ELECTRON/GAS ANALOGY EXPERIMENT.

WPW FILE 2

PURPOSE.

It is proposed to simulate the helical ring-vortex model of the electron in macro-scale in the atmosphere for purposes of determining the validity of the model and ascertaining some of its pertinent characteristics. In detail, the experiment will attempt to include the following:

1. Generate a helical ring-vortex which will be stable and self-sustaining for a specific time period. The vortex is to be formed in a gas atmosphere and have a central-axis particle-velocity of mach 1.
2. Verify by photography the existence of the vortex and measure its flow reversal diameter.
3. Determine the effect of geometric and gas flow variables on the flow reversal diameter.
4. Generate multiple vortices which can be positioned near each other and measure the forces resulting from their interaction.

FEASIBILITY

From discussion with Dr. J. Xerikos and examination of photographs taken of his master's thesis project, it is apparently possible to generate vortices at sonic velocities. Whether such a vortex can be self-sustaining for any significant time period is highly speculative.

If the experiment is to be done at a pressure of one atmosphere, the pressure levels associated with Mach 1 velocity would require the use of an aerodynamic wind tunnel with sufficient cross section to permit the desired changes in boundary geometry. Photography could be done with the E.L.&S. HYCAM camera which is capable of up to 10,000 frames/sec of 16mm. film. The camera resolution is 60 lines/mm. and 400 ft. of film will provide .8 sec. duration at 10,000 f/sec. (approx. ½ of film length is used during the camera accelerating process) Individual line tracers of smoke, vapor or larger particles could be injected into the vortex to indicate flow direction. Cost of photography would run ~$1000-2000 for several runs.

The mechanism for generating multiple vortices for the purpose of measuring their interactions has not been investigated but on the surface it would seem far from simple.

By doing the experiment at much less than atmospheric pressure, it may be possible to use facilities less sophisticated than the sonic wind tunnel. However, the reduced gas density indicates a larger dia. vortex which may also pose facilities problems.

Although the experiment can be performed with relative simplicity at gas velocities of less than mach 1, it is thought that the sonic velocity is a valid constraint and the results of such an experiment would be meaningless. It should also be relatively easy to produce a pair of subsonic vortices.

and measure their interaction forces. The results in this case may have greater validity.

Before it is possible to be more specific about facilities requirements and costs, it would be highly desirable to determine theoretically the anticipated vortex size and configuration details.

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cc. J.M. Brown.