

SEEDING CONSIDERATIONS FOR AN LV SYSTEM
IN A LARGE TRANSONIC WIND TUNNEL

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The results from any laser velocimeter (LV) depend upon the seeding particles. If they are too large they fail to follow the flow, if too small they may be impossible for your system to see. Thus, when we at Lewis decided to use a laser velocimeter to measure the properties of propellers, seeding was a great concern. Many methods were tried and weeded out by using a Malvern particle sizer. The most promising ones were tested in the tunnel and the LV measurements compared to theoretical values of velocity as the particle approached a blunt nose body along a stagnation streamline. Data obtained from the LV system are compared with the one dimensional particle lag calculation in figure 1. This figure shows the theoretical velocity over the blunt nose and a velocity profile for 5 μm particles. This indicates the particles were approximately 5 μm .

Figure 2 shows the seeding method. The seed, DOP, was atomized by 2 seeders run with all 12 available atomizer jets on. The atomizer seed traveled from these two seeders through four 1 inch tubes 20 feet long to the plenum chamber where this cluster of tubes injected the seed into the air stream. The tubes were located 60 feet from the model and could be moved only by shutting the tunnel down.

Figure 3 shows our future seeding plans. The model will be a cylinder with a hemispherical head, about 8 to 12 inches in diameter and properly instrumented with pressure taps. The test would more accurately evaluate our current seeding techniques, evaluate ways to improve these techniques so data rates can be increased in areas of interest like across shocks and between blades, and finally evaluate alternate methods which might be used for other facilities.

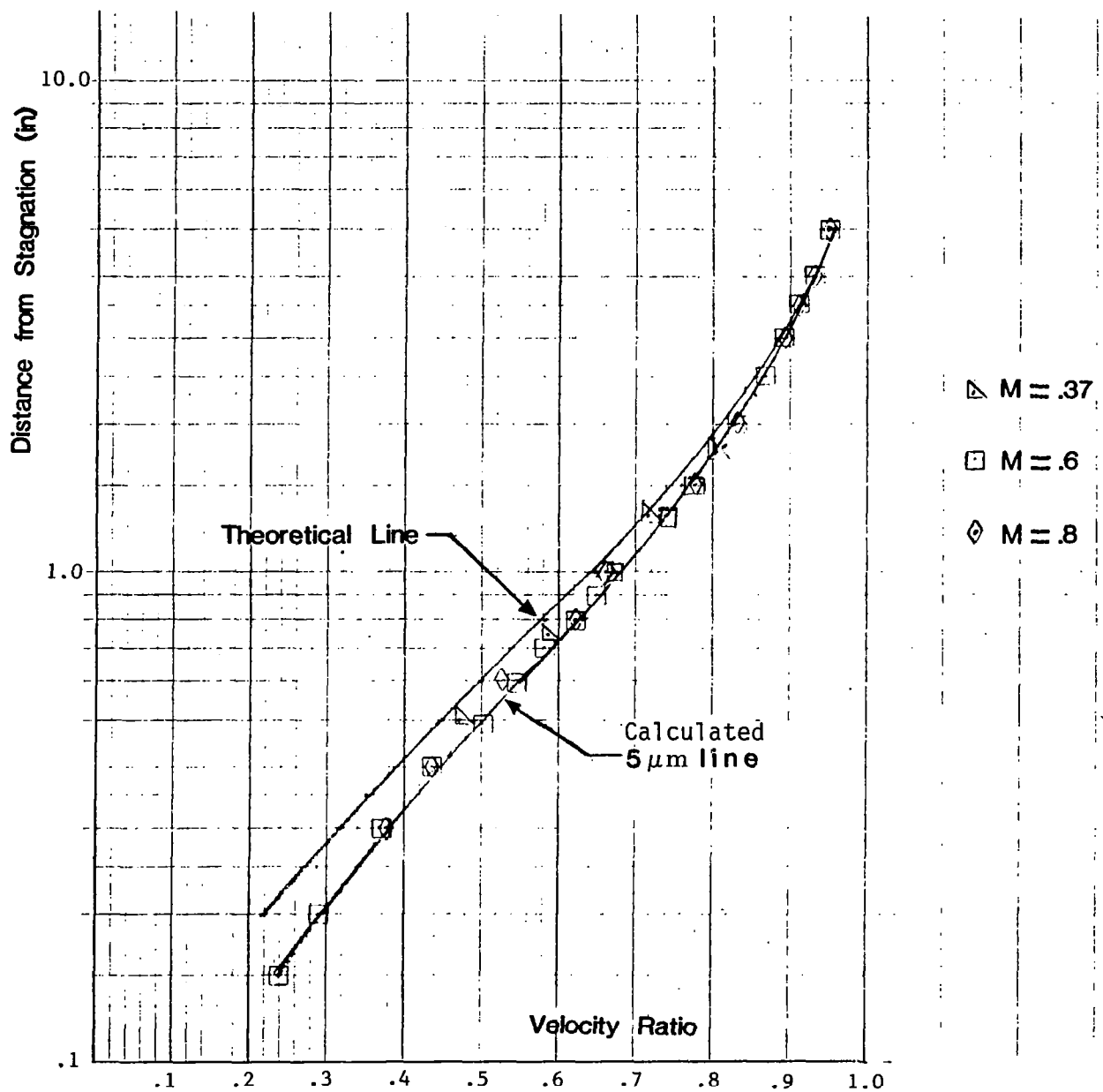


Figure 1.- Comparison of LV measurements to theoretical values of velocity as the particle approached a blunt nose body along a streamline.

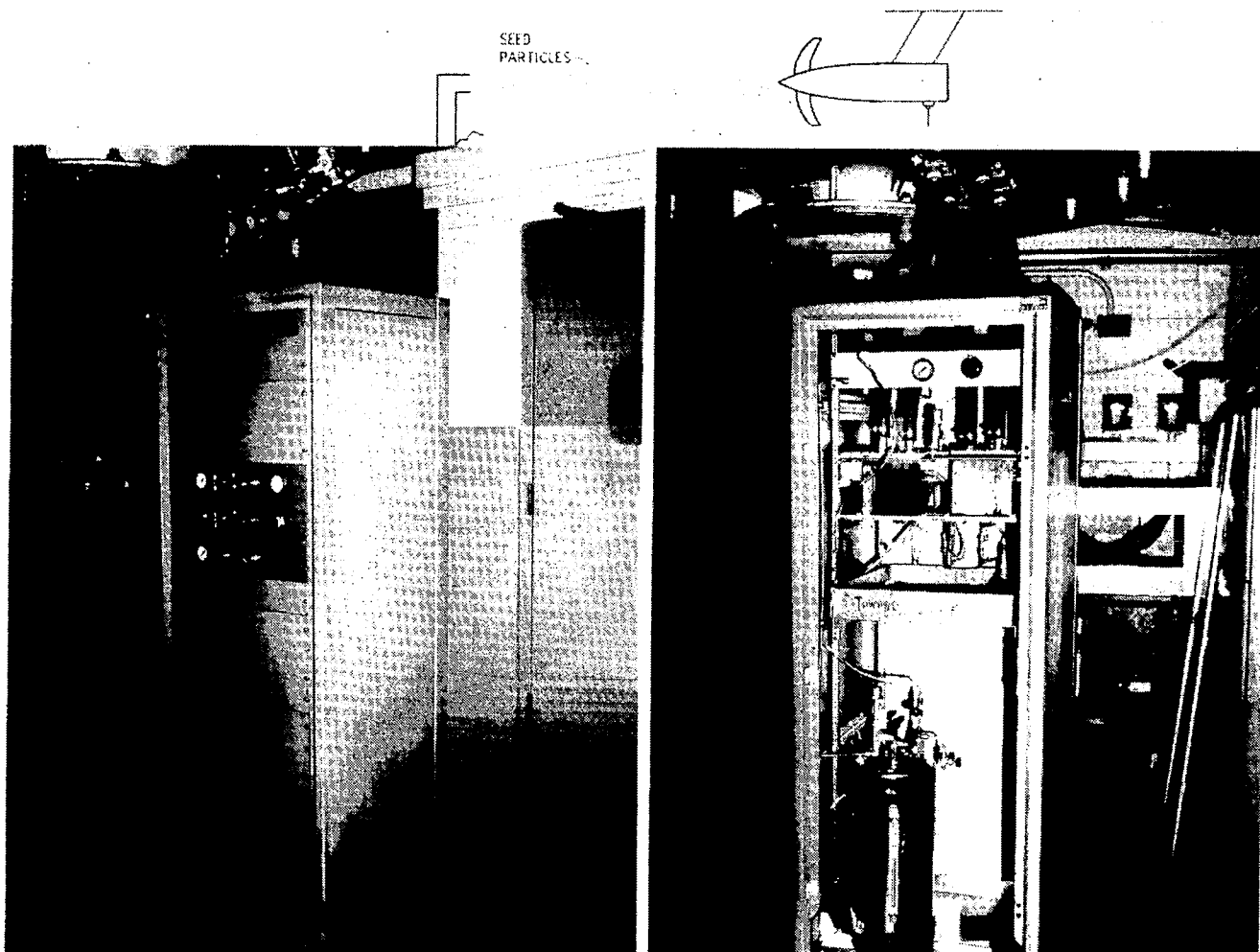


Figure 2.- Propeller particle generator system.

MODEL: Cylinder - Hemispherical Head
PURPOSE: Check Current System
Increase Data Rate Within Blades
Improve System
Evaluate Alternatives

Figure 3.- Future plans.