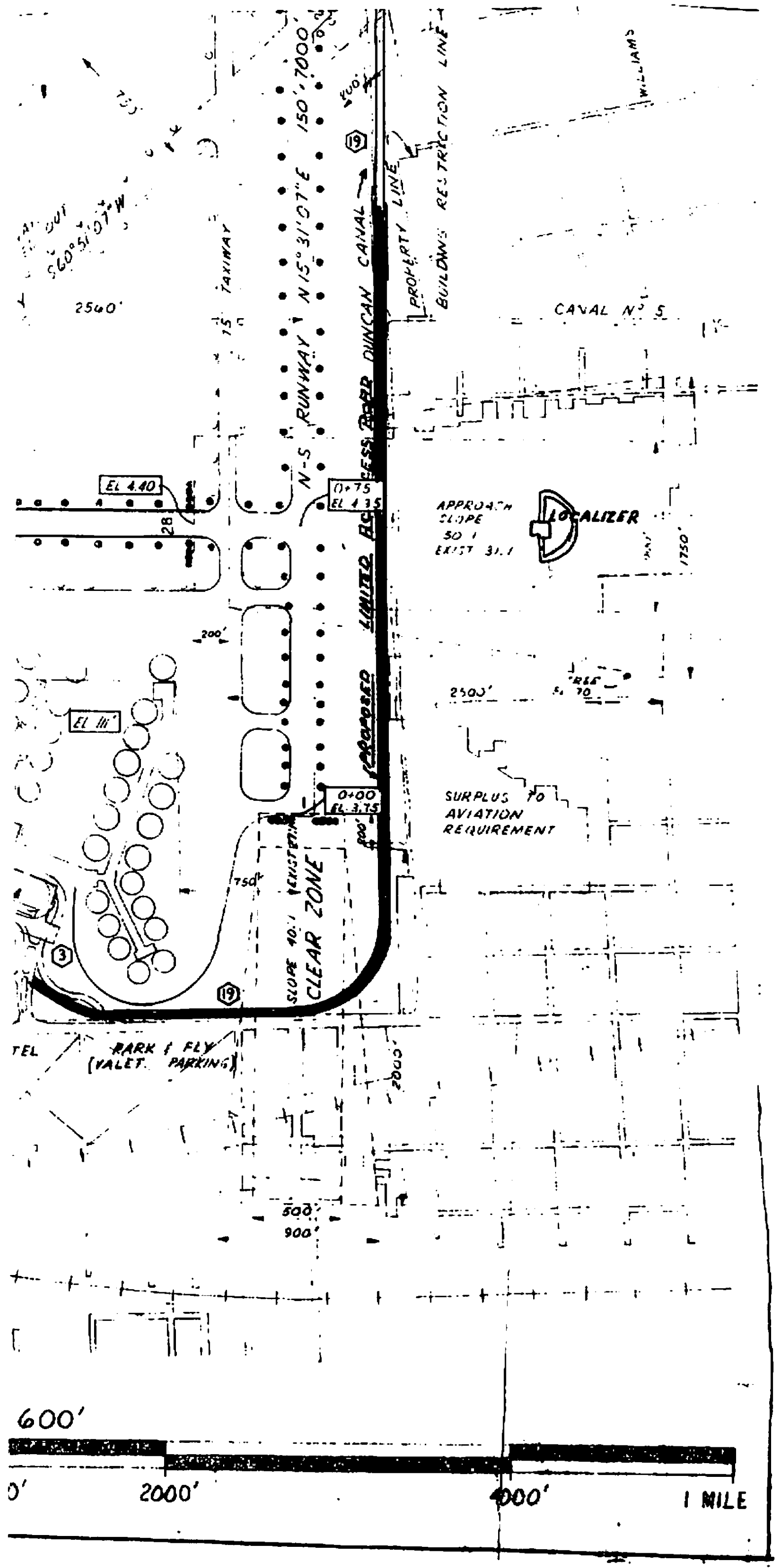

Figure 1 Airport Layout Showing Proposed Limited Access Road

Under these conditions, the Course Deviation Indication (CDI) was predicted along the flight path above an extended runway centerline from 23,000 feet in front of the localizer to approximately the stop end of the 9227 foot long runway in the presence of various types of vehicular traffic.

The vehicular traffic, under which the localizer performance was predicted, was modeled as follows:

1. A single car modeled as a perfectly reflecting rectangular box, 20 feet long, 8 feet wide and 6 feet high situated on the roadway with an x-distance of 863 feet (x-direction is the direction along the runway centerline) and a y-distance of 90 feet (y-direction is the direction perpendicular to the runway centerline). This position was chosen to give a worst case single car result. The front and one side of the car were illuminated by the ILS antenna as depicted in Figure 2.a.
2. A single perfectly reflecting trailer truck 45 feet long, 8 feet wide and 13 feet high. The x-distance of the truck is 863 feet from the localizer and y-distance is 90 feet perpendicular to the extended runway centerline, (see Fig. 3.a).
3. A traffic jam along part of the roadway as shown in Figure 4.a. The traffic jam is simulated by a long perfectly reflecting wall 6 feet high. The x-distance of the wall is 863 feet from the localizer and the y-distance extends 1000 feet perpendicular to the extended runway centerline (see Fig. 4.a).
4. A worst case car spacing (called "Fresnel" cars) located on the roadway. Each car in this traffic distribution is assumed to have two perfectly reflecting sides 20 feet long, 8 feet wide and 6 feet high. The x-distance of each car is 863 feet. The y-distances are distributed as shown in Table 1. This "Fresnel" spacing of cars is depicted schematically in Figure 5.a.

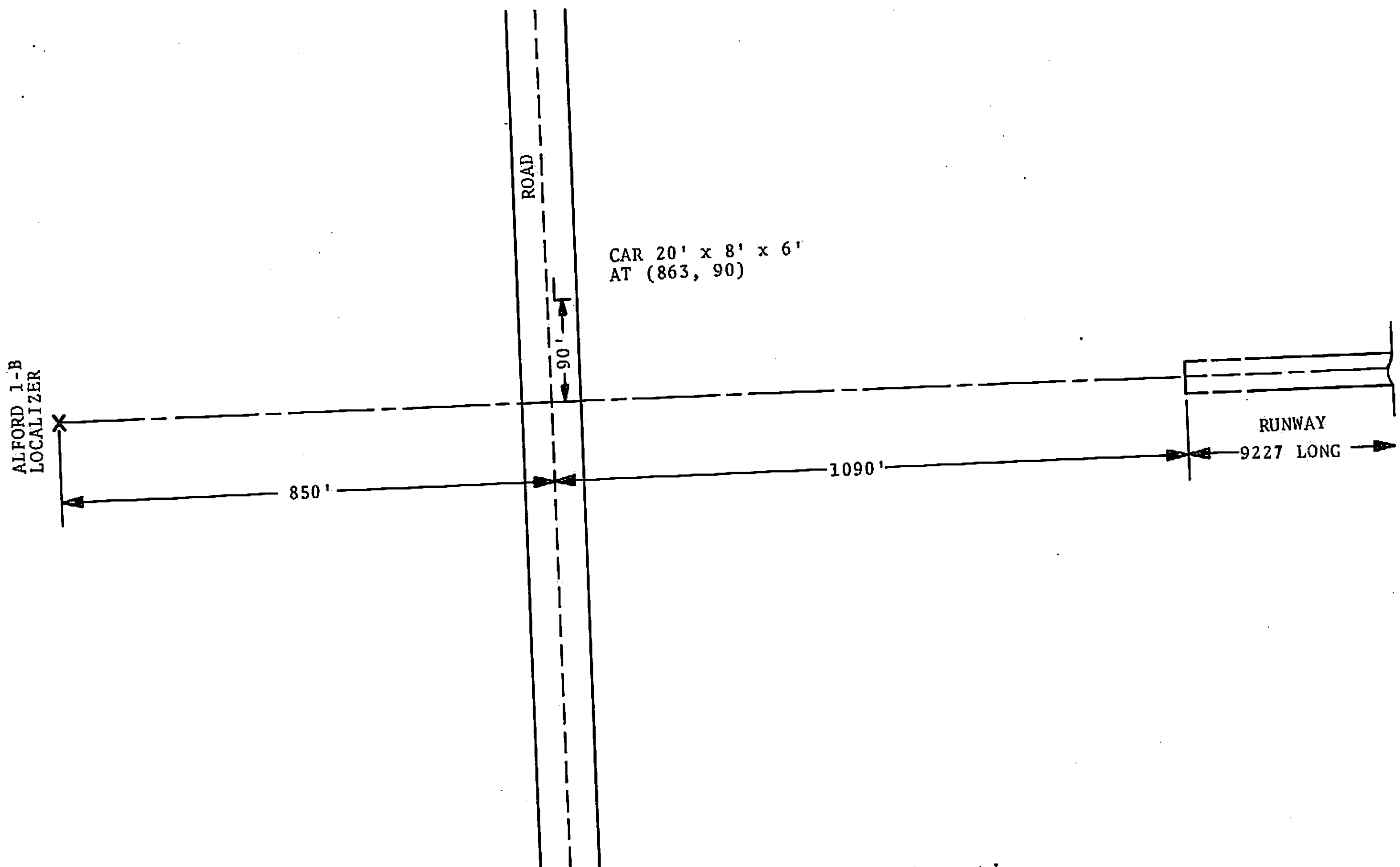

Figure 2.a Single Car Scattering Schematic

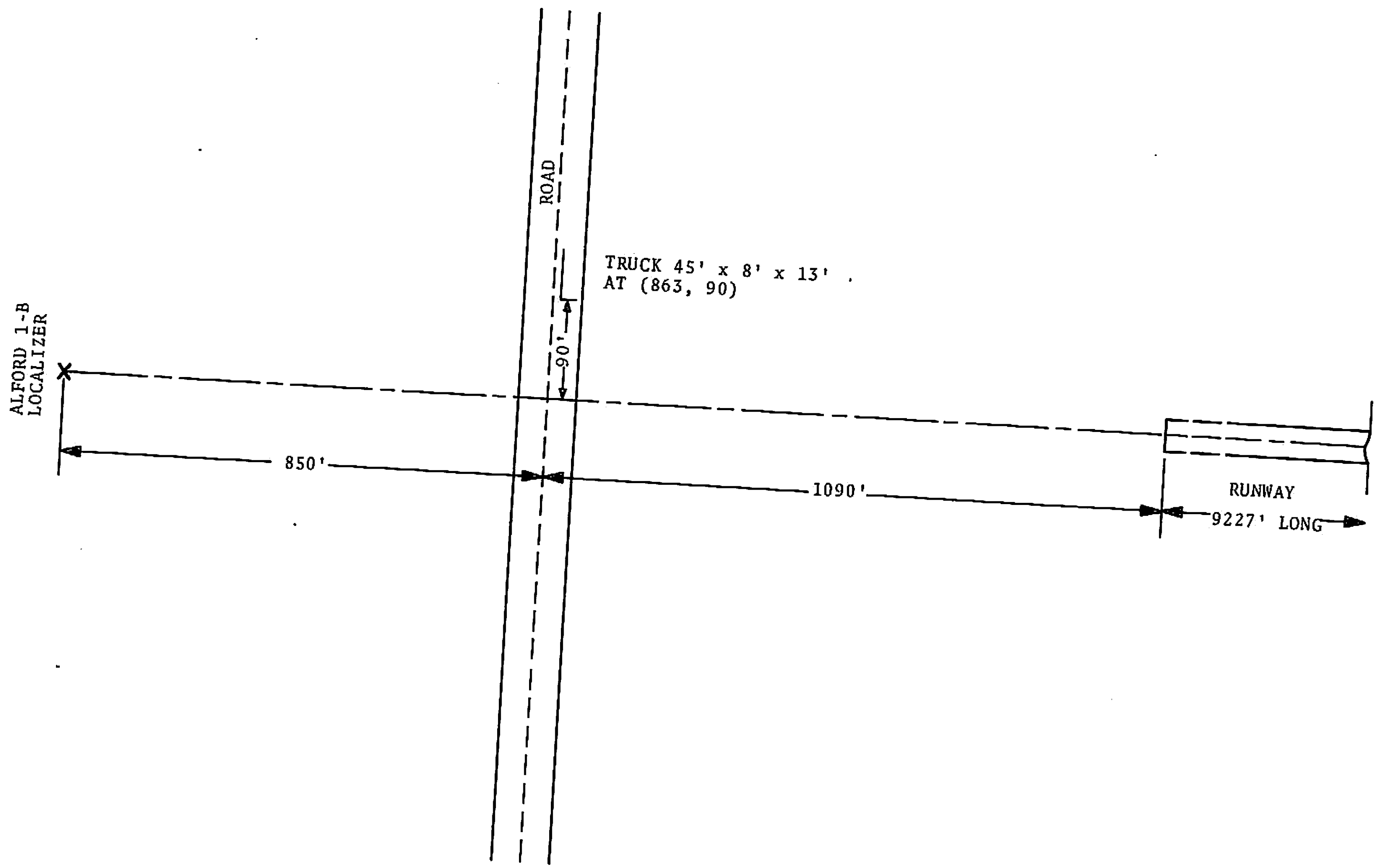

Figure 3.a Single Truck Scattering Schematic

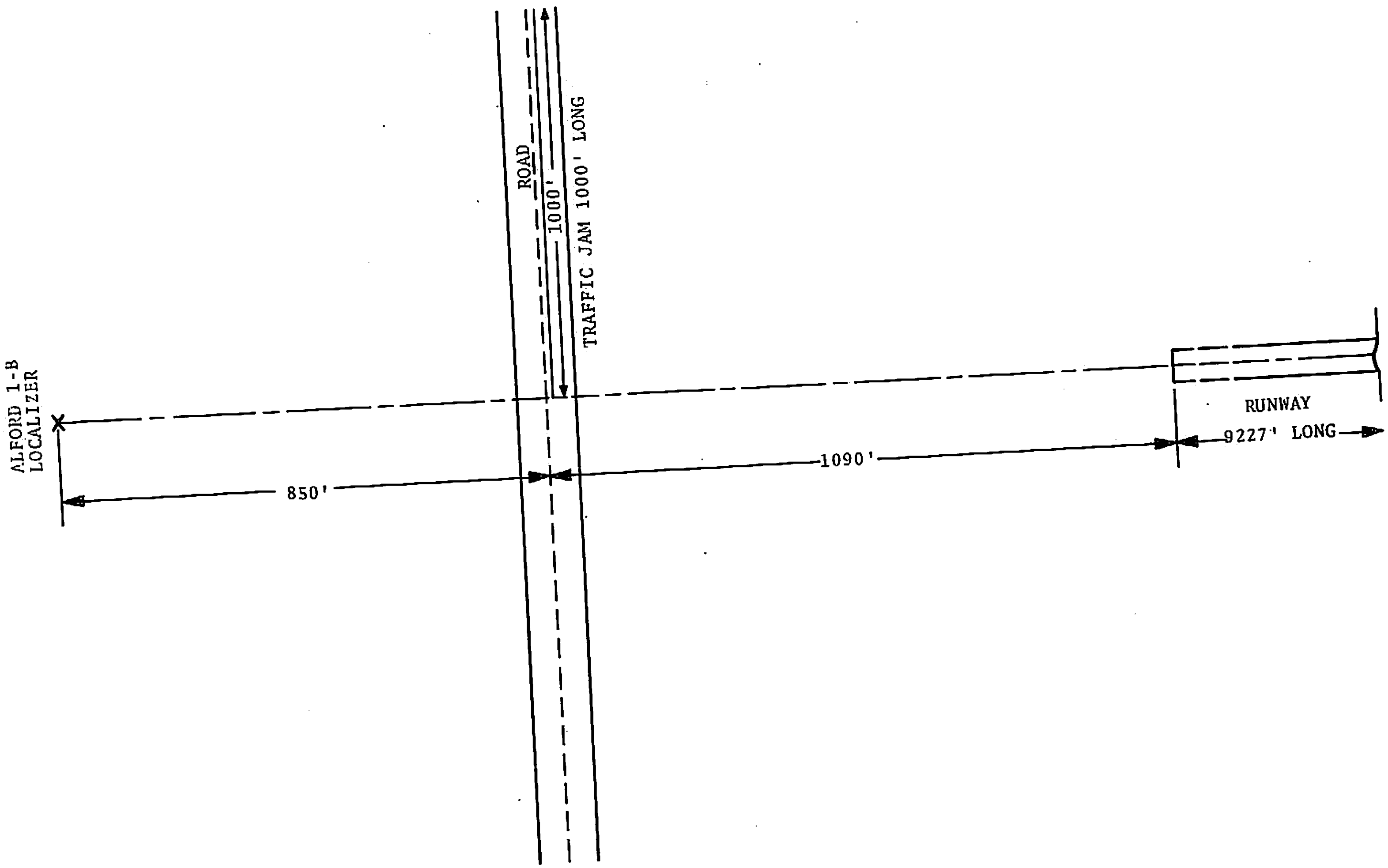

Figure 4.a Traffic Jam Schematic

Figure 2.b, corresponding to the single car situation shown in Figure 2.a shows the predicted CDI along the flight path from 23,000 feet to 2000 feet in front of the localizer. The antenna height is 13.3 feet (almost identical results were obtained for an antenna height of 6 feet, not shown). As can be seen from Figure 2.b, the derogation due to the presence of the single car is almost negligible.

Figure 3.b, corresponding to the single trailer truck situation shown in Figure 3.a, shows the predicted CDI along the flight path from 23,000 feet to 2000 feet in front of the localizer. The antenna height is 6 feet (almost identical results were obtained with an antenna height of 13.3 feet, not shown). The derogation to course structure due to the presence of the truck, while larger than that due to the presence of the shorter car, is still very small. The higher peak value of the CDI predicted in this case of a truck is due to the greater height of the truck (13 feet compared with 6 feet for the car). On the other hand, the broader CDI pattern predicted is due to the longer dimensions of the truck (45 feet compared with 20 feet for the car). The different positive-negative asymmetries between the CDI's for the truck and car is also due to their different lengths, originating in the diffraction term of the scattering formuli.[1]

Figure 4.b, corresponding to the traffic jam depicted in Figure 4.a, shows the CDI along the flight path from 23,000 feet to 2000 feet in front of the localizer. As can be seen, the predicted derogation is almost negligible.

Finally, Figure 5.b, corresponding to the worst case traffic distribution or "Fresnel" car spacing depicted in Figure 5.a, shows the CDI along the flight path from 23,000 feet to 2000 feet in front of the localizer. The antenna height is 13.3 feet (again, almost identical results were obtained for the shorter 6 foot antenna height). The derogation due to the presence of even this worst case traffic distribution of car spacing is still very small.

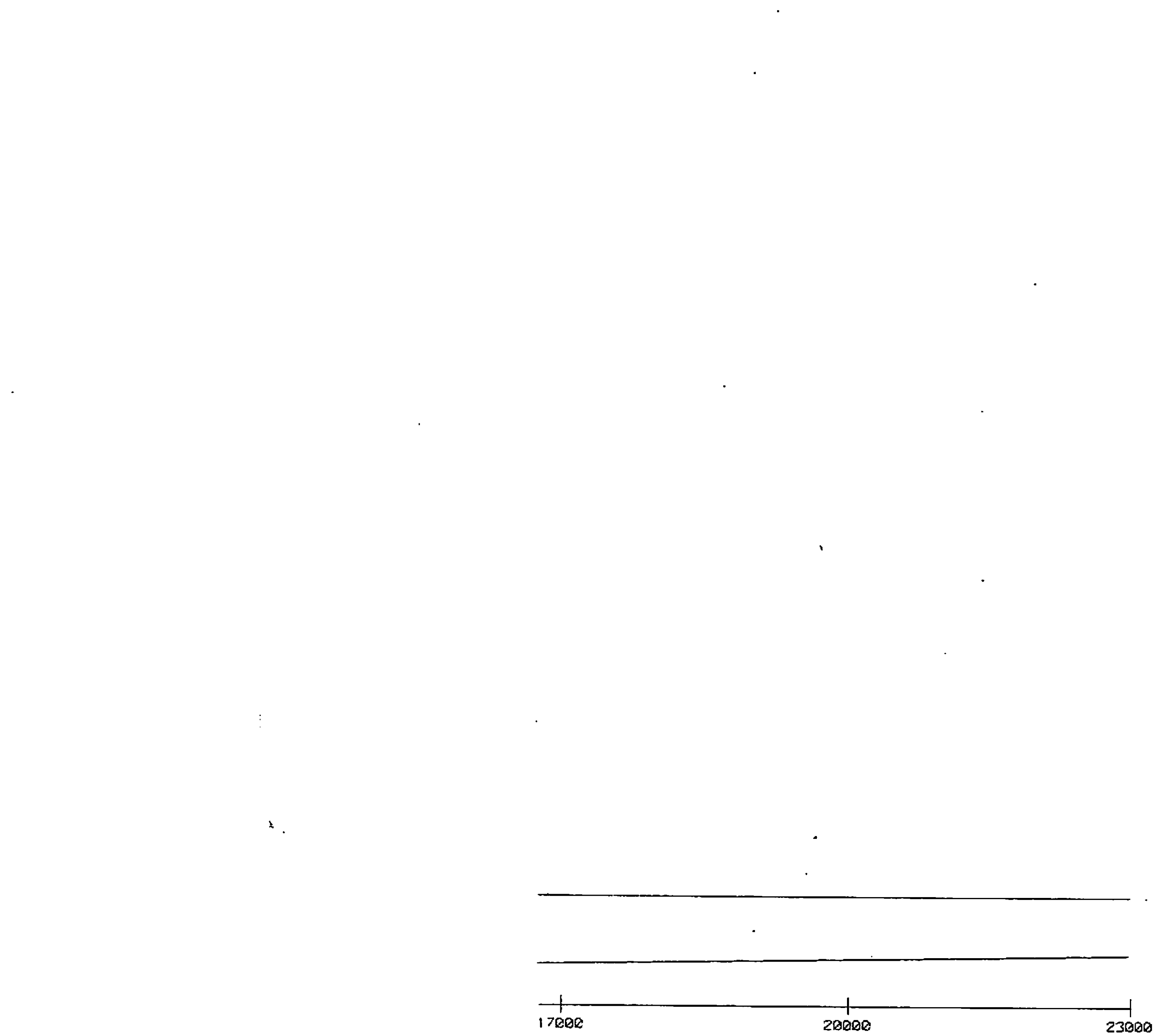

Figure 2.b CDI Due to Single Car Scattering

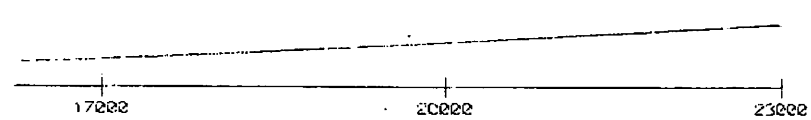

Figure 3.b CDI Due to Single Truck Scattering

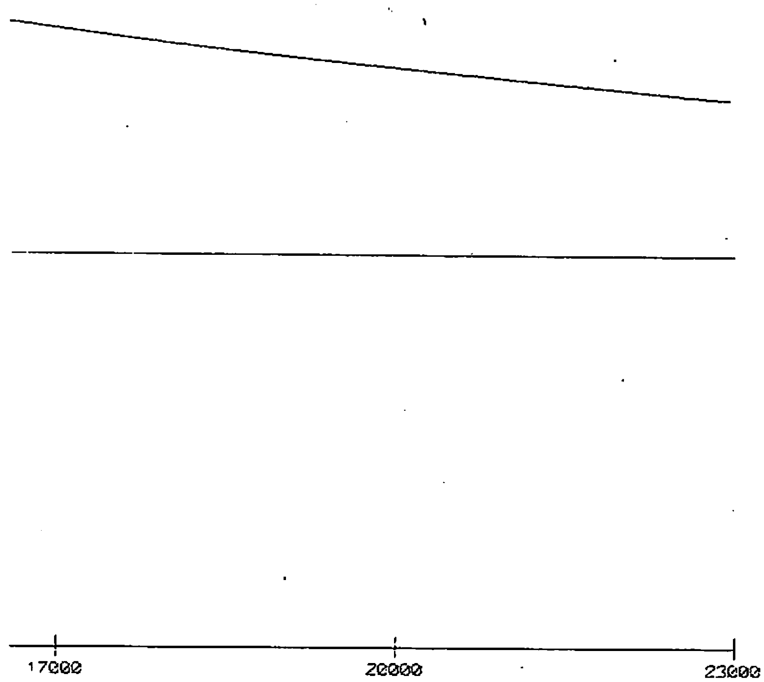

Figure 4.b CDI Due to Traffic Jam Scattering

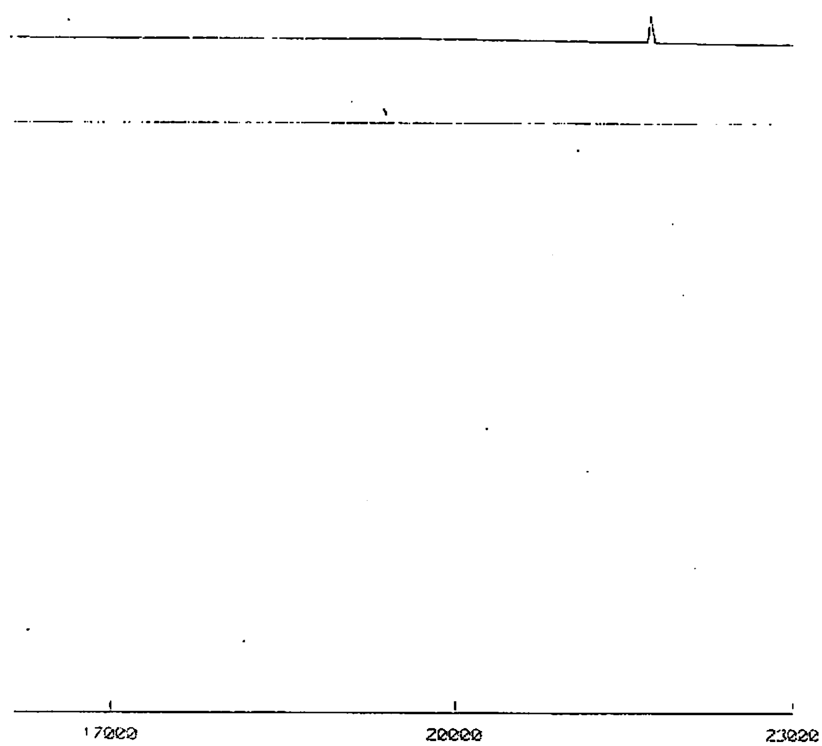

Figure 5.b CDI Due to "Fresnel" Car Spacing Scattering